

An aerial photograph of a coastline. The top half shows a deep blue sea meeting a white sandy beach. To the right, a steep, green cliffside descends to the water's edge. The water transitions from dark blue to a lighter turquoise near the shore. Several people are visible swimming in the shallow water. The overall scene is scenic and natural.

中華民國骨科醫學會

Taiwan Orthopaedic Association

110年度第79次學術大會  
線上摘要集



中華民國骨科醫學會  
110 年度第 79 次學術研討會(線上)

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## 骨科研究 Free paper

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# Free Paper

## 口頭演講



**Biomechanical Comparison of Pedicle Screw Fixation Strength in Synthetic Bones: Effects of Screw Shape, Core/Thread Profile and Cement Augmentation**

以生物力學的方式探討骨釘形狀、螺紋、以及骨水泥輔助對於椎弓骨釘強度的影響

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**Introduction**

Pedicle screw loosening resulting from insufficient bone-screw interfacial holding power is not uncommon. The screw shape and thread profile are considered important factors of the screw fixation strength. This work investigated the difference in pullout strength between conical and cylindrical screws with three different thread designs. The effects of the thread profiles on the screw fixation strength of cannulated screws with or without cement augmentation in osteoporotic bone were also evaluated.

**Materials and Methods**

Commercially available artificial standard L4 vertebrae and low-density polyurethane foam blocks were used as substitutes for healthy vertebrae and osteoporotic bones, respectively. The screw pullout strengths of nine screw systems were investigated (six in each).

**Results**

These systems included the combination of three different screw shapes (solid/cylindrical, solid/conical and cannulated/cylindrical) with three different thread profiles (fine-thread, coarse-thread and dual-core/dual-thread). Solid screws were designed for the cementless screw fixation of vertebrae using the standard samples, whereas cannulated screws were designed for the cemented screw fixation of osteoporotic bone using low-density test blocks. Following specimen preparation, a screw pullout test was conducted using a material test machine, and the maximal screw pullout strength was compared among the groups.

**Discussion**

This study demonstrated that, in healthy vertebrae, both the conical and dual-core/dual-thread designs can improve pullout strength. A combination of the conical and dual-core/dual-thread designs may achieve optimal postoperative screw stability. However, in osteoporotic bone, the thread profile has little impact on the screw fixation strength when pedicle screws are fixed with cement augmentation.

**Conclusions**

Cement augmentation is the most important factor contributing to screw pullout fixation strength as compared to screw designs.

**International External Validation of the SORG Machine Learning Algorithms for Predicting 90-Day and 1-Year Survival of Patients with Spine Metastases using a Taiwanese Cohort****利用臺灣人種之世代追蹤研究外部驗證 SORG 機器學習演算法對癌症脊椎轉移病人 90 天與 1 年存活率之預測力**

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**Introduction**

Accurately predicting the survival of patients with spinal metastases is essential for surgical intervention. The SORG machine-learning (ML) algorithm accurately predicted the 90-day and 1-year mortality of patients with metastatic cancer to the spine. However, prior external validations were conducted on the east coast of the United States, representing a generally homogeneous population. The aim of this study was to externally validate the SORG algorithms with a Taiwanese population.

**Materials and Methods**

The baseline characteristics of our validation cohort were compared with those of the previously published validation cohorts. Discrimination (c-statistic and receiver operating curve), calibration (calibration plot, intercept, and slope), overall performance (Brier score), and decision curve analysis were used to assess the performance of the SORG ML algorithms in this cohort.

**Results**

Ninety-day and 1-year mortality rates were 110 (26%) and 256 (60%), respectively. The SORG ML algorithm for 90-day and 1-year mortality demonstrated a high level of discriminative ability (c-statistics of 0.73 [CI, 0.67–0.78] and 0.74 [CI, 0.69–0.79]), overall performance, and had a positive net benefit throughout all threshold probabilities in decision curve analysis. The algorithm for 1-year mortality had a good calibration. However, the 90-day mortality algorithm underestimated mortality for the lowest predicted probabilities.

**Discussion**

Applying the same algorithms to an American and Taiwanese population may therefore poorly predict patient survival because the average BMI of Taiwanese and American patients were hypothesized to be similar. The primary tumor type and disease nature also had a great difference in different regions. The AUCs of the SORG ML 90-day and 1-year algorithms provided better discrimination by excluding cancers with a significantly better prognosis in Taiwan

**Conclusions**

The SORG algorithms for predicting 90-day and 1-year mortality in patients with spinal metastatic disease generally performed well on international external validation in a predominately Taiwanese population. However, 90-day mortality was underestimated in this group. Whether this inconsistency was due to different primary tumor characteristics, BMI, selection bias or other factors remains unclear, and may be better understood with further validative works that utilize international/diverse populations.

## The Influence of Lumbar Spinal Stenosis on Ability of Postural Control

### 腰椎狹窄症對姿態控制的影響

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#### Introduction

Lumbar spinal stenosis (LSS) is a heterogenous diagnosis indicating a narrowing of the lumbar spinal canal, resulting in subsequent compression of the neural elements. The clinical symptoms and radiographic severity of spinal stenosis do not correlate well, and there are no well-developed physiological tests. The goal of this study is to investigate the correlations between severity of lumbar spinal stenosis and ability of postural control.

#### Materials and Methods

Fifty patients aged 50 and older with lumbar spinal stenosis were enrolled in the study. Clinical assessment of lumbar spinal stenosis included subjective severity (pain scores, Oswestry Disability Index, and Swiss Spinal Stenosis Questionnaire), radiographic parameters (global alignment, lumbar lordosis, and spondylolisthesis), and MRI study (central stenosis, lateral recess stenosis, and foraminal stenosis). The ability of postural control was assessed using posturography to measure the position of center of pressure (COP). The correlation between clinical assessment of lumbar spinal stenosis and ability of postural control was studied using multiple regression analysis, with the level of significance set at  $\alpha=0.05$ .

#### Results

In the subjective severity, only worse functional scores in Swiss Spinal Stenosis Questionnaire were associated with higher COP sway velocity. There were no correlations between radiographic parameters and ability of postural control. Central, lateral recess, and foraminal stenosis in the MRI study all had positive correlations with COP sway velocity.

#### Discussion

The human balance system consists of multisensory and sensorimotor networks of visual, vestibular, and proprioceptive systems. Compression of neural elements at lumbar spine may have impacts on proprioception and muscle control in the lower limbs, which in turn, contribute to balance problems.

#### Conclusions

Objective evidence of neural compression in patients with lumbar spinal stenosis was correlated with worse ability of postural control. Patients who had less severe symptoms did not ensure normal postural control ability.

## Can the Radiographic Signs of Lumbar Spine Degeneration Predict Ligamentum Flavum Hypertrophy ?

### - the Correlation Study between Plain Radiography and MRI Image

腰椎退化的 X 光影像特徵能否預測黃韌帶肥厚? - X 光影像和核磁共振的關聯性研究

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### Introduction

Lumbar spinal canal stenosis (LSCS) is a common spinal degenerative disease that causes disability in the elderly. Among the causes, "ligamentum flavum hypertrophy (LFH)" is one of the major components. In the clinical context, most LSCS patients underwent plain radiography in the initial evaluation. Nevertheless, physicians usually need Magnetic Resonance Imaging (MRI) for definite diagnosis. The purpose of this study is to identify and validate radiographic parameters to be the predictors for ligamentum flavum (LF) thickness on MRI scans.

### Materials and Methods

We retrospectively enrolled 213 LSCS patients, who received both lumbar spine radiography (anteroposterior and dynamic /Flexion-Extension views) and MRI studies in NCKUH. LF thickness and area at L3-4 and L4-5 levels were measured on axial images of MRI. Radiographic parameters related to disc degeneration were evaluated, including disc height, disc lordotic angles, vacuum phenomenon, disc calcification, endplate sclerosis, and spur formation. Radiographic signs of instability, including sagittal translation, segmental angular rotation, spondylolysis, and Meyerding classification of spondylolisthesis were also recorded. Finally, facet joint arthropathy and spinopelvic alignment were documented and graded. We correlated the LF thickness and area with these radiographic parameters. All data were analyzed using SPSS version 17.

### Results

The results revealed that the thickness and area are significantly correlated with age( $p<0.001$ ), intradiscal angle( $p=0.010$ ), angular rotation( $p=0.005$ ), lumbar lordosis angle( $p<0.001$ ), sacral slope( $p=0.002$ ). Moreover, statistically significant differences of LF thickness and area between patients with and without vacuum disc( $p=0.003$ ), endplate sclerosis( $p=0.006$ ), spur formation( $p=0.034$ ), facet arthropathy( $p<0.001$ ) were identified.

### Discussion

With the advent of aging era, spinal degenerative diseases are frequently encountered in clinical practice. Spinal degenerative diseases appear to be evolved in deteriorative cascade, which initiate from disc degeneration, to segmental instability, and ultimately ankylosis. Each phase had corresponded radiographic signs. Recent studies indicate that aging, degeneration, mechanical stress and compensatory stabilization are all possible etiologies of LFH. In the current study, we further confirmed the correlation between the radiographic parameters of degeneration and LFH.

### Conclusions

For LSCS patients, the presence of vacuum disc, endplate sclerosis, spur formation, facet arthropathy, decreased angular rotation on radiographs predicted the occurrence of LFH based on MR images. The clinical relevance is that MRI is suggested for symptomatic patients with these radiographic signs to detect LFH.

## Analysis of Sagittal Lumbopelvic Alignment between Supine, Standing and Sitting Positions 仰臥姿、站姿與坐姿的腰椎-骨盆矢狀排列分析

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### Introduction

Older adults, because of weakness in locomotion, and office workers spend most of their time in the sitting position. Kinematic analysis of the lumbar spine elucidates the causes of low back pain while sitting, thus aiding the formulation of prevention strategies. We investigated the difference in sagittal lumbopelvic alignment between the supine, standing, and sitting positions in middle-aged patients with chronic low back pain.

### Materials and Methods

The lumbar lordotic angle (LL); lumbar segmental angles, specifically, L1–2, L2–3, L3–4, L4–5, and L5–S1 Cobb angles; sacral slope (SS); pelvic tilt (PT); and pelvic incidence (PI) were measured on the lateral spine in standing, supine, and sitting positions using radiographs.

### Results

Of the 87 participants, 47 and 40 were men and women, respectively (mean age:  $56.1 \pm 7.4$  years). The average PI was  $49.9 \pm 10.0^\circ$ . LL, SS, L2–3, L3–4, and L4–5 Cobb angles decreased significantly during movement from the standing to sitting position and from the standing to supine position, while PT increased during these movements. L5–S1 Cobb angle decrease contributed the most to the change in LL when moving from the standing to sitting position. Changes in PT, LL, and L5–S1 Cobb angle when moving from the standing to sitting position were less substantial in older participants.

### Discussion

PI, the crucial parameter of spine sagittal alignment, is not only in the erect position, but also in the seated and supine positions according to previous literature. The whole spinal curves in the supine position should be taken into account, for instance at the examination results of computed tomography or magnetic resonance imaging for surgical references. Adjusting LL based on PI values during spinal surgery is apparently essential, even in patients whose physical activities are severely limited.

### Conclusions

The spinopelvic sagittal parameters mostly significantly changed from the standing positions to the sitting and supine position among the middle-aged patients with chronic LBP, except for L1–2 Cobb angle and L5–S1 Cobb angle between supine and standing positions.

缺繳

缺繳



## Automated Measurement of Adolescent Idiopathic Scoliosis Using the Cascaded Pyramid Network 青少年脊椎側彎的自動量測-利用串聯式金字塔網絡分析

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### Introduction

Scoliosis is a spinal deformity in which a sideways curvature is noted. Radiographs are needed to identify the severity and classification. Idiopathic scoliosis is usually diagnosed and warranted treatments in adolescents. Convolutional neural network, which are made of multilayer convolution, is a promising approach to analyze the medical images. However, "hard" features, such as Cobb's angle, could not be simply recognized traditionally. Cascaded pyramid network (CPN) is a two staged structure. In the first stage, "easy" features, such as the vertices of each vertebrae, are identified; while "hard" features are identified. Here, we present our primitive result

### Materials and Methods

After approval of Institutional Review Board, 373 whole spine radiographs were collected from 373 patients from NTUH. The vertices of thoracic and lumbar vertebrae were annotated by orthopedic spine specialists. For identification of central sacral vertical line (CSVL), the centers of the proximal sacral endplates were also localized. The 373 datasets were then divided into training and testing dataset (346 and 27 images). First stage of CPN was utilized. Testing images were then validated. The predicted locations were then compared. The performance was evaluated by using the absolute error of the predicted location.

### Results

The 69 landmarks on 27 testing images showed mean distance error at 10.87 mm. The centers of the proximal sacral endplates showed the best estimation, with mean error at 4.28 mm. The mean error of the predicted location was 9.20mm at T1, 8.40mm at T2, 7.54mm at T3, 8.42mm at T4, 11.40mm at T5, 12.23mm at T6, 11.49mm at T7, 11.33mm at T8, 11.95 mm at T9, 11.95mm at T10, 9.16mm at T11, 8.25mm at T12, , 6.38mm at L1, 8.62mm at L2, 11.76mm at L3, 16.75mm at L4, 21.49mm at L5. The best estimation was at L1 and the worst estimation was at L5.

### Discussion

First stage of analysis of AIS using CPN showed mean distance error at 10.87mm. Here, only 346 training images were used. Theoretically, the accuracy could be better when using more training dataset. Previous study predicting sagittal vertical axis showed error distance at 6mm using 990 patient. Though the "hard" points were not validated in this study, but we believed that the good performance would be achieved when predicting the "hard" points..

### Conclusions

Automatic measurements of orthopedics field is believed to influence the clinical practice in the coming years.. The primitive result of first stage of CPN showed excellent estimations when evaluating the "easy" features. The proposed architecture could be further implemented to identify more landmarks for clinical practice in the future.

缺繳

## Surgical Outcomes of Robot-Assisted Versus Freehand Pedicle Screw Placement in Adolescent Idiopathic Scoliosis

機器手臂輔助與徒手置放椎弓釘用於青少年原發性脊椎側彎之手術結果比較

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臺中榮民總醫院骨科部<sup>1</sup> 衛生福利部豐原醫院骨科部<sup>2</sup>

### Introduction

Posterior instrumentation with pedicle screw is widely used on adolescent idiopathic scoliosis (AIS) patients to achieve curve correction and spinal stabilization. Screw implantation can be arduous in patients with high degree of deformity. Misplacement and complications occur even for experienced spine surgeons. Since the advent of robot technology, the accuracy of pedicle screw placement is greatly improved which have been validated in previous studies. However, literatures concerning outcomes were scarce. The purpose of this study was to evaluate the clinical and radiological outcomes of robot-assisted (RA) compared with freehand (FH) pedicle screw placement in AIS patients.

### Materials and Methods

All AIS patients receiving posterior instrumentation with pedicle screw at our institute since April 2013 were screened. Medical records and radiographic images were retrospectively reviewed. Clinical outcome measures were VAS, ODI, EQ-5D, and any complication event. Radiological outcomes comprised both coronal and sagittal parameters inclusive of Cobb angle, coronal balance, trunk shift, radiographic shoulder height (RSH), thoracic kyphosis (TK), lumbar lordosis (LL), sagittal vertical axis (SVA), pelvic tilt (PT), pelvic incidence (PI), and sacral slope (SS).

### Results

A total of 40 AIS patients (male : female = 9 : 31) fulfilled minimum follow-up of 6 months, and was included for analysis. There was no significant difference of the change of VAS of pain, EQ-5D, and ODI postoperatively between two groups. The screw density of RA and FH groups were  $1.88 \pm 0.14$  (mean  $\pm$  SD) and  $1.27 \pm 0.54$ , respectively. The correction rate of Cobb's angle of RA and FH groups were  $62.77\% \pm 12.54\%$  and  $60.39\% \pm 13.56\%$ , respectively. There was lower complication rate in RA group, compared with FH group. In FH group, one patient suffered from postoperative pneumothorax, one suffered from UTI, two suffered from postoperative back pain and numbness, and one suffered from screw breakage. In RA group, only one patient suffered from screw breakage.

### Discussion

A good understanding of the anatomy of spine and principles of pedicle screw implantation is crucial to establish optimal trajectory so that complication can be avoided with better outcomes. The modern robot technology can assist clinical surgeon to achieve this goal.

### Conclusions

The higher correction rate of Cobb angle in RA group may be due to higher screw density providing stronger anchorage of the implant to the bone. In addition, higher accuracy of screw implantation in RA group may be attributable to the decreased complication rate. However, a study with longer follow-up period and larger sample size are necessary in the future.

**Cerebral Palsy with Hyperlordosis - Strategy and Literature Review****腦性麻痺合併高度脊椎前凸的治療對策與文獻回顧**李奕澄<sup>1</sup> 曾效祖<sup>1</sup>台北慈濟醫院骨科<sup>1</sup>**Introduction**

Cerebral palsy (CP) with lordoscoliosis is common. However, CP with hyperlordosis is rare and difficult to treat. The best strategy and parameter for correction are still debate. We present a case of CP with hyperlordosis who was treated with two stages surgery.

**Materials and Methods**

The 15-year-old boy was a case of CP with lordoscoliosis (Spastic and quadriplegia, GMFCS IV). He ever underwent bilateral hip release. However, rapid progression in Cobb's angle was noted (60 deg to 88 deg) in few months. Also, poor sitting balance was noted. He lost follow-up for one year and visited our OPD for correction surgery. The pre-op Cobb's angle showed 104 deg (T10 - L4), lumbar lordosis (LL) 90 deg and pelvic obliquity 26 deg.

**Results**

The T4 to S1 posterior instrument and fusion was finished and post-op radiography showed Cobb's angle 84 deg (T10 - L4), lumbar lordosis (LL) 80 deg. Due to difficulty of screw approach, multiple levels osteotomy did not be performed initially. The patient showed improvement of sitting balance. However, bow shape of spine with high pressure at sacrum and occipital area. The second surgery was performed. T11-L4 posterior column osteotomy (PCO) with sublaminar wire was performed five months later. The post-op radiography showed Cobb's angle 50 deg (T10 - L4), lumbar lordosis (LL) 65 deg. The patient was discharged with excellent satisfaction.

**Discussion**

The incidence of CP with scoliosis is about 20%. The characteristic of it is rapid progression (mean 10-20 deg / month in age 8 to 10 years). Especially in CP with spastic quadriplegic. Lumbar hyperlordosis occurred in 4.5% of all CP (Karampalis et al., 2014). The etiology is still unclear but hip flexor contractures may play an important role. The most complaint from patient and family are back pain, poor sitting balance and bedsores. The bracing is less effective and long spine fusion is necessary. The previous studies showed various technique to balance sagittal and each revealed effective and promising. Posterior approach, posterior column osteotomy (PCO) with pedicle screws fixation showed not only effective but also safe than anterior release combined with posterior fusion.

**Conclusions**

To correct sagittal balance has positive impact on quality of life, functional ability and provision of nursing care. CP with hyperlordosis could be corrected via posterior approach with PCOs

**Old but Powerful Correction - Sublaminar Wires in Spine Deformity****舊式椎板下鋼絲固定術在脊椎畸形矯正的應用**

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**Introduction**

Most spine deformity could be corrected via posterior instrument with pedicle screws. However, extreme spine rotation in thoracic area may deter the screw inserted. The old methods could dodge the entry point and at the same time provide powerful fixation and correction.

**Materials and Methods**

We provide two cases of neurofibromatosis-1 with scoliosis. The first one is a 12-year-old boy with pre-op Cobb's angle showed T2-T6: 65 deg (convex to the left, apex at T4) and T6-T12: 100 deg (convex to the right, apex at T9) and the second 12-year-old boy with pre-op Cobb's angle showed T2-T12: 73 deg(convex to the right, apex at T7) and thoracic kyphosis (T4/T12) 97 deg. Both cases encountered difficulty of approach in thoracic spine with pedicle screws insertion.

**Results**

We performed posterior column osteotomy (PCO) with sublaminar wire fixation in apex and finally fixation with pedicle screws in both ends. Both cases showed satisfied result without neurological deficit or dural tear. The postoperative course was smooth. The correction rate was 52%. One of case with 4.5 years follow-up showed no loss of reduction.

**Discussion**

The sublaminar wires were took place by modern technique of pedicle screws fixation due to better correction and 3-D stability. However, in extreme deformity, sublaminar wires seem play a role due to easy applied and low profile. The iatrogenic neurological injury revealed 10% in previous study. The correction rate was as good as modern pedicle screws.

**Conclusions**

Sublaminar wire is useful due to inexpensive, easy applied and low profile. Hybrid technique with column osteotomy (PCO), sublaminar wire and pedicle screws provide both stability and better correction.

**Revision Surgery for Same Segment Disease Following Anterior Cervical Discectomy and Fusion(ACDF): MMH Experiences****前位頸椎間盤切除及骨融合手術術後同節段再手術案例探討**

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**Introduction**

Anterior cervical discectomy and fusion(ACDF) is a proven treatment for patients with cervical spine stenosis and disc herniation and results in significantly improved outcomes. However, postoperative recurrence of myelopathy following ACDF may occur. We reviewed the reasons for the persistent symptoms and undertaken the revision surgery after a thorough evaluation.

**Materials and Methods**

Three cases treated revision surgery within a 1.5-year period following the primary ACDF procedure were identified and data were retrospectively reviewed. The cause for persistent symptoms was evaluated completely before the revision surgery and was testified during the operation. The previous polyetheretherketone (PEEK) cage was removed with burr and the metal cage was used in all cases. The follow-up period after the revision surgery was ranged from 5 to 12 months.

**Results**

The cause for these patients to receive the revision surgery included persistent posterior osteophyte, spreading of an ossified posterior longitudinal ligament, adjacent segment disease and endplate fracture. Improvements in myelopathy or radiculopathy after the revision surgery were seen in all of the patients.

**Discussion**

We evaluated the reasons for the persistent or recurrent symptoms of our patients. The revision surgery was done based on the thorough evaluation and the patient's anatomy pattern. The metallic cage was used in our revision cases due to the advantages of a high bony fusion rate, reduction of subsidence and high porosity.

**Conclusions**

A comprehensive history, physical examination and images are essential in delivering the correct diagnosis. Revision anterior surgery is more difficult than the original procedure, including dissection through a scar bed and takedown of prior hardware and bone graft material. The metallic cage was used in all of our revision cases and the outcome is satisfactory. Therefore, we thought the metal cage might be a worthy choice for revision ACDF.

## The Strategy for Recurrent Cervical Kyphotic Deformity after Anterior Cervical Discectomy and Fusions: A Case Series with Literature Review

頸椎前側椎間盤切除及骨融合手術術後復發頸椎後凸的處置策略：病例系列與文獻回顧

陳顥文 張家銘 葉光庭 吳文田 陳英和  
花蓮慈濟醫院骨科部

### Introduction

The solution for recurrent cervical kyphotic deformity (CKD) after Anterior Cervical Discectomy and Fusions (ACDF) remain a challenging issue. In addition, it may occur with implant loosening, dislodge and further collapse of the anterior column followed with cervical spondylotic myelopathy (CSM). The main purpose of this study is to investigate an appropriate procedure as a resolution by the case presentation and literature review.

### Materials and Methods

Seven cases under through ACDF over individual levels for either degenerative or traumatic cervical kyphotic deformity but suffered from multilevel cervical spondylotic myelopathy (MCSM) according to either ligament degenerative change or implant failure after an average of 5.5 years post initial surgery (3~8 years).

### Results

Good surgical outcome with more than 25 degree of lordotic gain after adequate decompression of the central cord by open-door laminoplasty. (3 of 3-levels laminoplasty and 4 of 4-levels laminoplasty). The posterior decompression in advance ensured more secured space for the extent lordosis correction during revised ACDF or ACCF. Besides, revised posterior cervical instrumentation with pedicle screws instead of the original lateral mass screws provided greater pullout resistance and made it possible and secure to achieve greater lordotic correction. The improvement on the neurologic symptom so as the radiographic parameters indicated better functional outcome and quality of life.

### Discussions

As the horizontal gaze and cervical sagittal alignment (CSA) were highly associated with each patient's quality of life, surgical consideration should include adequate spinal cord decompression and restoration of a better CSA. According to literature review, solid posterior instrumented fusion (PIF) structure is important for prevention of implant failure and recurrent cervical deformity. In addition, the radiographic measurements included C0-C2 lordosis, C2-C7 lordosis, C2-C7 sagittal-vertical axis (SVA), C7 slope, and C7 slope minus cervical lordosis (C7S-CL), Japanese Orthopedic association (JOA) score, Neck Disability Index (NDI) and visual analog scale (VAS) scores were emphasized to evaluate and predict the clinical outcomes.

### Conclusions

As a reasonable strategy for recurrent cervical kyphotic deformity (CKD) with or without implant failure, adequate decompression by laminoplasty in advance to anterior revision and the lordotic correction by posterior instrumentation with all pedicle screws may achieve a better functional recovery.



## The Surgical Treatment of Atlantoaxial Dislocation: A Case Series and Review of Literature 頸椎第一、二節脫位之手術治療：個案報告系列及文獻回顧

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### Introduction

The causes of atlantoaxial dislocation (AAD) can be attributed to traumatic, degenerative, congenital and pathologic causes. AAD can result from traumatic odontoid fracture, transverse ligament attenuation or rupture, congenital occipital cervical junction abnormalities, and other pathologic lesions such as infection or tumors of the atlas or axis. Furthermore, AAD can be classified into reducible and irreducible types.

### Materials and Methods

We report our experience in the diagnosis and treatment of patients with atlantoaxial dislocation. These patients present with neck pain and movement restriction, limb weakness and numbness, and pyramidal signs, etc. Each patient's neurological symptoms and image studies were thoroughly evaluated. After the surgical indication was determined, these selected cases underwent surgery at our hospital with posterior reduction and fixation.

### Results

There are 6 consecutive patients who underwent posterior reduction and fusion in our case series. All of the patients made a smooth recovery as well as relieved of symptoms.

### Discussion

There are several anterior and posterior atlantoaxial fusion techniques for the surgical treatment of AAD. Each technique has its own indications, contraindications, risks, and technical difficulty.

### Conclusions

Atlantoaxial dislocation is an uncommon but potentially debilitating condition. Surgical treatment offers the best chance to halt the progression of the disease. Our method of posterior fusion with C1-2 screw instrumentation provides a reliable reduction and fixation method to treat the AAD.

## Segmental Lordotic Angle Difference Between Lateral and Prone Position in LLIF Surgery

側位及俯位姿勢在腰椎側前位融合術中對單節脊柱前凸角度的影響

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### Introduction

Lateral (Oblique) lumbar interbody fusion (LLIF/OLIF) is getting popular for spinal fusion surgery. However, position change from lateral to prone usually necessary for posterior pedicle screws insertion. In order to shortening the operation time, some surgeons use lateral position to insert pedicles screws, some surgeons use anterolateral screws for fixation. Some studies reported that there was no statistically significance between lateral and prone position in segmental lordotic angle in LLIF/OLIF surgery. The purpose of this study was to evaluate the segmental lordotic angle difference between lateral decubitus position and prone position in LLIF/OLIF surgery.

### Materials and Methods

Patients over the age of 18 with degenerative lumbar pathology who underwent a lumbar interbody fusion via lateral access from 2017–2020 from a single surgeon met inclusion criteria. Totally 12 consecutive patients were included. Fifteen levels were fused. After the LLIF surgery, patients would be changed to prone position on Jackson table with hip extension and in lordotic position for pedicle screws insertion (with or without decompression) on the same day or in 1 week. Disk space angle was measured on intraoperative C-arm images after: (1) cage insertion in lateral position, (2) prone repositioning and posterior instrumentation. Paired t test was used to determine significance ( $\alpha=0.05$ ).

### Results

Five patients were women, 7 were men. The age ranged from 46 to 80 years (mean: 65.2 Y/O). The fusion levels were located at L1-2 (n=1), L2-3 (n=3), L3-4 (n=6), and L4-5 (n=5). Decompression was performed in 6 patients. The mean segmental lordotic angle was 7.99 degree (range: 4.2-14.7degree) in lateral decubitus position. The mean segmental lordotic angle was 11.6 degree (range: 5.4-16.0 degree) after pedicle screws instrumentation in prone position ( $p<0.05$ ).

### Discussion

Several studies reported that there was no statistically significance between lateral and prone position in segmental lordotic angle in LLIF/OLIF surgery. Theoretically, prone position should get better lordotic angle than lateral decubitus position. One study found that selecting the appropriate surgical table and hip position are very important for segmental lordosis in the lower lumbar spine. Our study demonstrated that prone position can get better lordotic angle than lateral position. The limitation of this study was small case number, further study is needed to support our result.

### Conclusions

Prone position pedicle screws insertion following LLIF can increase the segmental lordotic angle if patients were placed in lordotic position in Jackson table with hip extension.

## The Clinical and Radiologic Outcome of Oblique Lumbar Interbody Fusion for the Treatment of Adjacent Segment Disease

斜側前脊椎融合手術用於治療腰椎鄰近節病變之預後

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### Introduction

Adjacent segment disease (ASD) is a common after lumbar spine fusion. Surgical intervention is considered when conservative treatment fails. Oblique lumbar interbody fusion (OLIF) for the treatment of degenerative spine disease has gradually become popular in the past ten years. However, the outcomes of OLIF for the treatment of ASD have yet to be elucidated. Our studies aimed to report the results in patients who underwent OLIF for the treatment of ASD.

### Materials and Methods

All Patients who underwent single-level OLIF for symptomatic ASD after lumbar fusion at VGHTC were included in this retrospective case series (March 2018 - December 2019). Exclusion criteria included primary fusion for non-degenerative diseases (trauma, tumor, infection... etc.) or prior instrumentation at the index OLIF level. The preoperative and postoperative functional score including VAS, ODI and EQ5D were documented. Preoperative and postoperative radiographic outcomes were compared.

### Results

A total of 18 patients met the inclusion criteria and were included for analysis. When comparing the pre-operative data with both the first and most recent follow-up postoperatively, OLIF resulted in a significant reduction in back pain, leg pain and ODI score ( $p < 0.05$ ).

### Discussion

OLIF is one type of lateral lumbar interbody fusion (LLIF) and was recommended by some experts for the treatment of ASD with less postoperative pain and favorable outcomes. This may be due to the small surgical incision during approach, fewer disturbances to the paraspinal muscle and less nerve root manipulation. Improvement of radiologic parameters may be attributed to the effect of indirect decompression with larger intervertebral cage.

### Conclusions

According to our results and early experiences, we proposed that OLIF was safe and effective for ASD. However, due to small case number and short follow up duration, studies with larger patient group and longer follow up time should be conducted.

## Factors that Anticipate Potentially Poor Outcomes from Sufficiently Corrected Age-Adjusted Sagittal Parameters in Anterior Lumbar Fusion Patients

探討前開式脊椎融合術患者即便符合年齡尺度校正仍預後不佳的因子

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### Introduction

Recent studies have suggested three sagittal profiles: sagittal vertical axis (SVA), pelvic tilt (PT), and pelvic incidence minus lumbar lordosis (PI-LL) may be age dependent. This study aims to investigate actors that anticipate potentially poor outcomes from sufficiently corrected age-adjusted sagittal parameters in anterior lumbar fusion patients.

### Materials and Methods

All 65 patients received anterior lumbar fusion treatment, including Anterior (ALIF) and Oblique (OLIF) interbody fusion, for adult spinal deformity. Health related quality of life (HRQOL) measurement including European Quality of life scale (EQ5D), total Visual Analog Scale of pain (VASPT), VASP of back (VASPB), and Oswestry Disability Index (ODI) were measured at pre-OP and 1 year post-OP follow up. Age-adjusted threshold was calculated according to the study of Lafage et al. Patients with sufficient correction in accordance with age-adjusted sagittal parameters of SVA, PT, and PI-LL with poor outcome defined as ODI score >40 were included in this study. Patients were stratified into two groups; the SUFFICIENT group for reaching the target threshold, and the UNDER group for under treatment in accordance to the status of three age-adjusted range parameters; SVA, PT, and PI-LL. Pre-OP sagittal parameters were included; age, sex, OP type, BMI, hospital stays, sacral slope (SS) group, thoracic kyphosis (TK) group, PI group, LL-TK mismatch group, PILL group, PT group, SVA group, L4S1 lordosis, LL, PT, SS, PI, TK, SVA, PI-LL, LL-TK, sacral-femoral distance (SFD), SVA/SFD, spinal balance condition.

### Results

Parameter profile of the population (57% Female, 30 ALIF/35 OLIF, mean 62.7 y/o) at 1 year was: SVA=37.2±30.3mm, PT=18.8°±7.3°, and PI-LL=9.1°±13.1°. In the SVA group, low TK and longer hospital stay were related to worse EQ5D; in the PT group, high LL-TK mismatch was related to worse EQ5D and VASPL. Moreover, greater SVA/SFD ratio was related to worse ODI score; in the PI-LL group, high LL-TK mismatch was related to worse EQ5. Greater SVA/SFD ratio was related to worse ODI score. Patients with greater BMI and under correction of SVA simultaneously showed worse VASPB. OLIF group had worse VASPT.

### Discussion

Previous study showed beneficial by correcting in accordance to age-adjusted threshold of SVA, PT, and PI-LL. Therefore, age-adjusted threshold of the parameters should be taken into consideration of the operative planning. However, among sufficiently corrected patients, influential factors that anticipate unsatisfactory HRQOL are yet to be determined. According to our result, high BMI demonstrated the potential of poor recovery and influenced isolated low back pain. In pre-OP evaluation, spinal balance plays an important role in predicting post-OP HRQOL, including SVA/SFD ratio and LL-TK mismatch.

### Conclusions

Poor outcome despite sufficiently corrected was correlated with multiple factors, including baseline BMI, LL-TK mismatch, and spinal balance. More pre-OP data including baseline lab data and comorbidities should be included in future studies.

**Comparison of One-Stage Versus Two- Stage MIS Correction for Adult Spinal Deformity****一次性及分期性微創脊椎融合術在成人脊椎側彎矯正之比較**

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**Introduction**

Posterior approach for treatment of adult spinal deformity (ASD) has high complication rates. Oblique lumbar interbody fusion (OLIF) as minimally invasive approach (MIS) is playing an increasing role in the treatment of adult degenerative scoliosis. The objective of this study is to evaluate the outcomes and complications of one-stage and staged OLIF with posterior instrumentation and to document which procedure is more efficacious and provides better results.

**Materials and Methods**

A retrospective study was performed including 23 patients with ASD and underwent OLIF with posterior instrumentation, these patients were divided into two groups: Group I one-stage or Group II staged operation. The radiographical and functional results one-stage or staged operation were statistically analyzed. The complications were carefully recorded.

**Results**

There was no significant difference between Group I and II, considering age at surgery, preoperative scoliosis angle, pelvic tilt kyphosis angle, lordosis angle, and operation time ( $P > 0.05$ ). Group II had significantly longer hospitalization time ( $P < 0.05$ ) and Group I were associated with less intraoperative blood loss ( $P < 0.05$ ). The radiographic outcome both groups showed significant correction ( $P > 0.05$ ) in pelvic incidence–lumbar lordosis (PI-LL), lumbar lordosis (LL), sagittal vertical axis (SVA) (mm), and Max Cobb angles. For functional outcome, both group of patients showed significant improvement ( $P < 0.05$ ) in visual analog scale (VAS), Oswestry Disability Index (ODI) and EuroQol (EQ-5D). Complication occurred in 6 patients (6 / 23, 26%), two patients were from Group I and four patients were from Group II.

**Discussion**

OLIF can achieve desired correction in both one-stage and staged operation. During planning staged operation were usually suggested for patients requiring more levels of correction, because more time were required to observe the effect of first stage of operation. Even though our data suggests staged operation may result in more complications such as subsidence and infection, we believe larger patient pool and longer follow-up are required to confirm the occurrence and cause of this phenomenon.

**Conclusions**

OLIF with posterior instrumentation for ASD in both one-stage and staged operation can achieve desired correction angles with significant improvement of functional outcomes.

**Leriche's Syndrome, A Rare Complication Following Lumbar Spinal Surgery : A Case Report**  
**Leriche 症候群，腰椎手術後罕見併發症：病例報告**

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**Introduction**

Cauda equina syndrome is caused by lesions to the nerve roots emerging from below the conus medullaris. It generally manifests as low back pain, weakness of the lower limbs, saddle anesthesia, and sexual and sphincter dysfunction. Cauda equina syndrome is an infrequent entity but requires urgent aetiological diagnosis and early treatment in order to minimize the potentially severe and irreversible sequelae.

**Materials and Methods**

The 69-year-old man, a heavy smoker for 56 years, with a diagnosis of hypertension, DM, PAOD and Af was referred to the emergency department on suspicion of cauda equina syndrome. The patient presented sudden weakness and numbness of the lower limbs, accompanied by severe low back pain. He reported surgical history of L3/4/5 PLF and PI. NE showed weakness of the lower limbs (dorsiflexion and plantar flexion 1/3) and no weakness in the upper limbs. He presented tactile hypoesthesia of the external face of the thighs, groin area, and saddle anesthesia. Achilles reflexes was abolished. Decreased tone of the anal sphincters was also noted. Bedside ultrasound showed distended bladder. Insertion of a Foley catheter resulted in 800ml of urine output. In conclusion, NE findings were compatible with cauda equina syndrome. Furthermore, the peripheral pulses were palpable except left ATA and DPA due to diagnosed PAOD and angioplasty failure before.

**Results**

An emergency MRI scan and CT scan revealed disc bulging at L2/3 level causing thecal sac compression which compatible with our findings. The patient was undergoing L2/3 prompt surgical PD, TLIF with cage and PI. After the surgery, saddle anesthesia and lower leg pain and numbness significantly improved; moreover, muscle power recovered (dorsiflexion and plantar flexion 3-4/4) and he could walk around with walker. Nevertheless, the patient complained sudden sever bil. lower limb pain and numbness after two days of the operation. Bilateral lower limb was pulseless, paralysis, parenthesis and pallor. PE found bil. lower limb disappeared DTR and MP decreased. Aorta CTA found hypodense filling defects in infrarenal aorta and bilateral common iliac arteries, favor Leriche syndrome. CVS doctor was consulted and the patient was arranged for emergent bypass surgery.

**Discussion**

In the literature review, vascular injury associated with posterior lumbar spine surgery is not common but can be fatal. Early recognition, diagnosis, and prompt treatment are essential to prevent fatal outcomes. The explained reason is that we believe the vibration of vessels caused from surgery can promote thrombus formation, through a mechanical injury to the intima of the artery. The aortic occlusion of Leriche's syndrome is usually caused by diffuse atherosclerotic changes, exacerbated by smoking, diabetes, hypertension, and hypercholesterolemia. However, iatrogenic trauma to the blood vessels as a cause for thrombosis has been documented.

**Conclusions**

In our case, surgery could have promoted endothelial injury leading to thrombus formation. In addition, smoking, Af, DM, and PAOD history can promote hypercoagulability and related risks.

## Pre-operative Chronic Opioid Use Relates to Poor Outcome of Spine Surgery: A Nationwide Study 術前長期使用嗎啡影響脊椎手術預後：國家級研究

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### Introduction

There is a growing interest in understanding the association between pre-operative opioid therapy and spine surgery outcomes. However, prior research focused on the countries where opioid prescription/treatment is common and little is known about whether the association exists under restrictive opioid prescription regulations. Furthermore, the empirical evidence remains elusive and the long-term outcomes of pre-operative opioid therapy is underexplored. This study aims to fill these gaps.

### Materials and Methods

We applied survival analysis and the matching techniques to the 2007-2017 National Health Insurance Research Database, a nationally representative and longitudinal data source from Taiwan, to investigate how pre-operative opioid therapy affects four spine surgery outcomes: 1-year reoperation, 2-year reoperation, 90-days ED visit, and 90-days readmission.

### Results

The study includes 258,511 patients. The results indicate that: (1) High-dose users have a higher hazard to experience these undesirable surgery outcomes, even after controlling for patients' characteristics, such as, Charlson comorbidity index, treatment setting, and income. (2) High-dose users impose the heaviest medical cost in two years following the spine surgery, in contrast to the low-dose users and non-users. (3) There is a dose-response pattern in that high-dose users consistently show a higher risk of poor surgery outcomes.

### Discussion

The results seem to suggest a dose-response relationship between pre-operative chronic opioid therapy and surgery outcomes. As patients with pre-operative chronic opioid therapy have poorer outcomes, future interventions may need to focus on taper opioids prior to spine surgery. The limitations of this study include that this study mainly focuses on Tramadol hydroxychloride and Tramadol/acetaminophen, and considers all kinds of degenerative spine surgery.

### Conclusions

Our findings are among the first to report the relationship between pre-operative chronic opioid therapy and spine surgery outcomes in a country with restrictive opioid prescription regulations and the results suggest that surgeons must be cautious about pre-operative opioid prescription or discontinue opioid some time before the spine surgery to avoid unsatisfied surgical outcomes.

## Outcome of High Viscosity Bone Cement Vertebroplasty versus Low Viscosity Bone Cement Vertebroplasty in the Treatment of Mid- and High- Thoracic Levels Vertebral Compression Fractures

對中高胸椎椎體壓迫性骨折使用高黏度骨水泥與低黏度骨水泥進行椎體成形術的治療成效比較

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### Introduction

Compression fracture can be a painful disease especially for patients with osteoporosis, neoplasm, or trauma. The current established treatment for this condition is percutaneous vertebroplasty. As the advance of science and technology, novel bone cements with numerous formulated ingredients have greatly evolved and appeared commercialized. Recently, viscosity was in the focus to pursue better clinical outcomes and fewer complications. Meanwhile, the experience in the treatment of vertebrae of the mid (T7-9)- and high (T4-6)- thoracic levels is limited. Thus, the goal of this study is to identify the different outcomes between the high viscosity bone cement (HVBC) and low viscosity bone cement (LVBC) using in the mid- and high- thoracic levels compression fractures.

### Materials and Methods

The author retrospectively reviewed patients with mid (T7-9)- and high (T4-6)- thoracic levels compression fracture underwent percutaneous vertebroplasty between 2007 and 2020 in a single medical institute. We identified and followed up patients, measured the vertebrae image via plain film and MRI. The comorbidity, bone cement brand, variation of vertebral height, Cobb's angle, pain scale and complication of each patient was recorded, then analyzed.

### Results

Between 2007 and 2020, there were 105 patients during this study period, and totally 144 vertebrae levels were accounted for. Nine different bone cement brands were used, and only one brand belonged to HVBC, which was used in 72 vertebrae levels. We separated all patients into two groups based on the cement viscosity, HVBC and LVBC, respectively. Several variables were analyzed, and found that both groups were increased vertebral body height after the vertebroplasty ( $\Delta$ AVH: 2.190 (2.595) vs. 2.480 (3.093),  $p=0.555$ ), and improving kyphotic angle (-4.218 (4.231) vs. -4.556 (5.167),  $p=0.679$ ). No statistical significance of further adjacent fracture (6 (13%) vs. 17 (27.4%),  $p=0.071$ ). But with obvious statistic different of cement injection volume (3.66(1.357) vs. 3.11(1.526),  $p=0.024$ ), incidence of cement leakage (26(36.6%) vs. 45(62.5%),  $p=0.002$ ) and improving VAS score after the procedure (2.4 (1.526) vs. 3.07 (1.689),  $p=0.014$ ), especially fewer patients with post-op VAS  $\geq 3$  points (22 (30.6%) vs. 39 (54.2%),  $p=0.004$ ) in the HVBC group. Meanwhile, vertebrae levels are also categorized as two groups by mid (T7-9)- and high (T4-6)- thoracic levels, and analyzed.

### Discussion

The main goal of percutaneous vertebroplasty is to strive to maintain or to increase the vertebral body height, correct the kyphotic angle, stabilize the unstable vertebrae body, decrease the pain scale. Both HVBC and LVBC could achieve the goal at mid (T7-9)- and high (T4-6)- thoracic levels, and no statistical difference in adjacent fracture but different in cement leakage. Moreover, patients with HVBC showed better postoperative pain scores.

### Conclusions

HVBC and LVBC are safe and effective in improving quality of life and relieving pain in the treatment of mid (T7-9)- and high (T4-6)- thoracic levels vertebral compression fractures.



**Vertebroplasty and its Effect on Respiratory Function****椎體成形術及其對呼吸功能的影響**

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**Introduction**

A spinal compression fracture not only causes pain but also deforms the vertebral body, thereby reducing quality of life and respiratory function. We assume that the utility of vertebroplasty lies not only in its potential pain-relieving effects, but also in the fact that it can be expected to improve alignment of the thorax, with a corresponding favorable effect on respiratory function. Therefore, our object was to investigate the effects of vertebroplasty on pain-relieving and respiratory function in patients with compression fractures.

**Materials and Methods**

Thirty-seven consecutive patients diagnosed with compression fracture involving thoracic spine from MRI findings and underwent vertebroplasty from 2019/10-2021/01 at our institute. Exclusion criteria including: Malignancy, systemic infection disease, previous thoracic or lumbar surgery, respiratory disease history, and inability to obey and perform lung function test. At the end, thirty patients (twenty-two female & eight male) were included with average age of seventy-one years old. The vertebroplasty level were twenty-three patients with thoracic spine and seven patients with thoracic and lumbar spine. There were twenty-one patient with single level and eight with multiple levels. The evaluation of parameters including visual analog score (VAS), forced expiratory volume (FVC), Forced expiratory volume in 1 second (FEV1), chest expansion (CE). The evaluation time were selected including pre-operatively, post-operatively, 1 week after discharge, and 3 weeks after discharge.

**Results**

For patient with spinal compression fracture involving thoracic spine and underwent treatment, vertebroplasty improve pain relieving and chest expansion both post-operation and three weeks after discharge with statistically significance. Respiratory function seems to reach the improvement subjectively yet no statically significance was found according to our data.

**Discussion**

Although our study did not showed significance different in lung function after vertebroplasty, however Noboru et al. had studied the effect of the vertebroplasty on respiratory function in patient with compression fracture. Their study showed vertebroplasty improves restrictive ventilatory impairment, but this improvement requires approximately 1 month to occur. Greater improvement in restrictive ventilatory dysfunction was observed in patients who underwent multiple vertebroplasty procedures. We believe that the improvement of the chest expansion was resulted from the pain-relieving effect, however the difference of lung function between our study and Noboru et al. still remained unclear and still take further study to clarify.

**Conclusions**

Vertebroplasty improve pain-relieving and chest expansion but show no significant difference in respiratory function tests. However thoracic movement alone is insufficient to improve lung respiratory function, and daily respiratory exercise may still take time more than one month to improve respiratory functions.

**Biportal Endoscopic Foraminotomy for Cervical Foramen Stenosis: Diagnostic Challenge and Novel Surgical Technique****雙通道脊柱內鏡手術治療頸椎椎間孔狹窄經驗分享**

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**Introduction**

Cervical radiculopathy is a well-known disease often caused by foramen stenosis or disc herniation. The diagnosis process usually needs to evaluate the correlation of clinical symptoms with the image findings. In our experience, MRI is a good tool for detecting the degree of foramen stenosis especially via parasagittal view compared to traditional sagittal view. To date, biportal endoscopic foraminotomy is a good choice with impressive clinical efficacy. The purpose of our manuscript was to share our consecutive 6 patients experience for treating cervical foramen stenosis using biportal endoscopic foraminotomy. Also, we would like to introduce a novel surgical technique of inside out foraminotomy which clinical results were adorable.

**Materials and methods**

6 patients received biportal endoscopic foraminotomy for cervical radiculopathy. The pre-operative symptoms, physical examination, lab data, image study (including xrays and MRI) were clearly reviewed and intra-operative procedure were also recorded. Mean follow up period were 10.4 months. The post-operative OPD chart were clearly reviewed (including complications, symptoms).

**Results**

One of them were caused by herniated intervertebral disc and the other were foramen stenosis. All the patients were put in a prone position under general anesthesia. The target level was checked by C arm and focus on the V point. Two small incision were made around laminar border and create portals (video and working portal, 5 patients from ipsilateral side and 1 patient from contralateral side accompanied with inside out technique). Posterior interlaminar approach were performed followed by partial laminotomy with burr and Arthrocare under endoscopic system. The target exiting root was then decompressed smoothly and the postoperative follow up showed subsided of the radicular pain. However, one patient diagnosed of left side foraminal stenosis, C5/6/7 received revision UBE foraminotomy, C5/6 due to inadequate decompression. We completed decompression via posterior interlaminar approach accompanied with inside-out technique (the operator this time was standing on the right side) during revision surgery until the target exiting root was clearly identified and exposed. Furthermore, one patient was found to receive wrong side surgery because of the bilateral upper limb radicular pain subsided disproportionately compared to the preoperative status.

**Discussion**

Biportal endoscopic foraminotomy is a good choice for cervical radiculopathy with impressive clinical efficacy which decreasing damages of the posterior cervical musculo-ligamentous structures iatrogenically.

**Conclusions**

In our experience, we advocate an inside-out technique (the operator standing on the contralateral side but from the ipsilateral interlaminar approach) which may have more clear scope vision and can help preventing inadequate decompression intraoperatively. The outcome was adorable.

缺繳

**Early Result of Full-Endoscopic Interlaminar Decompression for Lumbar Spinal Stenosis**  
**全內視鏡椎板間減壓在治療脊椎狹窄之早期報告**

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**Introduction**

Full-endoscopic interlaminar decompression (FEID) is a minimally invasive technique for management of neural compression secondary to lumbar spinal stenosis (LSS). The safety and efficacy of FEID was still debated. The aim of this study was to investigate the short-term outcome of FEID for LSS.

**Materials and Methods**

It is a retrospective study of prospectively collected data from Aug 2018 to Oct 2020 at the National Taiwan University Hospital Hsin-Chu Branch. Our indication of FEID were 1) claudication or radiculopathy secondary to lateral recess and/or central stenosis, 2) no spinal instability in dynamic radiographs, and 3) failed conservative treatment. Patients who underwent FEID with regular follow-up for more than 3 months were eligible for this study. Visual analogue scale (VAS) of leg, clinical and radiographic outcome, and satisfactory rate were evaluated.

**Results**

A total of 19 patients with a mean age of 69 years and a mean follow-up of 15 months were enrolled. Five of them were revision surgeries. Eighteen of them received one-level FEID. Perioperative complication included one dural tear in a patient with concurrent synovial cyst of the facet joint. There was no newly developed neurological complication in the acute stage following FEID. VAS of leg improved significantly after FEID. Fifteen of them discontinued NSAIDs analgesics at the postoperative 3 months. Eight-four percent patients reported good to excellent satisfactory rate. During follow-up, there were two new mild-to-moderate contralateral radiculopathy and one iatrogenic instability.

**Discussion**

The results of this case series showed that FEID is a safe technique for primary spinal surgery of LSS. However, the outcome in revision surgery or those who had previous and more acute and subsequent complications noted in our cohort. All patients with late complication had previous vertebral compression fracture and two of them had previous spinal surgery. Furthermore, surgical experience may be an another important prognostic factor. These complications occurred in our first 10 cases of FEID for lumbar spinal stenosis

**Conclusions**

FEID may provide safe, effective, and favorable outcome for management of LSS in primary spine surgery. However, the efficacy of FEID in revision spinal surgery is controversial. More studies are required to clarify predictors of FEID outcome in LSS management.

## Unilateral Biportal Endoscopic Spine Surgery for Herniated Intervertebral Disc: 3 Years Report

### 雙通道微創內視鏡脊椎手術治療椎間盤突出的成效:三年案例報告

薛如峯 1 鮑卓倫 2

聯新國際醫院骨科 1 亞東紀念醫院骨科部 2

#### Introduction

Herniated intervertebral disc (HIVD) in the lumbo-sacral spines is a common spinal lesion. It may cause radiculopathy or myelopathy, presenting sciatica, lower limbs numbness, claudication, abnormal gait, motor weakness or cauda equina syndrome. The gold standard surgical treatment for HIVD was microdiscectomy. For the increasing demand of minimally invasive procedure, Unilateral biportal endoscopic (UBE) spine surgery was developed in the recent years as a novel technique for treating HIVD.

#### Materials and Methods

From July 2018 to January 2021, 98 patients (57 males and 41 females) with an average age of 54.9 (ranged 19-87) presenting with HIVD were included in this study. Most patients sustained unilateral or bilateral sciatica or radiculopathy. 91 patients received discectomy, and 7 patients received decompression alone. Among these cases, interlaminar approach was used in 72 patients, while paraspinal approach was used in 18 patients, contralateral approach for far lateral disc was used in 5 patients, and 3 cases of cervical spine foraminotomy. The clinical outcomes were evaluated by retrospective review of the medical charts and image studies as well as the visual analogue score (VAS).

#### Results

Most of the patients presented significant symptom relief immediately after the operation. VAS for leg pain showed significantly improvement from 8.3 pre-operatively to 1.8 at the final follow-up. The average hospitalization was 3.75 days. 7 complication occurred (7.1%), including 5 dural tears, 1 epidural hematoma, and 1 transient motor weakness. 6 patients received secondary surgeries due to inadequate decompression in 2 patients, HIVD recurrence in 3 patients, and post-operative segmental instability in 1 patient.

#### Discussion

Evolved from the original arthroscopic system, the UBE technique can be adapted to almost all kind of spinal pathologies nowadays. In our review, we demonstrated the potentials of this technique, which provides a safe, quick-recovered, high quality of life, and excellent cost-effectiveness for patients with HIVD.

#### Conclusion

Unilateral biportal endoscopic (UBE) spine surgery is a novel, full-endoscopic, extremely minimal invasive technique which showed excellent outcomes and quick recoveries for patient with HIVD.

## Endoscopic Lumbar Spinal Hybrid Surgery in the Treatment of Multiple Level Lumbar Degenerative Spondylolisthesis and Spinal Stenosis: A Novel Surgical Technique and Clinical Outcomes

新式脊椎內視鏡混和手術以治療長節脊椎滑脫與神經壓迫之技術與癒後分析

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### Introduction

We frequently found elders suffered from multilevel degenerative lumbar spondylosis with spondylolisthesis, especially in heavy workers, farmers, or obese patients. The gold standard of spondylolisthesis treatment is surgical fusion in current concept, however, long-segment fusion would cause adjacent segment disease occurring sooner than we expect. Due to the technique and equipment developed in endoscopic spine surgery, the lumbar spine fusion, laminectomy, or discectomy now could be treated smoothly by single or bi-portal spinal endoscope. We try to use these endoscopic techniques for decreasing fusion level in long-segment degenerative lumbar spine.

### Materials and Methods

From September 2019 to October 2020, we collected 4 patients of long-segment (>3 segments) spondylosis and spondylolisthesis with spinal stenosis who needs to be treated by spinal fusion traditionally. Instead, we arranged ALIF or endoscopic cage fusion for spondylolisthesis with foramen stenosis level, and the endoscopic unilateral approach bilateral decompressions were done for other cephalic central stenosis levels. We followed up the image stability, VAS score and Oswestry Disability Index pre-operatively and half year after operation to trace the short-term result.

### Results

The 6month post-operative average ODI score is 20.5% comparing with the pre-operative ODI score 50%. The VAS score decreases from 8.2 pre-operatively to 2.5 6 months after operation. Range of motion angle, vertebral slip distance and the static segmental lumbar lordosis angle showed no difference between pre-operation and post.

### Discussion

The indication of this procedure is limited, thus strictly case selection is necessary. Furthermore, the endoscopic decompression and fusion techniques are not promoted widely in our department due to longer learning curve. Not surprisingly, the case number is relative limited. Otherwise, long term outcome needs to be traced and analyzed. While the clinical outcomes are promising, more randomized control trial and biomechanical studies are warranted.

### Conclusions

This so called “hybrid lumbar spinal surgery” means fusion in the most caudal level and decompression around the above segments via endoscopy assisted. In this short-term follow-up, which showed it is a feasible option for treating multi-level spondylosis with central spinal stenosis and caudal level spondylolisthesis, resulting comparable clinical results with previous studies. Doing the shortest fusion level via the most minimal invasive endoscopic technique is our core value and strength of this procedure. We hope that this is just the beginning, and there will be more large-scale studies for better understanding of the pros and cons of this novel technique in the future.

## Treatment of Burst Fractures with Severe Neurological Deficits in Senile Patients Using Percutaneous Kyphoplasty, Short Segment Pedicle Screw Fixation, and Biportal Endoscopic Decompression

微創手術在脊椎爆裂性骨折的應用

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### Introduction

According to the classic Denis classification, “burst fracture” was used to describe traumatic vertebral compression fractures involving the anterior and middle columns or the fractures associated with canal compromise and neurological deficits occurred in the thoraco-lumbar vertebrae. In an aged society like Taiwan, there is an increasing number of “burst fractures” occurred in senile patients with osteoporotic bone quality. However, the clinical presentations were quite different with burst fractures which occurred in younger patients with good bone quality. The management of burst fractures in senile patients is challenging and no guidelines could be followed.

### Materials and Methods

In this study, we reported 3 cases of thoraco-lumbar burst fractures in senile patients treated using minimally invasive and novel endoscopic techniques. We used percutaneous kyphoplasty (PKP) to provide support for the collapsed anterior and middle columns and short segment transpedicle screws fixation (one level above, one level below, and intermediate screws) to stabilize the construct and to restore the alignment. All 3 patients had severe canal compromise with motor weakness on their lower limbs and sphincter dysfunction before the operation. Low temperature PMMA bone cement was used to augment the transpedicle screws in 1 patient with very low bone density (DEXA T-score < -3). Decompression was done using unilateral biportal endoscopic techniques in 2 patients and mini-open techniques in 1 patient.

### Results

All 3 patients had quick and significant improvement in back pain and neurological deficits immediately after the operation. Recovery of muscle power was observed in 1 week after the operation. Recovery of sphincter function took much longer time, varied from 2 weeks to 3 months. All patients regained their walking ability after rehabilitation. There was no medical, surgical, or neurological complications. By using the minimally invasive techniques, the surgical wounds were as small as 5 to 7 cm.

### Discussion

Adequate decompression was achieved by the novel biportal endoscopic techniques and verified by the post-operative MRI. In our patients, the short segment pedicle screw fixation and PKP provided a strong and stable construct with no screw loosening or loss of reduction. The minimized soft tissue damage resulted in quick functional recovery.

### Conclusions

With PKP, short segment fixation with intermediate screws, and biportal endoscopic techniques, the burst fracture in senile patients with osteoporotic bone quality could be successfully managed with minimal soft tissue damage and quick recovery.

## Risk Factors and Prognosis of Recurrent Lumbar Disc Herniation after Full Endoscopic Lumbar Discectomy

內視鏡腰椎椎間盤切除術後復發椎間盤突出的危險因子和預後

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### Introduction

Lumbar disc herniation (LDH) is a common degenerative spinal disease. Although conventional open discectomy (OD) is the standard surgical treatment, it is correlated with adverse outcomes, including recurrent LDH (rLDH). Minimally invasive surgeries (MISs) for rLDH were developed, such as full endoscopic lumbar discectomy (FELD). The effects of FELD and other such surgical procedures remain under debate.

### Materials and Methods

A narrative review was conducted to identify studies analyzing causes of and risk factors for rLDH after FELD, the current prevention and treatment strategies and compared the postoperative outcome and complication risk of FELD with those of microendoscopic discectomy (MED) and minimally invasive transforaminal interbody fusion (MIS-TLIF) in rLDH treatment. A search was conducted on PubMed. Both retrospective and prospective comparative studies were included.

### Results

FELD demonstrates shorter operation time, lower blood loss, and complication rates than OD and MIS-TLIF, but without any significant differences in hospital stay duration and recurrence rate. Besides, FELD were associated with less pain than was MIS-TLIF. FELD has many advantages over the conventional MED including no need for general anesthesia, less or no iatrogenic neurologic damage, low infection risk, direct approach to the extruded disc fragment, minimal disturbance of the intracanal capsular structures, and no interference of scar tissue to reach protruded or extruded rLDH.

### Discussion

Postoperative magnetic resonance imaging is essential in this surgery. Complete understanding of the surgical anatomy and the fundamental techniques of OD and MIS are the cornerstones for mastering FELD procedures. Recognizing complications of FELD such as nerve root injury, retroperitoneal cavity injury, and great vessel injury are also crucial. Appropriate postoperative monitoring and care massively influence patient prognosis as well.

### Conclusions

Revisonal surgery via FELD is the most appropriate choice for rLDH because it is associated with highest patient satisfaction in the early stages after surgery. Before performing this surgery, careful patient selection, treatment planning and technical expertise of the surgeon are essential for obtaining effective results.



## Subconjunctival Hemorrhage as a Rare Complication in a Patient Undergoing Endoscopic Decompression for Lumbar Spine : A Case Report

結膜下出血為腰椎內視鏡減壓罕見併發症：病例報告

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### Introduction

Ophthalmologic complications associated with prone surgical positioning after non-ocular surgery is rare.

It includes corneal abrasion, conjunctivitis, eyelid hematoma, direct trauma, blurred vision, permanent visual loss, subconjunctival hemorrhage and so on. Of all, corneal abrasion was the most commonly seen. However, we reported this uncommon case of subconjunctival hemorrhage who underwent endoscopic decompression for lumbar spine.

### Materials and Methods

A Case Report

### Results

A 32-year-old man without systemic disease had L4-5 severe spinal stenosis due to the ruptured disc and right leg radiculopathy. Preoperative medical exam showed weight, 80 kg; body mass index, 31 kg/m<sup>2</sup>. He underwent endoscopic decompression of L4-5 with posterior laminectomy, removal of hypertrophic ligament flavum and discectomy from right side. During the operation, the patient was positioned prone for 75 minutes. At the conclusion of surgery, the patient developed painless subconjunctival hemorrhage with intact visual acuity in his left eye. After consulting ophthalmologist, a confirmed diagnosis of subconjunctival hemorrhage was made. He was managed conservative treatment. One month later, the patient had spontaneously complete resolution without sequelae.

### Discussion

We presented an uncommon case of subconjunctival hemorrhage after endoscopic decompression for lumbar spine in the prone position. Subconjunctival hemorrhage after prone positioning surgery is usually spontaneous and unilateral without pain or visual loss. According to previous studies, it results from tearing of small vessels bridging the potential space between the episcleral and conjunctival tissues. Furthermore, the risk factors include local trauma, acute conjunctivitis, obesity, diabetes mellitus, systemic hypertension, and long length of operation time. Despite the impressive appearance, subconjunctival hemorrhage usually resolves without any intervention.

### Conclusions

Overall, subconjunctival hemorrhage as a complication after lumbar spine surgery is rare and it could resolve spontaneously without sequelae. Nevertheless, we should beware of patients who had risk factors and further ophthalmologic evaluation is necessary to rule out the possibility of concurrent and more serious ocular problems.

**Experience of participating in an international multi-center study: Successful publication of Chest Wall Injury Society-Traumatic Brain Injury (CWIS-TBI) Study****參與國際多中心研究之經驗-成功發表胸部外傷協會之創傷性腦損傷研究-**蘇盈豪<sup>1</sup> 黃俊雄<sup>2</sup> 王堯墩<sup>3</sup> 陳孟侃<sup>4</sup> 柯煥章<sup>5</sup>台大新竹分院骨科部<sup>1</sup> 創傷醫學部<sup>2</sup> 急診醫學部<sup>3</sup> 家庭醫學部<sup>4</sup> 外科部胸腔外科<sup>5</sup>**Introduction**

Traumatic brain injury (TBI) is one of the negative prognostic factors in patient who sustained severe rib fractures. Surgical stabilization of rib fractures (SSRF) has been used for at least 40 years for management of flail chest or multiple rib fractures. However, the impact of SSRF on patient with TBI is still controversial. The aim of this study is to investigate the impact of SSRF on the outcome of patient who sustained a moderate or severe TBI.

**Materials and Methods**

This is an international multi-center retrospective study. After receiving the invitation of participation from the Chest Wall Injury Society (CWIS), we could download the IRB application and study protocol. After getting IRB approval by local IRB committee, we collect and analyze the data from our own institute. Then, the international PI could pool the data from multi-center through RedCap software. Before submitting the manuscript, each center could provide comments or remarks through e-mails.

**Results**

After pooling of 456 patients of which 111 (24.3%) underwent SSRF, the result showed that the odds of developing pneumonia (OR 0.59 (95% CI 0.38-0.98),  $p=0.043$ ) and 30-day mortality (OR 0.32 (95% CI 0.11-0.91),  $p=0.032$ ) were significantly lower in the SSRF group. Patients with moderate TBI had similar outcome in both groups. In patients with severe TBI, the odds of 30-day mortality was significantly lower after SSRF (0.19 (95% CI 0.04-0.88),  $p=0.034$ ).

**Discussion**

Traditionally, it is hard to understand the effect of SSRF on patients with TBI. After participating in international multicenter study, surgeons from different countries could contribute to scientific research. It is feasible and low cost in the network generation. According to the finding of this study, early SSRF may improve the short-term outcome of the patient who sustained a moderate or severe TBI.

**Conclusions**

Through this international collaboration, trauma surgeon could get a high-quality study for management of patient with concomitant severe rib fractures and TBI. This full-length article was accepted and published in the Journal of Trauma and Acute Care Surgery.

## Reducing Senescence-Associated Expression Via the Combination of Cross-Linked Hyaluronic Acid and Corticosteroid in IL-1 $\beta$ -Stimulated Human Chondrocytes: A Possible Therapeutic Strategy for Knee Osteoarthritis

在軟骨細胞中併用交聯型玻尿酸與類固醇以減緩老化機制：膝退化性關節炎的可能治療方向

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### Introduction

The cytokine IL-1 $\beta$  is related to cell aging by inducing expression of the senescence-associated secretory phenotypes (SASPs) genes, such as IL-6, MMP-1, and MMP-13. Corticosteroids have been widely used for anti-inflammation in knee osteoarthritis (OA) via intra-articular injection, but the deleterious effects such as cytotoxicity and decreased extracellular matrix (ECM) synthesis have been documented. Intra-articular injection of hyaluronic acid (HA) has been known to provide viscosupplementation and further suppress production of OA-associated cytokines such as IL-1 $\beta$ , IL-6, and TNF- $\alpha$ , as well as ECM-degrading enzymes such as MMP-1, -3, -13, and ADAMTS-4 in human chondrocytes. We believe that intra-articular injection of a combination of corticosteroids and cross-linked HA (cHA) could alleviate inflammation without causing excessive cytotoxicity.

### Materials and Methods

Human chondrocytes were obtained from patients with OA undergoing total knee arthroplasty. Primary cells were cultured in a combination of dexamethasone (Dex) and cHA under different preparations and concentrations. Cell proliferation, senescence, and the expression levels of MMP-1, MMP-3, MMP-13, ADAMTS-4, IL-6, p16, and collagen type II (COLII) were determined by WST-8 analysis, qRT-PCR, immunocytochemistry, and immunoblotting.

### Results

Dex significantly inhibited cell proliferation in a dose-dependent manner and the combination of cHA and Dex prevented the deleterious effect on cell proliferation raised by Dex. IL-1 $\beta$ -induced down-regulation of aggrecan and COLII, up-regulation of MMP-1, MMP-3, MMP-13, and ADAMTS-4, as well as increased senescence-associated  $\beta$ -galactosidase (SA- $\beta$ -gal) activity in chondrocytes could be significantly improved after co-treatment with the combination of cHA/Dex.

### Discussion

Our in vitro results demonstrated the optimal combination of cHA and Dex, which can effectively attenuate the inflammation markers and senescence in IL-1 $\beta$ -stimulated human chondrocytes without cytotoxicity. The previous study showed that selective removal of these senescent cells in vitro decreased expression of inflammatory markers as well as the increased ECM proteins expression of the cartilage tissue. These significant findings provide a new insight into the possible therapeutic strategy for knee OA.

### Conclusions

The combination of cHA and corticosteroid could reduce the senescence associated expression in IL-1 $\beta$ -stimulated human chondrocytes.

## Cytotoxicity and Cell response of Preosteoblast in Calcium Sulfate-Augmented PMMA Bone Cement

加入 CaSO<sub>4</sub> 的 PMMA 骨水泥對 preosteoblast 的細胞反應和毒性影響

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### Introduction

Poly(methyl methacrylate) (PMMA) has been widely used in orthopedic applications, but bone ingrowth and toxic monomer release are drawbacks of this material. Particle reinforcement with osteoconductive substitute, such as calcium sulfate (CaSO<sub>4</sub>), is a way to modify the biomechanical and biological properties of PMMA bone cement. The goal of this study was to examine the bioactivity of modified bone cement containing CaSO<sub>4</sub> by using measurements of MMA monomer release, cytotoxicity and surface topography.

### Materials and Methods

The current study investigated the release of methyl methacrylate (MMA) monomers from the various formulations of PMMA containing CaSO<sub>4</sub> (i.e. CaSO<sub>4</sub>/PMMA+CaSO<sub>4</sub>= 0%, 5%, 10%, 20%, and 40% weight ratios). The monomer was measured by ultra-performance liquid chromatography. In addition, cytotoxicity assays were performed using MC3T3-E1 cells to evaluate the release of toxic MMA monomers from the different formulations. The attachment of cells to CaSO<sub>4</sub>-augmented cement discs was observed by light and electronic microscopy, and surface topography was also evaluated by atomic force microscopy.

### Results

The MMA monomer released from the various formulations of PMMA mixed with CaSO<sub>4</sub> described above were  $2.20 \pm 0.08$ ,  $2.42 \pm 0.07$ ,  $2.73 \pm 0.08$ ,  $2.68 \pm 0.12$  and  $2.89 \pm 0.12$  mg/ml. In MMA monomer cytotoxicity test, a significant decrease in cell viability was noted at MMA concentrations greater than 2.0 mg/ml ( $88.15 \pm 3.07$  %) compared with that observed in the control (100 %). The number of live cells on these discs were  $451.3 \pm 41.2$ ,  $410.6 \pm 30.2$ ,  $409.1 \pm 30.5$ ,  $172.5 \pm 12.0$ , and  $15.2 \pm 6.9$  per mm<sup>2</sup>. The fluorescence intensity of actin filament in MC3T3-E1 cells on these discs were  $16.7 \pm 0.1$ ,  $15.4 \pm 1.4$ ,  $11.1 \pm 2.3$ ,  $10.4 \pm 1.1$ , and  $2.9 \pm 0.6$ . The numbers of micropores (>1.0  $\mu$ m) on these discs were  $202.3 \pm 41.1$ ,  $257.5 \pm 100.7$ ,  $312.6 \pm 82.2$ ,  $643.7 \pm 112.6$  and  $901.1 \pm 176.9$  per mm<sup>2</sup>. The surface roughness of these discs were  $4.74 \pm 0.09$ ,  $4.86 \pm 0.71$ ,  $5.73 \pm 0.32$ ,  $10.23 \pm 2.20$  and  $15.50 \pm 1.05$  nm.

### Discussion

The results revealed that increased CaSO<sub>4</sub> weight ratios led to increased MMA monomer release. Cell density on CaSO<sub>4</sub>-augmented bone cement discs was decreased at CaSO<sub>4</sub> weight ratios above 10 %. In addition, the presence of micropores on the surface and surface roughness were both increased for PMMA composite discs containing higher levels of CaSO<sub>4</sub>. These results demonstrated that a decreased number of MC3T3-E1 cells on the surface of CaSO<sub>4</sub>-PMMA composites was correlated to increased MMA monomer release, micropore number and surface roughness.

### Conclusions

CaSO<sub>4</sub> has been clinically used in to improve radiopacity, cell affinity and bone ingrowth. However, a CaSO<sub>4</sub> ratio above 10 % in the powder mixture led to decreased cell density and abnormal cell attachment, indicating poor bioactivity. The number of surface micropores, the surface roughness and the amount of leaked MMA monomer increased as the amount of CaSO<sub>4</sub> added to the PMMA matrix increased, and these effects could be harmful to the **osteogenic cells**. **As a result, adding a high proportion of CaSO<sub>4</sub> (>10 wt. %) to the powder mixture did not reinforce the biological properties of traditional PMMA bone cement.**

## Development of a Multiplex and Sensitive Lateral Flow Immunoassay for the Diagnosis of Periprosthetic Joint Infection

### 多重靈敏側向流體免疫層析法用於診斷人工關節感染

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#### Introduction

In this study, we prove that combining alpha-defensin and C-reactive protein (CRP) as biomarkers possesses the potential to provide accurate periprosthetic joint infection (PJI) diagnosis. To further verify the result, we developed a multi-target lateral flow immunoassay strip (msLFIA) with staking pad design to obtain on-site rapid response for clinical diagnosis of PJI.

#### Materials and Methods

A total of 10 synovial fluid samples were tested using the msLFIA, and the results showed that the combined measurements of synovial fluid alpha-defensin and CRP levels were consistent with those obtained from a commercial enzyme-linked immunosorbent assay kit.

#### Results

A total of 10 synovial fluid samples sequentially submitted for alpha-defensin and CRP tests by ELISA and our msLFIA devices. The msLFIA cut-off values for alpha-defensin and CRP have been set at 10 µg/mL and 5 µg/mL, respectively. Alpha-defensin test were positive in 8 cases and were negative in 2 cases, while CRP test were positive in 7 cases and were negative in 3 cases. Eight ELISA-alpha-defensin and seven ELISA-CRP samples with higher value over 21.5 µg/mL and 8.3 µg/mL, respectively, were positive for the msLFIA, and 2 ELISA-alpha-defensin and 3 ELISA-CRP samples with value below 7.2 µg/mL and 5.4 µg/mL were negative with the LFIA. The results were correlated with the concentration of each synovial fluid sample by ELISA. The correlation coefficients of alpha-defensin and CRP between msLFIA and ELISA were 0.91 and 0.92, respectively, which indicate an acceptable agreement between the two detection methods for the protein levels of alpha-defensin and CRP. The signal intensity was dependent on the affinity of antibody to antigen. The slope of the correlation between msLFIA and ELISA was 70.15 and 178.67 for alpha-defensin and CRP, respectively, which indicating that the higher slope of CRP has higher signal intensity than alpha-defensin because anti-CRP antibody possesses a higher affinity for CRP.

#### Discussion

Compared to using ELISA for detecting alpha-defensin and CRP levels, msLFIA has the potential for screening for these two biomarkers due to its superior efficiency. The advantages of the msLFIA over the ELISA include rapid results, less sample processing requirement, low-cost, yes-no answers generated without additional instruments, and ease of use for non-laboratory personnel.

#### Conclusions

msLFIA strip is a reliable test for the detection of alpha-defensin and CRP in synovial fluid samples. It has the advantages of rapid, low-cost, ease of use, and can be used as the preliminary test for evaluating patients with suspected PJI.

**Suramin Attenuates Intervertebral Disc Degeneration by Inhibiting the NF- $\kappa$ B Signaling Pathway****Suramin 可通過抑制 NF- $\kappa$ B 信號通路來減輕脊椎椎間盤退變**

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**Introduction**

Interleukin (IL)1- $\beta$  is one of major pathogenic regulators in intervertebral disc degeneration (IDD) pathologic development. However, effective drug for IDD is limited. Suramin is a medicament for the treatment of African sleeping sickness. This study aimed to investigate the pharmacological effects of suramin on mitigating IDD and to characterize the underlying mechanism.

**Materials and Methods**

The nucleus pulposus (NP) cells were treated with vehicle, 10 ng/ml IL-1 $\beta$ , 10  $\mu$ M suramin or suramin plus IL-1 $\beta$ . The expressions of catabolic and anabolic proteins, proinflammatory cytokines, MAPK and NF- $\kappa$ B-related signaling molecules were assessed with Western blotting, qRT-PCR and immunofluorescence. Flow cytometry were applied to detect apoptotic cells. To study pharmacological functions of the suramin ex vivo, we carried out IDD organ culture and analyzed their differentiation by Safranin O-Fast green and Alcian blue staining.

**Results**

Suramin effectively inhibited IL-1 $\beta$ -induced apoptosis in NP cells. In addition, suramin-involved downregulation of MMP-3, MMP-13, ADAMTS-4 and ADAMTS-5, and upregulation of Col2a1 and Aggrecan in the IL-1 $\beta$ -treated porcine NP cells was estimated as degenerative tendency.

**Discussion**

Our data evidenced that the suramin is able to suppress IL-1 $\beta$ -activated the TLR2/MyD88/NF- $\kappa$ B pathway. The IL-1 $\beta$ -induced inflammation that was reflected in elevations of IL-1 $\beta$ , IL-8 and TNF- $\alpha$  was alleviated when cells exposed to suramin. Furthermore, ex vivo experiments showed that suramin suppressed IL-1 $\beta$ -mediated proteoglycan depletion, induction of MMP-3, ADAMTS-4 and the pro-inflammatory gene expression such as IL-1 $\beta$ , IL-8 and TNF- $\alpha$ .

**Conclusions**

Suramin administration as a novel and effectively therapeutic approach is potentially to alleviate the IDD by reducing extra-cellular matrix deposition, and inhibiting apoptosis and inflammatory reaction in the NP cells.

**The Role of Aquaporin 9 in Bone Metabolism Homeostasis****Aquaporin 9 在骨骼代謝平衡所扮演的角色**

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**Introduction**

The aquaporin 9 (AQP9) is a water channel that regulates water secretion and controls the transportation of free radicals to mitigate the cellular integrity and tissue homeostasis. Previous in vitro studies indicated that aquaporins are critical in regulating the differentiation of mesenchymal stem cells and potentially participate in transporting free radicals, indicating AQP9 might play an important role in connecting oxidative stress and cell differentiation. However, the exact function of AQP9 and its role in mediating the interplay between oxidative stress and osteoclastogenesis in the bone cells remain unclear.

**Materials and Methods**

To better understand the role of AQP9 in vitro, we use RAW264.7-derived osteoclast cells to study the role of AQP9 during osteoclast differentiation under oxidative stress (e.g. hydrogen peroxide). RAW264.7 macrophages were treated with 50ng/mL RANKL to induce osteoclast differentiation for 6 days. The percentage of differentiation was determined using TRAP staining to quantify the population of osteoclast cells. During differentiation, various concentrations of hydrogen peroxide (0-1200  $\mu$ M) were added to the cell culture for 6 hr. AQP9 and inflammatory factors were measured by quantitative PCR.

**Results**

After hydrogen peroxide induction, we observed a significant increase of AQP9 and fpr2 in osteoclasts with increased oxidative stress. In contrast, we observed a significant decrease of apoe and sod1 under oxidative stress.

**Discussion**

Although our current data do not provide direct evidence of AQP9 in regulating oxidative stress, studies in the future using siRNA to inhibit AQP9 will be useful to illustrate the molecular function of AQP9 during osteoclastogenesis.

**Conclusions**

Our data suggested that the expression of AQP9 is affected by oxidative stress during osteoclastogenesis. Specifically, AQP9 significantly increases with oxidative stress, indicating AQP9 might play a role in response to environmental stress. Moreover, we found that anti-inflammatory 15lox was upregulated in response to oxidative stress.

**Pro-inflammatory Environment Alters Molecular Repertoire of Osteoclastogenesis.****促發炎環境改變蝕骨細胞生成的分子組成**

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**Introduction**

Inflammation have long been linked to bone diseases such as osteoporosis or bone destruction. Loss of balance of bone resorption and bone formation appears to be the leading hypothesis explaining the mechanisms underlying this phenomenon. However, the effects of inflammation on the bone resorption or the cellular properties of the specific types of cells, such as osteoclasts, have not been fully understood. The difficulties of the in vivo studies mainly come from the complexity generated from interactions of multiple cellular components and complicated microenvironment of the bone tissues. Previous studies reported that M1 inflammatory stimuli inhibit the differentiation of osteoclasts. The detail cellular responses upon RANKL stimulation of the progenitor osteoclasts in the inflammatory milieu and its mechanisms have not been fully characterized.

**Materials and Methods**

RAW264.7 subclone2 was used in this study as the macrophages and pre-osteoclasts and after RANKL induction was differentiated into osteoclasts. qPCR was used to evaluate the AP-1, c-Fos, C-myc and NFATc1 genes expression in different conditions. Western blot was used to determine the protein level of Akt and ERK.

**Results**

we reported that the molecular repertoire of RANKL-stimulated osteoclastogenesis from RAW247.6 is altered in the inflammatory environment. Adding conditioned medium collected from LPS-treated bone marrow derived macrophage to RAW247.6 cell induced cell number changes in a biphasic manner and impaired RANKL-induced differentiation and cell fusion. During the 6-day period of incubation with RANKL, proinflammatory cytokines induced proliferation of RAW cells in the first 2 days, following by massive cell death starting from the fourth day of incubation. The activation of proliferation related signaling molecules Akt and ERK were elevated in the M1 environments. In contrast, the expressions of genes needed for osteoclast differentiation, including AP-1, c-Fos, C-myc and NFATc1 were disrupted.

**Discussion**

The expressions of pro-inflammatory genes were also upregulated, implicating the augmentation of the inflammatory molecules. After a long-term incubation in inflammatory environments, the undifferentiated osteoclast precursors proceed to apoptosis. Overall, M1 milieu overwhelmed the RANKL stimulation that drove the cellular responses of RAW247.6 resembled the cellular responses of the macrophages in the proinflammatory environments.

**Conclusions**

Our results indicated that inflammatory environments inhibit osteoclastogenesis, activate the myeloid cells and potentiate inflammation. The influence of the M1 milieu on the functions of differentiated osteoclast and the combinational impact on the bone resorption need further determination.



**TNF- $\alpha$  Alters Mitochondrial Functions and Dynamics of Osteoblasts****TNF- $\alpha$  改變成骨細胞粒線體功能和平衡**

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**Introduction**

Inflammatory milieu inhibits osteoblast differentiation and impairs osteoblast functions. Among the pro-inflammatory cytokines, TNF- $\alpha$  has been demonstrated to inhibit osteoblastogenesis and induces apoptosis in differentiated osteoblast. Therefore, we hypothesize that TNF- $\alpha$  alters mitochondrial functions and dynamics. In this project we examine the mitochondrial functions and dynamics of differentiated osteoblast. These alterations might be associated with TNF- $\alpha$  induced apoptosis and served as a potential causes of inflammatory induced bone loss.

**Materials and Methods**

The expression of several mitochondrial associated genes, such as ND1 and COX1, both of which encode genes involved in electron transport chain, represent the status of oxidative phosphorylation and aerobic respiration. Additionally, the mitochondrial dynamics are driven by the transcriptional regulation of dynamics associated genes, including mitochondrial fission-related gene *fn1* and *drp1* and fusion related genes *mfn1*, *mfn2* and *opa1*. To test our hypothesis, we use MC3T3-E1 induce with ascorbic acid and *bmp* as cell mode of osteoblast. This differentiated osteoblast cells were treated with TNF- $\alpha$ . Quantitative PCR were employed to measure the expression changes of mitochondrial regulating genes.

**Results**

TNF- $\alpha$  stimulation altered expression of many mitochondrial associated genes. Electron transport chain associated gene ND1 was upregulated, indicating the elevation of oxidative phosphorylation. This result also implies the increase of oxidative stress. The increase of both *nrf1* and *nrf2* genes demonstrated that the presence of TNF- $\alpha$  promotes mitochondrial biogenesis. As for the mitochondrial dynamics, the upregulation of *drp1* and *fn1* gene upon TNF- $\alpha$  stimulation revealed the increase of mitochondrial fission. In comparison, the expression of *mfn2* and *opa1* remained unaltered. These results suggested that TNF- $\alpha$  treatment induce the shift of mitochondrial dynamics toward mitochondrial fission.

**Discussion**

Inflammatory environment appeared to inhibit mitochondrial functions in other cell types. Here we examine the mitochondrial functions and status by stimulating with single pro-inflammatory cytokines. Our results is different from our prediction, suggesting that every single cytokine might affect cell differently. The phenotype should be the ourcome of the integration of many stimulations. Also, we aware that mitochondrial functions and dynamics need more experiment to confirm our conclusions.

**Conclusions**

TNF- $\alpha$  trigger mitochondrial alterations in oxidative phosphorylation, biogenesis and mitochondrial dynamics. The mechanism of how these alterations related to apoptosis and bone loss is worth of further investigation.

## In Vitro Evaluation of a Novel 3D Hydrogel in Inhibiting the Inflammation Responses in Nucleus Pulposus Cells

### 新型 3D 水凝膠培養髓核細胞與細胞發炎反應之體外實驗

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#### Introduction

Degenerative Disc Disease (DDD) is an age-related disease that often associated with the accumulation of inflammation-related factors, leading to apoptosis of nucleus pulposus tissue as well as degeneration of the intervertebral disc. DDD causes insufficient supporting strength of the disc, which leads to the extrusion of the nucleus pulposus, causing pain in the patient's lower back. According to statistical reports, there are around 85% of people over the age of 50 have disc degeneration. Except using steroids to relieve inflammation-associated pain, there is a serious lack of treatment options for curing DDD. At present, mesenchymal stem cells (MSC) based therapy has attracted numerous attention due to its potential to repair damaged cells. However, the sustained inflammatory environment contributes to the loss of injected MSC cells as well as inhibiting the differentiation of MSC to nucleus pulposus (NP) cells, results in low efficacy of cell therapy. Therefore, how to effectively regulate the inflammatory microenvironment will be essential using MSC to treat DDD.

#### Materials and Methods

The human NP cells were cultured in DMEM-LG with 10% fetal bovine serum (FBS). Then, 20ng TGF $\beta$ 1, 20ng BMP7, 20 ng GDF5, 10 ng insulin, 100 nM Mdexamehasone and 100  $\mu$ M ascorbic acid were used to maintain NP cells. Cells were then cultured in peptide-based 3D hydrogel for 7 days with or without the addition of LPS (100 ng/mL). Comparable controls were regular culture condition without peptide-based hydrogel (2D). Cells were then harvested, and gene expression profiles were analyzed using RT-qPCR.

#### Results

After stimulation of LPS with or without hydrogel, we observed a significant reduction of pro-inflammatory cytokines Tnf $\alpha$ , Il1b, Il-6 and Fpr2 under 3D culture condition. In contrast, we observed a significant increase of Il-10, Arg-1 and aggrecan under 3D culture condition.

#### Discussion

It has been demonstrated that MSC cells are capable of modulating anti-inflammatory responses, which is critical in promoting tissue repair. Therefore, our goal is to characterize whether our designed 3D peptide-based hydrogel could provide protection for NP cells to ameliorate inflammatory responses.

#### Conclusions

Our data suggested that our design 3D peptide-based hydrogel could provide protective effects in reducing LPS-induced pro-inflammatory responses in NP cells.

## Development and Application of a Lower Extremity Model by Integration of Gait Analysis and Finite Element Method

整合步態動作分析與有限元素法於人體下肢擬真數值模型之建置與應用

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### Introduction

Human musculoskeletal lower extremity is an indispensable system to generate walking and movement. This important system may fail due to bone fractures or joint diseases. The biomechanical mechanism of the musculoskeletal lower extremity is needed to be clarified. Past studies had developed the lower extremity finite element model to discover the biomechanics of human musculoskeletal lower extremity. However, a single leg finite element model with part of lower extremity muscles was considered. Thus, the purpose of this study was to develop a complete human musculoskeletal lower extremity model by integration of gait analysis technique and finite element method.

### Materials and Methods

Both gait analysis technique and finite element analysis were integrated and used to create the complete human musculoskeletal lower extremity model. The complete human musculoskeletal lower extremity model, which consisted of full pelvis, right and left femurs, right and left tibiae, right and left fibulae, and right and left feet, was developed in this study. To simulate the realistic loading and boundary conditions of walking, thirteen bone and joint angles, 140 lower extremity muscle forces, and two ground reaction forces were obtained by using OpenSim. Four gait postures were considered including heel strike, foot flat, mid-stance, and heel off. The finite element model of the musculoskeletal lower extremity was developed by using ANSYS Workbench. In post-processing, the displacement distribution and bone stress distribution of the lower extremity were calculated.

### Results and Discussion

The right foot of the musculoskeletal lower extremity model is swinging forward. Thus, the results of the displacement analysis showed that the maximum displacement has occurred at the knee of the right foot in the walking postures of heel strike, foot flat, and mid-stance. In the walking posture of heel off, the right foot is supporting foot and the left foot is swinging foot. Thus, the maximum displacement has occurred at the knee of the left foot. The results of the bone stress analysis showed that the maximum stress of the pelvis occurred at the arcuate line of the pelvic inlet. Additionally, the maximum stress of the femur and tibia occurred at the distal end and the proximal end respectively.

### Conclusions

The human lower extremity model with the realistic loading and bounding conditions of the walking postures could be successfully developed by integration of gait analysis and finite element method. This computational technique could be applied to investigate the effects of various lower extremity postures on the biomechanical mechanism of human lower extremity.

**Triptolide Attenuates Muscle Injury, Inflammation, and Oxidative Stress in a Delayed-Onset Muscle Soreness (DOMS) Animal Model**

雷公藤內酯在延遲發作型肌肉痠痛(DOMS)動物實驗中顯著減緩肌肉損傷，發炎反應，及氧化壓力

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**Introduction**

Delayed onset muscle soreness (DOMS) is associated with exercise-induced muscle damage and inflammation, which mainly caused by prolonged eccentric exercise in humans. Triptolide, extracted from a Chinese herb *Tripterygium wilfordii* Hook F, has being used for treating autoimmune and inflammatory diseases in clinical practice. However, whether triptolide can attenuate acute muscle damage is still unclear. Here, we examined the effect of triptolide on carrageenan-induced DOMS in rats.

**Materials and Methods**

Rat acute left gastrocnemius muscular damage was induced by injecting 3% of carrageenan. Thirty rats were divided into five groups of six. Group I (N group), rats received 100 microliter of saline (gastrocnemius muscle injection) and 500 microliter of saline; Group II (C group), rats received 100 microliter of 3% carrageenan (gastrocnemius muscle injection) and 500 microliter of saline; and Groups III-V, rats received 100 microliter of 3% carrageenan (gastrocnemius muscle injection) and 500 microliter of triptolide (30, 100, and 300 mg/kg, respectively)

**Results**

Triptolide attenuated carrageenan-induced acute muscular damage without affecting hepatic function. Triptolide decreased lipid hydroperoxide and increased reduced glutathione levels in muscles. Triptolide decreased muscular proinflammatory cytokine release and the activation of nuclear factor- $\kappa$ B pathway in carrageenan-treated rat muscle. Triptolide significantly decreased the muscular levels of nitric oxide and inducible nitric oxide synthase expression. Further, triptolide reduced the muscular myeloperoxidase activity in carrageenan-treated muscle.

**Discussion**

Triptolide may attenuate carrageenan-induced muscle damage by inhibiting muscular inflammation and oxidative stress. In addition, the activation of NF- $\kappa$ B pathway may be down-regulated by triptolide-associated iNOS inhibition in carrageenan-induced muscle inflammation, and inhibiting MPO activity may be crucial in triptolide's protective effect against carrageenan-induced acute muscle damage.

Although triptolide has been reported to have hepatotoxicity, in the present study, triptolide at the therapeutic dose significantly decreased LDH and CPK activities, but did not affect GOT and GPT levels. We suggested that triptolide may have the potential of clinical application for the patients with acute muscle inflammation.

**Conclusions**

Triptolide may attenuate muscle inflammation by inhibiting muscular inflammation and oxidative stress, and, in addition, by inhibiting MPO-associated oxidative stress in carrageenan-induced DOMS in animal model.

## Detection of Bone Turnover Marker by Non-Invasive Sample

### 非侵入式方法量測骨質轉換因子之研究

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#### Introduction

骨質不停進行生長及代謝過程中，會釋放出骨質轉換因子，可分為兩大類：在骨質生長時所釋放的骨質生長因子；骨質被分解時所釋放的骨質分解因子，兩者分別可以代表骨質生長及分解的速率。目前臨床上對於骨質轉換因子的檢測，都使用侵入式(抽血檢驗)的方式進行；目前已有研究探討非侵入式之檢測，以尿液為檢體，並僅侷限在骨質分解因子，以唾液作為檢體目前則是沒有確切的定論。本研究決定選用骨質生長因子 P1NP 以及骨質分解因子  $\beta$ CTX 作為研究標的物。利用不同免疫分析方法對受試者血液與唾液中 P1NP、 $\beta$ CTX 進行定性以及定量的探討，以期能開發非侵入式之骨質轉換因子檢測技術。

#### Materials and Methods

本研究受試者共 18 位，分為兩類。第一類為骨質疏鬆症之患者，並在服用 Forteo 或 Prolia 療程中，由國立臺灣大學醫學院附設分院新竹分院骨科部(以下簡稱院方)提供；第二組為健康受試者，無骨質疏鬆症病史的受試者。開始先對受試者進行唾液及血液的採集。血液檢體部分，委託臺大醫院新竹分院檢驗科協助採集 3.5ml 全血，而後由新竹聯合醫事檢驗所針對血液中 P1NP 及  $\beta$ CTX 進行濃度測定，其檢測方法為電光化學法(ECLIA)，使用儀器為 ROCHE Cobas e411。針唾液檢體，本研究則是使用 Spitting Method 採集約 5ml 之唾液上清液，並使用兩種酵素結合免疫吸附分析法(ELISA) 之商用 ELISA Kit 進行濃度量測。其中 P1NP 選用三明治型 ELISA Kit；而  $\beta$ CTX 則是選用競爭型 ELISA Kit。

#### Results

本研究已成功量測出受試者體內血液與唾液中的 P1NP、 $\beta$ CTX 濃度。

血液中 P1NP 部分，院方受試者濃度範圍為 11.05- 717.9 ng/ml；健康受試者濃度範圍為 37.47-103.1 ng/ml 血液中  $\beta$ CTX 部分，院方受試者濃度範圍為 0.055 -1.44 ng/ml；健康受試者濃度範圍為 0.23 - 0.61 ng/ml

唾液中 P1NP 部分，院方受試者濃度範圍為 0.192-1.556 ng/ml；健康受試者濃度範圍為 0.505 - 1.351 ng/ml

唾液中  $\beta$ CTX 部分，院方受試者濃度範圍為 0.125-0.365 ng/ml；健康受試者濃度範圍為 0.55- 2.404 ng/ml

#### Discussion

本研究將所有受試者之數據分為大類，分別為：(1) P1NP (2)  $\beta$ CTX

對受試者之血液與唾液檢體數據進行相關性分析(Correlation Analysis)，得到相關係數(Coefficient of correlation)。結果顯示，所有受試者之 P1NP 在血液與唾液中濃度的相關係數為 0.89，代表高度相關；若再細分為兩種受試者分別進行討論，可得出院方受試者相關係數為 0.82，健康受試者則為 0.95；皆為高度相關。而受試者之  $\beta$ CTX 在血液與唾液中濃度的相關係數為 0.44，僅為中度相關。

#### Conclusions

本研究旨在探討非侵入式之量測骨質轉換因子的可能性。搜集了 18 位受試者檢體數據，包含骨骼經過相關性分析後，發現受試者 P1NP 血液與唾液的相關性為高度相關，代表能藉由量測人體內唾液 P1NP 濃度來推估血液 P1NP 濃度。而受試者  $\beta$ CTX 血液與唾液的相關性則為中度相關，代表受試者血液、唾液之  $\beta$ CTX 濃度不具明顯相關性，尚不適合由受試者唾液濃度來推估其在血液中的濃度。

## Medial Meniscal Root Tear

### 內側半月板根破裂手術治療經驗分享

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#### Introduction

Meniscal root tears or avulsions left untreated, caused incapable of properly distributing axial load and resisting rotation and translation. In this study, we are curious about the treatment result in elderly patients group of medial meniscal root tear by trans-tibial single tunnel pullout method.

#### Materials and Methods

We evaluated 2018-2020, total 12 patients(12 females, average age 63.75 year-old, left: 6, right: 6 ) under diagnosis of medial meniscal root tear. Single surgeon, Operative arthroscopic assisted trans-tibial single-tunnel pullout suture. Patient selection: Injury time: less than 6 months, rule-out chronic injury. Injury pattern: low energy injury( sprain, step-up or downstairs) Knee varus deformity < 5°( Mechanical axis) Rule-out advanced osteoarthritis( Kellgren & Lawrence grade 3-4). Surgery method: Standard anteromedial and anterolateral portals, posteromedial portals if needed. Remove the cortex of anteromedial eminence and medial femoral notch if needed. Prepare the bone bed by removing the cartilage and cortical bone about 10mm in diameter to reattach the meniscus. Tibial tunnel chosen over the medial of posterior cruciate ligament insertion.(Smith & Nephew, ACL-reconstruction jig) The stump of medial meniscus was sutured by meniscal needle ( Smith & Nephew FAST-FIX 360 \* 1 or 2 needles depends on tissue condition.) The suture was pullout from tibial tunnel by wire loop( Arthrex mini-ACL tight-rope). Suture was tightened over anterior tibial with an endobutton ( Smith & Nephew endobutton) with knee flexion 0°( full-extension)

#### Results

12 females, age: 63.75, left: 6, right: 6, trans-tibial single tunnel pullout. Range of motion: 2.5° - 87.08° IKDC Score: 34.53 / 64.53 ( pre-op/ post-op) Lysholm knee scoring grade: 53.5 / 73.1 ( pre-op/ post-op) KL grade: 2 patients from KL grade 2 to grade 3 ( 16.6%) Non-healing: 1 non-healing of 6 months post-op ( 8.3%)

#### Discussion

In our practice, most patients underwent operation with Arthroscopic assisted meniscal root repair with 2 meniscal needles( Smith & Nephew FAST-FIX 360) + endobutton augmentation over anterior tibial tunnel( Smith & Nephew endobutton) shortened the operation time in less than 2 hours.

#### Conclusions

Compared with suture-passage device fashion: meniscal needle( Smith & Nephew FAST-FIX 360) for grasp more soft tissue of meniscal stump to prevent suture or wire cut through, secure fixation to the foot print of posterior tibia plateau and healing in situ.

## Comparison of Tunnel Enlargement and Clinical Outcomes in Patient with Double Bundle Anterior Cruciate Reconstruction with Anterolateral Ligament Reconstruction and Internal Brace and Outside-in Double Bundle Anterior Cruciate Ligament Reconstruction

比較雙股前十字韌帶重建與雙股前十字韌帶合併前外側韌帶與內支架重建之隧道擴張與臨床結果

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### Introduction

The aim of this study is to compare the tunnel enlargement and clinical outcomes in patients with double bundle anterior cruciate reconstruction (DB ACLR) with anterolateral ligament reconstruction (ALLR) and internal brace (IB) augmentation and outside-in (OI) DB ACLR.

### Materials and Methods

Seventy-two patients were enrolled and divided into 2 groups based on the different surgical techniques: group 1: DB ACLR with ALLR and IB augmentation (n = 33) and group 2: OI DB ACLR. (n = 39). The patients were evaluated according to the Lysholm scores and IKDC at 9-month after surgery. Plain radiographs were performed in all patients for a mean of 9 months' follow up. Tunnel enlargement was determined by the widths perpendicular to the long axis of the tunnels at 1cm from the articular aperture and the maximum width in anteroposterior (AP) and lateral radiographs. The divergent angle in AP radiograph was also measured.

### Results

On the femoral side, no significant difference was found in tunnel enlargement (both AM and PL tunnel) in AP radiograph. Conversely, on the tibial side, tunnel enlargement was greater in the group 2 than group 1 (p = .03). 15% of the patient in group 2 has tunnel coalition on the tibial side. The most common shape of the enlarged tibial tunnels was cylindrical in AP radiographs, and reverse triangle in lateral radiographs. No coalition was found on the femoral side. The divergent angle was significant greater in group 1 than in group 2 (p = .04). In addition, the clinical outcomes were good in both group without significant differences.

### Discussion

Little was found in the literature on the question of tunnel enlargement and clinical outcome between these two groups. The results of this study indicate that additional ALLR with internal brace lower the tunnel enlargement of tibial site comparing with the group 2. This result may be explained by the fact that ALLR can increase rotation stability. Additionally, there was no tunnel coalition reported in the group 1, which might be related to larger divergent angle provided by the OI technique of PL tunnel. Based on the evidence of this study, the anatomical ACLR with additional procedures could probably benefit the patient with rotational stability although the clinical outcomes in the 9-month follow up have no significant difference.

### Conclusion

This study demonstrated lower tibial tunnel enlargement on tibial side in DB ACLR with ALLR and IB group, which might be related to more resistance on pivot shift because of additional ALLR and IB. In addition, the larger divergent angle of femoral tunnel might be related to less tunnel enlargement. In particular, the clinical results were good without significant difference between the two groups in the 9-month follow up.

## MMH Experiences- Complications Following Arthroscopic All-inside ACL Reconstruction 懸吊法前十字韌帶重建的術後併發症之馬偕經驗分享

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### Introduction

This study was aimed to evaluate the percentage of complications associated with all-inside ACL reconstruction (ACLR) at a minimum of one year follow-up in our hospital and to demonstrate each complication in this relatively newly developed technique.

### Materials and Methods

A retrospective descriptive review was conducted on the complications associated with all-inside ACLR performed between December 2015 and July 2019. Total 225 all-inside ACLR were performed, but patients who had multiple ligament reconstruction, revision ACLR, and there was no postoperative MRI were excluded. A total of 89 patients have been enrolled in this study. A quadruple semitendinosus tendon autograft was utilized in 71 patients and the rest were reconstructed with allograft. Patients were evaluated preoperatively using the Lysholm and Tegner scores and at six, 12 months postoperatively.

### Results

There were eighty-nine patients with mean age 30.9 years (range 15 to 61) were included. The average follow-up was 15.7 months to survey the possible complications. Range of motion in the reconstructed knee approximated the uninjured knee by 6 months. The simultaneous procedure of meniscus repair was 26.9 (24/89) %, partial meniscectomy was 8.9 (8/89) %, and no microfracture for chondral injury was noted in the included database. A total of 12 complications (13.4%) were found. The most common complication was malposition of the cortical button found in 8 cases, most were affected by the femur site button. The intraoperative breakdown of the retrograde drill was found in 2 cases, with 1 case infection, and 1 case of over-drilling with destruction of the external cortex. At the postoperative follow up, the tunnel widening was found in all cases, with 11 cases of partial or full thickness re-rupture, 1 case of loss of extension.

### Discussion

All-inside ACLR is a relatively newly technique with dual suspensory graft fixation, but also has potential risk of complications. Some complications developed owing to the immature skill and lack of the experience. Complication rates could be decreased when the surgeons could have a foreknowledge of possible complications before the operation. Loss of extension was regarded as the worst complications secondary only to the re-rupture.

### Conclusions

The all-inside ACLR was a safe and effective technique and demonstrates a good medium term subjective as well as objective outcomes with a relatively low complication and failure rate.



**Braided Polyester Suture as Internal Splint Decreased Early Loosening after Anterior Cruciate Ligament Reconstruction: Cases Series and Systemic Review****前十字韌帶重建時使用不可吸收線作為內固定避免早期鬆弛：病例報告及文獻回顧**

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**Introduction**

Rupture of anterior cruciate ligament (ACL) is a common injury of the knee, and the goal of ACL reconstruction is to restore the stability of knee and avoid secondary injury. Autogenously hamstring tendon graft was usually applied when reconstruction. But in proliferative phase of ligamentization, the strength of tendon graft would decrease, and the post-operation laxity was common. Symptomatic laxity would decrease curative effect and lead to fail to return to exercise. We introduce a novel method of internal splinting by using number 5 braided polyester suture (Ethibone) in prepared hamstring tendon graft.

**Materials and Methods**

Prospective case-series study was introduced. The aim of this study was to elucidate the additional suture line can diminish acute loosening during ligamentization. We collect 13 cases with ACL injury combined with or without meniscus injury. They all received ACL reconstruction with autogenous gracilis and semitendinosus tendon graft. We prepared four-stranded hamstring tendon graft by using suspensory system with two braided polyester suture embedded in it. The post-operative protocol was the same with brace protection and close chain exercise. The post-operation 2,6,12 weeks were arranged for following up. The stability was evaluated by using GNRB arthrometer and presented as translation in millimeters.

**Results**

We enrolled 13 cases in this period. There were 8 male and 5 female with mean age of 26 year old. The average operation time was 65 min. The anteroposterior translated detected by GNRB arthrometer in post-operation 3 months showed only 2mm in average. The knee range of motion was returned to normal.

**Discussion**

During the phase of ligamentization, the graft would necrosis and then the cell would regrow by creeping substitution. The strength of tendon was weak, then early loosening happened. In our study, number 5 non-absorbed suture line could not only offer internal splinting immediately, but also keep the strength even in the proliferative phase of ligamentization. After following 3 months, no case encountered loosening or laxity of knee.

**Conclusions**

In this study, number 5 non-absorbed suture lines were used as core of tendon graft work like internal splint to avoid the loosening during the phase of ligamentization. With this method, all cases could keep the strength of rehabilitation protocol.

缺繳

## Risk Factors Analysis of Functional Outcome of Open Wedge High Tibial Osteotomy for Medial Osteoarthritis

高位脛骨截骨矯正手術治療內側膝關節炎的功能性結果之危險因子分析

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### Introduction

To evaluate the correlation between functional outcomes and radiologic of open wedge high tibial osteotomy (OWHTO) combined with arthroscopic procedure in patients with primary medial osteoarthritis.

### Materials and Methods

From June 2016 to July 2019, this study involved 42 patients (42 knees) undergoing OWHTO with arthroscopic operation for primary medial osteoarthritis for least one-year follow up. Measurements included age, body weight, body mass index (BMI), hip-knee-ankle (HKA) angle, posterior tibial slope angle (PTSA), and the weight-bearing line (WBL) ratio. The arthritic change was evaluated by Kellgren–Lawrence (KL) classification. And, cartilage repair was under arthroscopic exam. Clinical evaluation was performed using the International Knee Documentation Committee (IKDC).

### Results

The preoperative HKA was the positively predictor of the functional outcome before OWHTO ( $p=0.024$ ). Negatively correlated with the postoperative PTSA of the difference IKDC ( $p=0.048$ ), and no correlated with age, body weight, body mass index (BMI), the weight-bearing line (WBL) ratio, cartilage damage degree and repairment.

### Discussion

The preoperative HKA was the only predictor of the functional outcome before OWHTO. The larger the HKA, the worse the functional outcome. Furthermore, we recommended the preoperative HKA as an indicator for improving the result. According to our data, malalignment  $<10.3^\circ$  of preoperative HKA was suggested and undergone OWHTO.

### Conclusions

This study identified relevant factors that significantly influenced HTO results. Accurate correction based on the preoperative HKA provides good lower limb alignment and better functional outcome.

**Arthroscopy-assisted 3D PSI Jigs for Tibial Plateau Malunion: From Lab to Clinical Application****3D 列印骨折復位輔具於關節鏡輔助脛骨平台骨折癒合不良- 從實驗室到臨床應用**

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**Introduction**

Malunion of tibial plateau fracture is a difficult condition to orthopaedic surgeon. Intra-articular corrective osteotomy is the treatment choice to relative young patients. However, it is very difficult to perform precise osteotomy at the malunion site intraoperatively. Thus, we develop the 3D printed patient specific instrument (PSI) to assist surgeons in performing intra-articular osteotomy.

Method.

**Materials and Methods**

We collected five patients with tibial plateau fracture malunion. All patients received inadequate ORIF before and the metal implants were remained. The CT was performed for all patients and 3D model of malunion tibia and the metal implant were created and processed with software. The malunion site, joint depression level, the remained metal implants and the osteotomy site were all evaluated in the computer. The PSI was also designed to match the patient's tibial surface and to assist in localizing the osteotomy site

**Results**

Adequate reduction was achieved through arthroscopic assisted 3D printing jigs. No major complications were noted through this method.

**Discussion**

We designed two PSI for the patient with tibial plateau fracture malunion. These two PSI guide was printed with 3D printer in Nylon. The first one is the "pin guide" and the second one is the "drill guide". We used the remained metal implant as the reference point for the pin guide, so we can easily apply the pin guide into patient's proximal tibia. Then two 2.0 mm k-wire were inserted in to the tibia through the designed sheath of the pin guide. Then, the metal implants and the pin guide were all removed. The drill guide was applied to the tibial along the two k wires. Multiple k wire drilling was performed through the sheaths of the drill guide. Theses drilling will mark the malunion site of the tibial plateau. Then the surgeon used the osteotome to connect the drilling holes and mobilize the depressed fragment. The fragment was pushed up to the articular surface and bone grafts was impacted in to the bone defect site. Finally, a new plate was applied to fix the elevated fragment.

**Conclusions**

3D printed PSI is effective to treat tibial plateau fracture malunion. It can help surgeon to locate the malunion site easily and precisely.

## The Clinical Outcome of Hip Arthroscopy for Borderline Development Dysplasia of the Hip: 2- to 17-Year Follow-up Results

髖關節鏡對於邊緣發展性髖關節發育不良的臨床結果:2 至 17 年的追蹤結果

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### Introduction

Hip arthroscopy for borderline developmental dysplasia of the hip (BDDH) has gained the attention of arthroscopic hip surgeons in the last two decades. However, controversies regarding surgical indications, surgical techniques and long-term outcomes of hip arthroscopic surgery still exist, and no consensus has yet been reached on its effectiveness and reliability for patients with BDDH. The purpose of this study is to evaluate the clinical outcomes of hip arthroscopic surgery for patients with BDDH and explore factors that influence these outcomes.

### Materials and Methods

From 2003 to 2018, a consecutive series of patients with BDDH, defined as lateral center edge angle (LCEA) 20°-25°, who received hip arthroscopy in a tertiary medical center was retrospectively reviewed. Patients who had received previous hip surgery, had avascular necrosis, had fractures, or a LCEA greater than 25° were excluded. Patient's pelvis anteroposterior radiographs and computed tomography images were evaluated. Subjective data were obtained from all patients before and after surgery and included the modified Harris Hip score (mHHS) (pain and function) and visual analogue score (VAS). Any complications, revision surgical procedures, or conversions to total hip arthroplasty (THA) or periacetabular osteotomy (PAO) were documented. Risk factors for poor prognosis were also investigated. The perioperative comparisons of mHHS and VAS were evaluated by paired t-test. A p-value of 0.05 was considered statistically significant.

### Results

A total of 18 patients and 18 hips with a mean age of 39.89 years (range 17-63) at the time of surgery were included. The mean LCEA was 22.46°±1.95° (range 20°-25.4°). The average follow-up time was 10.05 years (range 2 to 17 years). Overall, the mHHS improved from a weighted mean score of 40.25±13.36 preoperatively to 83.17±12.04 post-operatively (p < 0.001). Similarly, the VAS score improved from a mean score of 8.1±0.81 preoperatively to 1.89±1.75 post-operatively (p < 0.001). Failure included reoperations and conversions to THA or PAO. The overall conversion rate was 21% (4/19) with 3 patients requiring further THA and 1 patient PAO.

### Discussion

Hip pain and instability are significant issues in patients with BDDH and may be associated with acetabular under-coverage, ligamentum teres tears and capsular deficiency. Sequelae of untreated BDDH can include labral lesions, chondral damage, and early-onset hip osteoarthritis. Technical advancements in the last two decades have seen a better understanding of the role of hip arthroscopy for BDDH. Some studies have shown consistent improved patient pain and functional outcomes; however, the primary limitation of hip arthroscopy lies in its inability to correct bony structural abnormalities. Hence, controversial opinions exist regarding the best treatment approach for patients with BDDH. Poor prognostic factors have been explored in the literature which include age, BMI, cartilage and acetabulum condition and preoperative functional and pain scores.

### Conclusions

Hip arthroscopy is a promising treatment for patients with BDDH who present with hip pain and instability. A significant improvement in mHHS and VAS score were noted. Risks factors for patients who had persistent pain post-operatively or conversion to THA or PAO included age, BMI, cartilage wear severity and preoperative mHHS and VAS scores.

**Factor Associated with Estimation of Blood Loss in Shoulder Arthroscopic Surgery****肩關節鏡手術失血量估算及相關因子**

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**Introduction**

In the past 25 years, many conventional open procedure can performed arthroscopically. Arthroscopic surgery can be performed on any joint. Shoulder and knee arthroscopy are the most common. There are many benefits of arthroscopic procedure, including 1. swelling and pain is substantially reduced, 2. Less infection rate, 3. shorter hospital stay and recovery time, 4. Minimal scarring, and 5. Less blood loss. Blood loss is always presumed minimal in arthroscopic procedure. Therefore, we want to estimate the volume of blood loss and risk factor of much more blood loss in shoulder arthroscopic procedure in our hospital.

**Materials and Methods**

There are 118 cases with shoulder arthroscopic procedure included in this study, from 2019.11.1 to 2021.1.15, which are conducted by two sports surgeon. We check the Hemoglobin pre-operatively and on the post-op day 1. Variate parameters were recorded: sex, age, weight, OP time, type of procedure, Hypertension, anti-coagulant agent or anti-platelet agent use. The primary outcome of blood loss is calculated, using this equation: [blood loss(ml)]/[blood volume(ml)]\*pre-op Hb=Hb drop (g/dL) Blood volume was estimated in all patients using a simplification of Nedler's method based on patient weight with the formula 70 mL/kg body weight.

**Results**

There are 65 male patient and 53 female patient in the series. Mean age is 58.7. The mean weight is 65.2 kg. Our primary outcome: the mean volume of blood loss is 375 mL. Mean drop of hemoglobin: 1.16g/dL. There are 7 patient has history of anti-coagulant agent, and 31 patient has hypertension.

**Discussion**

As we known, shoulder arthroscopic surgery is a minimal invasive procedure with less blood loss. The volume of blood loss may depend on the op time, type of operation and patient's comorbidity and medication. However, in our group the volume of blood loss varied from 63 to 900 ml. There are still many factor which is not considered in our study, such as IV fluid consumption(fluid input and output). The small case number is our limitation.

**Conclusions**

Arthroscopic surgery is still a reliable choice as minimal invasive procedure.

**Biomechanical and Histologic Effects in Tendon Healing of Rat Achilles Tendinopathy with Adipose Derived Stromal Vascular Fraction Gel and Palate Rich Plasm**

高濃度自體血小板血漿和脂肪血管基質膠的生物力學以及組織學於小鼠阿基里斯腱疾病之效果

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**Introduction**

Tendinopathy, including tendinitis and tendinosis, is a common musculoskeletal disorder which may lead to tendon tear no matter with repetitive movement or overloading. Palate rich plasm (PRP), adipose derived stromal vascular fraction gel (ADSVF gel), or extracellular matrix of amniotic membrane (AM) have been applicate in tendon repair. Although positive effects of tissue engineering approach have been proved in tendon repair, seldom of the previous studies compared the effects of different regenerative medicine based interventions in Achilles tendon rupture. In this study, we propose to compare the effects of AM, PRP and ADSVF gel on rat Achilles tendon repair.

**Materials and Methods**

40 Sprague Dawley female rats (~250g, 8 weeks old) will propose to use. Both Achilles tendon will be transversely cut in all rats. The right Achilles tendon will be used as control while the left one will be used to exam the different interventions AM, PRP+AM, ADSVF gel + AM, and PRP + ADSVF gel +AM. After harvest, the tendons will be used to 1) analyze the effects of different interventions on the mechanical properties.

**Results**

The combination of PRP and ADSVF gel with AM will be superior than other two type of biological growth factors (PRP or ADSVF gel) or AM only no matter in the mechanical properties, the local strain, or micro structures. We also find that AM can reduce the tissue swelling, and SVA and PRP both produce more local swelling environment.

**Discussion**

The PRP + ADSVF gel + AM may demonstrate higher anisotropic fiber alignment and collagen content. Although both treatment can enhance the alignment of collagen fibers, there seems to be more amount and matured collagen fibers (orange to red color) in ADSVF gel treated group. It seems that PRP treatment can enhance the tendon recovery in the early stage of healing; however, ADSVF gel demonstrate higher ability in collagen synthesis and maturation at the mid to late phase of tendon recovery.

**Conclusions**

We expect that the use of these kind of commercial methods could significantly reduce the healing process and enhance the mechanical properties of the tendon. In the study design, we hope to figure out a best intervention for tendon repair, that is shorter healing duration with higher mechanical strength and microstructure of the tendon, which is importance for those need higher functional requirements of musculoskeletal systems such as the athletes. The comparison of these treatments can also provide a basic data for the clinician to choose proper treatments for the patients.

## Gastrocnemius VY Advancement Augmented with Flexor Hallucis Longus Transfer Compared with Flexor Hallucis Longus Transfer Only in Chronic Achilles Tendon Rupture: A Retrospective Studies

比較屈姆趾長肌腱轉移手術和腓腸肌延長術合併屈姆趾長肌腱轉移手術在慢性阿基里斯肌腱斷裂治療成效：回溯性比較研究

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### Introduction

The challenge of chronic Achilles tendon ruptures repair is the large defects after scar debridement. We compared the outcome of gastrocnemius VY advancement augmented with flexor hallucis longus transfer (FHL) and FHL transfer only in chronic Achilles tendon rupture.

### Materials and Methods

Between 2015 and 2019, 10 patients with unilateral reconstruction of chronic Achilles tendon ruptures were enrolled. The outcomes of 6 patients post gastrocnemius VY advancement augmented with flexor hallucis longus transfer and 4 patients post FHL transfer only were compared. Visual Analogue Scale (VAS), American Orthopaedic Foot and Ankle Society (AOFAS) Ankle-Hindfoot Scale and the 36-Item Short Form Health Survey (SF-36) were surveyed before surgery, three, six and twelve months points after surgery.

### Results

Significant outcome improvement was noted in both groups. The mean VAS score was 0 for both groups after one year. The mean AOFAS Ankle-Hindfoot score was 90 +/- 9 (VY + FHL) and 85 +/- 13 (FHL) after one year. SF-36 scores showed significant improvements in physical, role and social function scores in both groups. There was no significant difference between the groups in all parameter in all following time point. VY advancement augmented with FHL transfer required significantly longer operative time (110 +/- 31 min) compared to FHL transfer alone (79 +/- 19 min).

### Discussion

The limitations of this study include the small size and short duration of follow up. Re-rupture may be present after many years. Besides, the patient were not randomly assigned in the treatment group in retrospective studies. To validate the conclusion, the long-term follow-up randomized study may be necessary. Finally, the AOFAS Ankle-Hindfoot score might be over scored in the patient with complex ankle and hindfoot injury, which needed to be re-designed the evaluation parameter in future research.

### Conclusions

FHL transfer only might be an efficient and reliable technique with shorter operation time in treat of chronic Achilles tendon rupture due to no significant difference compared with gastrocnemius VY advancement augmented with FHL transfer after one year following. The further study was still necessary to validate the conclusion and lead a practice guide for this challenging issue.



**The Preliminary Results of Syndesmosis Injury Reconstructed with Suture Buttons****鈕扣人工纖維使用於重建踝帶聯合損傷之初步結果報告**鄭守恩<sup>1</sup> 藍宗裕<sup>1,2</sup>亞東紀念醫院骨科部<sup>1</sup> 亞東技術學院<sup>2</sup>**Introduction**

Syndesmosis injury, commonly associated with external rotation stresses, accounts for one tenth to one fifth of operation-treated ankle fractures. Neglected injuries or malreduction of the syndesmosis may result in post-traumatic ankle arthritis, which drastically diminishes the quality of life of the victim. Despite conventional technique utilizing syndesmotic screw as the main fixator, suture button emerged to be an alternative in the treatment of syndesmosis injury. Though several studies have proven a superior outcome of suture button over syndesmotic screw, there is still no definitive consensus on the usage of the implants. Therefore, we shared our early results of suture button in the treatment of syndesmosis injury.

**Materials and Methods**

From 2019 to 2020, there were 6 patients who underwent operations because of acute or chronic syndesmosis injuries. We used Tightrope ○R (Arthrex, FL, USA) to reconstruct the syndesmosis. All cases were followed up at least one year. The primary outcome was the American Orthopaedic Foot and Ankle Society (AOFAS) Ankle-Hindfoot Scale. Secondary outcome features mainly radiologic parameters. The tibiofibular clear space (TFCS), tibiofibular overlap (TFO) and medial clear space (MCO) were measured in a standard anteroposterior view of ankle.

**Results**

The median value of the AOFAS Ankle-Hindfoot Scale recruited preoperatively was 38 out of a total 100 points. As for radiological parameters, the mean value of preoperative tibiofibular clear space, tibiofibular overlap and medial clear space were 6.6, 2.2 and 7.2 mm, respectively. The median value of AOFAS score recruited one year after the surgery was 100. The mean value of TFCS, TFO and MCO were 3.5, 7.4 and 3.1 mm. The improvement of the primary and secondary outcomes both met a significant difference. ( $p < 0.05$ ) No major complication was documented.

**Discussion**

Significant improvement was observed in both AOFAS score and radiological measurements after the surgery, which implied a satisfying functional outcome and anatomical restoration utilizing suture button fixation. Common complications, mentioned in other studies, including infection, local irritation, osteolysis or sinking of the fixator were not documented in our studies. There was no loosening of the structure or re-diastasis after one year follow-up.

**Conclusions**

Anatomic reduction of the syndesmosis injuries remains a crucial issue in ankle stability. In our study, suture button fixation possesses a durable fixation, delightful functional and radiological outcomes. It is cost-effective, safe and comparable to conventional screw fixation.

## MR Arthrography of the Ankle: May be a Effective Diagnostic Tool for ATFL Rupture 踝關節磁振關節攝影術在前距腓韌帶斷裂的病人可以使診斷更加準確

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### Introduction

The anterior talofibular ligament (ATFL) is the most commonly injured ligaments when a plantar-flexed foot is forcefully inverted. Conventional magnetic resonance (MR) imaging and ultrasonography (US) are regarded as the methods of choice for noninvasive diagnosis of ATFL. However, previous studies on plain MR imaging suggested considerable limitations in the diagnosis of partial-thickness tears. In some studies, MR arthrography showed significantly higher sensitivity in the detection of ATFL tears. The aim of this study was to determine the efficacy of magnetic resonance (MR) arthrography for detecting anterior talofibular ligamentous injury of the ankle joint.

### Materials and Methods

32 patients who had undergone preoperative MRI and surgical treatment for ATFL were enrolled. The prevalence of anterior talofibular ligament were assessed. The diagnostic accuracy of ankle ligament imaging at MRI was analyzed using arthroscopy as a reference standard. Statistical differences between the diagnostic performances of the two methods were analyzed.

### Results

25 and 7 patients who underwent noncontrast magnetic resonance imaging and magnetic resonance arthrography were assigned into groups A and B, respectively. Sensitivity for diagnosing partial tendon tear(100% vs. 68%) was slightly higher in group B than in group A. The specificity for diagnosing complete tendon tear(85% vs. 68%) was higher in group B than in group A. Most patients with ligamentous injury were correctly diagnosed by MR arthrography. The noncontrast MRI alone had a higher incidence of false negative detection.

### Discussion

With MR arthrography, the examined joint is distended, permitting improved discrimination of intra-articular structures. MR arthrography uses the intra-articular injection of contrast material to duplicate this effect of joint fluid. Intra-articular joint distention with diluted contrast lifts the ligaments away from the adjacent bones, outlining the ligaments and improving their visualization. MR arthrography allows precise assessment of the thickness of the ligaments and their integrity at insertion sites.

### Conclusions

Magnetic resonance arthrography may facilitate more accurate diagnosis and grading of anterior talofibular ligament tears compared with noncontrast magnetic resonance imaging.

## Arthroscopic Repair for Chronic Lateral Ankle Instability: Case Series and Literature Review 慢性外側踝關節不穩定之關節鏡修補手術：病例系列報告與文獻回顧

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### Introduction

Arthroscopic techniques for lateral ankle ligament repair become more and more popular due to the advocated advantages of minimally invasive surgery. Nevertheless, certain discomforts such as possibility of sural nerve injury and limitation of plantar flexion of ankle joint remained to be the chief complaint of the patients during the follow-up. Therefore, our study aimed to analyze whether knot tying with knot pusher or with free-hand tie has any differences in clinical outcomes and mid-term functional performance in arthroscopic Brostrom-Gould procedure.

### Materials and Methods

From Mar. 2016 to Dec. 2018, 73 consecutive patients with ATFL and/ or CFL injuries underwent arthroscopic Borstrom procedure with Gould modification followed for a minimum of 12 months were reviewed. All patients underwent arthroscopic Brostrom-Gould procedure with inferior extensor retinaculum (IER) augmented were divided into: 1) Group I: with surgical tie by knot pusher (N=37); 2) Group II: self-cinching knot by free-hand tying (N=36). Radiographic parameters for lateral ankle stability were compared as measured on the preoperative, postoperative and follow-up plain radiographs. Clinical outcomes were assessed by Visual Analog Scale (VAS), AOFAS Ankle-Hindfoot Score, and Short Form 12 Health Survey (SF-12). Between group analyses were calculated using Student-t test & chi square test. Statistical differences were defined as  $p < 0.05$ .

### Results

There were no differences in the mean VAS, AOFAS Scores and SF-12 scores preoperatively between two groups. Besides, both groups showed significant improvement in all three scoring systems postoperatively. The range of motion was significantly lower in Group I compared to Group II especially during plantar flexion. 4 patients developed residual lateral ankle discomfort in the follow-up and all of which occurred in Group I (3/31, 9.6%). All patients in both groups presented good ankle stability postoperatively.

### Discussion

Ankle sprain is a common injury and most patients can get an adequate recovery after a conservative treatment. Surgical intervention is considered if conservative treatment is ineffective in those develop chronic lateral ankle instability. Different procedures have been illustrated during the past decades. Previous studies have reported comparable radiographic parameter measurements and ankle stability between open surgery and arthroscopic procedure in Brostrom-Gould procedure. However, the range of motion was significantly lower in patients with IER augmented by knot pusher which will correlate with unfavorable results. Our study tried to resolve this problem and the results showed satisfactory clinical outcomes in free-hand tying group.

### Conclusions

Even though the surgical outcomes were comparable in ankle stability and radiographic parameter measurements between knot pusher and free-hand tying groups, certain discomforts such as nerve injury and limitation of plantar flexion of ankle joint remained during the follow-up. The tightness of knot tying for arthroscopic IER augmentation should be careful assessment during surgery.

## Does Talar Neck Involvement in a Talus Fracture Affect Incidence of Posttraumatic Osteoarthritis and Avascular Necrosis? Results from a Case Series in VGHKS

探討距骨頸在距骨骨折中對術後關節退化及缺血性骨壞死的影響

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### Introduction

Post-traumatic osteoarthritis (PTOA) is the most common complication in talus fractures. Fractures involving the talar body were reported to have highest osteoarthritis (OA) rate among all the locations due to its proximity to subtalar and tibio-talar joints. However, whether neck involvement in a talus fracture will affect the incidence of PTOA has not been thoroughly discussed. Another common complication of talus fractures is avascular necrosis (AVN). It's reported that talar neck fractures have higher AVN incidence rate compared other fracture locations. In the present study, we examined the correlation between neck involvement in a given talus fracture and incidence rate of PTOA/AVN.

### Materials and Methods

In this retrospective study, we examined patients with talus fractures in VGHKS in a ten-year time span (2010 Jan – 2020 Dec). Patients who underwent conservative treatment rather than ORIF and those without or lost OPD follow-up were excluded. A total of 24 patients (13 male and 11 female) were included. We separated them into two groups: one with neck involvement (group A) and the other without neck involvement (group B) according to plain films and operation notes. PTOA was defined as joint space narrowing in tibio-talar, subtalar, or talo-navicular joints. The location of PTOA was also recorded for every case. AVN was defined as increased density within the talar dome or collapse of the articular surface. Identifications of the two complications were based on plain films from post-operation follow-up. We then examined the correlation between neck involvement in talus fracture and PTOA/AVN incidence rate statistically.

### Results

In all 24 patients, 11 were talus fractures with talar neck involvements (group A), 13 were fractures without neck involvement (group B). 4 patients in group A developed PTOA (36%). Regarding PTOA location, 2 patients had OA changes at both subtalar and tibio-talar joints, 1 at subtalar joint, and 1 at tibio-talar joint. 5 patients in group B developed PTOA (38.4%). Regarding PTOA location, 4 patients had OA changes at tibio-talar joint and 1 at subtalar joint. The difference between the PTOA incidence rates of two groups ( $p = 0.5686$ ) was not significant, and nor was the difference between the PTOA locations in two groups ( $p > 0.05$ ). Of all the cases, only 1 patient in group A developed AVN (4.2% vs. 0%).

### Discussion

In our study, the incidence rate of PTOA was 36% in the neck-involved group and 38.4% in the non-neck-involved group ( $p = 0.5686$ ). According to the results, neck involvement in a given talus fracture may not affect PTOA rate. Compared to previous studies regarding talus neck fracture, which mentioned a mean PTOA incidence rate of 49%, our data showed a relative lower rate. This may result from ORIF operations done in our patients. All of the included 24 patients had undergone ORIF with screws or screws plus plates for proper anatomic reduction. Gaining anatomic reduction during operation was reported to relate to better outcome and lower complications. However, further OPD follow-up will be needed as the PTOA incidence rate may increase with time. Concerning the location, most of PTOA in our studied group occurred at tibio-talar joint, which is inconsistent with previous studies' results (OA occurred mostly at subtalar joints). As for the only one case that developed AVN, the possible cause may be the severity of fracture (Hawkins' type IV) and open fracture characteristics according to previous studies on risk factors in talus neck fractures.

### Conclusions

Base on the results of our study, involvement of neck in a given talus fracture may not affect the incidence rate of PTOA or AVN. Due to the nature of PTOA, the incidence rate may increase with time. Our data showed lower PTOA rate compared to previous studies, and this may be the effect of relatively short post-operation follow-up time in our study. Further studies with greater number of cases and longer span of follow-up time may be needed.

**Functional Outcome of Talus Fractures After Hybrid Open Reduction and Internal Fixation :  
A Case Series****距骨骨折經混合式開放性復位固定手術之功能性評估:病例系列報告**

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**Introduction**

Talus fracture is challenging to manage, with varying fracture pattern and high rate of complication. Fractures of talus are relatively uncommon, and they usually occur after a high energy trauma. Conservative treatment can only be reserved for the non-displaced fracture. A minimal displacement over the articular surface may predispose to arthritis and may influence the quality of life. There was multiple technique of fixation, including external fixation, screws, plate osteosynthesis and even hybrid technique. The goal of current study is to evaluate the functional outcome of talus fractures after hybrid open reduction and internal fixation.

**Materials and Methods**

This is a retrospective study from Jan 2016 to Dec 2020. We thoroughly review medical record and radiography of the patients who were diagnosed with talus fracture and received surgical treatment. We use the Manchester Foot Pain and Disability Index (MFPDI) as functional evaluation under telephone survey. The results of the questionnaire were organized into three dimensions: functional limitation, pain intensity and personal appearance.

**Results**

Five-teen patients were diagnosed with talus fracture and received surgical treatment. Ten patients were excluded from the study for the non-hybrid fixation. The other 4 patients received internal fixation with mini-locking plate and head less screw. External fixation was applied simultaneously, and it was removed 2 weeks later. The follow-up radiography showed bony union for all the 4 patients. The average result of the MFPDI was 14/20 for the functional limitation, 7.5/14 for pain intensity and 0.5/4 for personal appearance. The average follow-up period is 13.2 months.

**Discussion**

Surgical treatment for the talus fracture is challenging with the historically poor outcome. Fortunately, a number of advancements have been made in the last decade. The mechanical intensity of the plate and screw hybrid fixation was proved previously. The current study showed the fair result of the talus fracture after hybrid surgery.

**Conclusions**

The hybrid fixation of the talus fracture is effective technique, and there was fair functional outcome postoperatively.

## Lisfranc Joint Arthritis Treated with Tarsometatarsal Joint Medial Closing Wedge Osteotomy and Arthrodesis

### 趾跗關節截骨融合手術治療趾跗關節關節炎

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#### Introduction

Lisfranc injuries involving the tarsometatarsal joint of the midfoot are relatively uncommon, making up 0.2% of all fractures. However, Lisfranc injury could lead to post-traumatic arthritis and long-term disability if missed diagnosed and not treated timely. Thus, this study was aimed to illustrate a new approach for Lisfranc joint arthritis arthrodesis.

#### Materials and Methods

3 female patients with an average age at surgery of 62 years were admitted for tarsometatarsal (TMT) joint closing wedge osteotomy and arthrodesis, due to post-traumatic arthritis of the Lisfranc joints. All patients complained pain over the 1st to 3rd TMTJ on walking with limited improvement after conservative treatment. Loss of joint space, midfoot deformity and osteoarthritis change of TMTJ were found in the radiographs. Two incisions were made over the 1st and 3rd webspace. The closing wedge correction was performed with a dorsal and medial based osteotomy from the 1st to 3th TMTJ. The fixation was performed with a pre-bend locking plate across the 1st to 3th TMTJ.

#### Results

All patient achieved radiological union during postoperative follow-up. No wound complication or infections was recorded upon the post-operative course. VAS and AOFAS mid-foot score improved post-operatively and all patients were satisfied with the surgical outcome. None of the patients in recent follow-up require subsequent surgery or revision surgery.

#### Discussion

Lisfranc injuries shoulder be underwent with surgical intervention promptly within the first 2 weeks from injury. However, if the pathology was not treated initially it may require salvage procedure such as arthrodesis or deformity correction. Wound infection, hardware related complication, and non-union were the factors should be considered before the surgery. This procedure reduced the number of incisions, hospital cost, surgical time and number of implants used. Our new method provides a practical and practicable surgical procedure with a satisfactory outcome.

#### Conclusions

We present a new approach for this disease with Lisfranc joint medial closing wedge osteotomy with arthrodesis. This approach showed favourable result in clinical results as well as medical cost reduction.

**Modified Two-Stage lengthening procedures for Brachymetatarsia: Case Series and Literature Review****改良式二階段延長術治療短趾症：病例系列報告及文獻回顧**

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**Introduction**

Brachymetatarsia is defined as 5 mm or more proximal to the parabolic arc of the metatarsal heads. Surgical correction with one stage lengthening or distraction osteogenesis was commonly use. However, post-op complication up to 50% was reported. To avoid these complications, we developed a modified two-stage lengthening procedure to achieve adequate metatarsal length and lower the complication rate. In this study, we want to discuss the effectiveness and the short-term clinical and radiographic outcomes of this technique.

**Materials and Methods**

This is a preliminary outcome of 5 cases (5 feet) of brachymetatarsia corrected by modified two-stage lengthening procedure. All patients are female and the mean age was 27 years (19 to 43). The mean follow-up period was 15 months (range 2 to 28 months). Clinical examinations and radiological parameters were performed. All patients underwent the modified two-stage lengthening procedure. First stage, we perform the transverse osteotomy and distracted to maximal length without neurovascular deficiency. Then, after a waiting period of 3-4 days, distraction started with a rate of 0.5-1 mm/day until adequate length was achieved. Second stage, we apply structural bone graft to bone defect, adjust metatarsal alignment and then fix with plate to keep length and remove the external fixator.

**Results**

The increased length was the mean of 16mm in post-operative 3 months follow-up. The percentage of the original length was the mean of 33%. Correction in metatarsal length of all cases maintained well until the bone healing. The mean AOFAS score achieved 94.6 points after surgery. All patients were satisfied with their foot appearance and function. Only one patient had mild pain when walking and little malalignment.

**Discussion**

There are various surgical techniques in the treatment of brachymetatarsia. The most frequently used surgical techniques are distraction osteogenesis and one-stage lengthening using autologous graft. Gradual metatarsal lengthening with an external fixator is a widely used method but relative high complication rate was noted. One-stage metatarsal lengthening is a well tolerate procedure, but neurovascular deficiency may happen if lengthening > 15mm. To decrease the time of external fixator used, we developed the modified two-stage lengthening procedure, which showed significant correction in metatarsal length without any major complication after surgery. The functional and cosmetic outcomes are all satisfactory. Overall, our technique shows obvious improvement in brachymetatarsia and more cases and long-term follow-up are needed.

**Conclusions**

The method of modified two-stage lengthening procedure demonstrates satisfactory short-term results, notable improvements in brachymetatarsia, and no early complication. In our limited experience, modified two-stage lengthening procedure is safe and effective in correcting brachymetatarsia.

缺繳



## The Mid-term Results of Patellofemoral Arthroplasty

### 髌骨股骨部分膝關節置換之中期報告

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#### Introduction

Patellofemoral arthroplasty (PFA) has had a renewed interest for delaying the total knee replacement, while limited results were reported. This retrospective cohort study aims to evaluate the prognosis and functional outcomes after PFA in patients with isolated patellofemoral osteoarthritis (OA).

#### Materials and Methods

From year 2014 to 2019, 34 knees in 30 patients (3 men and 27 women) with isolated patellofemoral joint advanced OA were treated with patellofemoral arthroplasty in Chang Gung Memorial Hospital Linkou branch. Patients suffering tibiofemoral OA more than Kellgran-Lawrence classification grade III were excluded. The primary outcome was the PFA survivorship and the secondary outcome was Kujala score evaluation. As for the statistics, Kaplan–Meier method and log-rank test were utilized for survivals.

#### Results

The median age at the time of surgery was 65 years (range 42-78), and the average follow-up period was five years (range 1-7). Four out of 34 knees required revision to total knee replacement because of the progressive tibiofemoral OA. Revisions were carried out after a mean of 33 months (range 10–68). The 5-year Kaplan–Meier survivorship was 90%. In subgroup analysis, the less preoperative tibiofemoral OA grade was the only parameter to prolong the survivorship ( $p < 0.05$ ), where 100% and 79% were reported in 18 grade I and 16 grade II OA knees, respectively. The age, side of the operated knee, and the preoperative Kujala score failed to achieve a statistically significant difference. There was no radiographic loosening in any case. The most recent functional assessment showed the mean Kujala score has improved from 72 (range 50-95) preoperatively to 82 (range 52-95) postoperatively.

#### Discussion

Our results were comparable with the existing literature, where the 5-year survivorship ranges from 88% to 100%. The single major reason for the revision was the progression of tibiofemoral OA, which was also concordant to previous reviews. The optimal patient selection seems to improve the survival of PFA, where all the four failure knees were in the preoperative tibiofemoral OA grade II group. When compared the PFA with Zimmer Unicompartment Knee (ZUK) Arthroplasty in our institute, the 5-year survivorship of PFA (90%) was inferior to ZUK (95.95%).

#### Conclusions

Midterm results with PFA demonstrate acceptable functional and radiographic outcomes. Judicious patient selection to identify truly isolated patellofemoral OA for PFA is necessary to prevent the early failure due to progressive tibiofemoral OA.

**Clinical Investigation of a Novel Device for Preventing Deep Vein Thrombosis****深層靜脈栓塞新型預防裝置之臨床研究**

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**Introduction**

Venous thromboembolism including deep vein thrombosis (DVT) is a potential complication following total joint arthroplasty. The possible damage to the vessel wall during the operation during the operation, the venous stasis caused by long-term bed rest, and the hypercoagulability the three main reasons for the formation of DVT. Ankle pumping exercise is currently suggested for patients after total joint arthroplasty, but the home compliance is unclear. We developed a device to help patient exercise both in hospital and at home, with the aim to prevent DVT.

**Materials and Methods**

Patients were randomly allocated to 3 of the intervention groups: self ankle pumping exercise, compressive machine, and our electronic device, which would remind patient to complete a series of exercise at specific time points. Duplex ultrasonography was used to evaluate DVT, and the parameters include: maximal venous outflow and maximal venous capacity. Patients were evaluated at postoperative day 1, 3, and first return visit (at about 14 days postoperatively). We then compare the incidence of DVT between groups.

**Results**

77 patients were included in this study (self-pumping n=29, compressive machine n=31, device n=17). There was no significant difference in patient characteristics. No DVT was noted through ultrasonography in three groups. Venous stasis was noted on postoperative day 1 in 3 cases in self-pumping group (13.8%), whereas no stasis was noted in the other 2 groups. Flow velocity and flow volume of the common femoral vein and popliteal vein were significantly higher in electronic device group ( $p<0.001$ ) compared with the other 2 groups on postoperative day 1, 3 and 14. Maximal venous outflow ratio (=max. velocity/flow volume, MVOR) was significantly higher in electronic device group in postoperative day 1, 3, and 14.

**Discussion**

The present study showed that the electronic device group had higher flow velocity and volume compared with self-pumping and compressive device, whatever in acute postoperative setting (day 1 and 3) or after discharge (day 14). This suggested that a portable wearable electronic device could provide continual notification to enhance patient compliance, and in turn, prevent venous stasis.

**Conclusions**

The current study suggested that our novel wearable electronic device could provide cost-effective prevention for postoperative venous stasis in total knee arthroplasty.

缺繳

## Spontaneous Bilateral Femoral Neck Fracture in Patients with End Stage Renal Diseases Receiving Hemodialysis: Case Series and Literature Review

### 洗腎患者之自發性雙側股骨頸骨折：系列病例報告與文獻回顧

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#### Introduction

雙側自發性股骨頸骨折是一種極為少見的骨折模式，患者多伴隨有骨質代謝的相關疾病，也因此造成在疾病的治療策略上更顯困難，此報告中我們匯集了三例均為洗腎及次發性甲狀腺亢進的系列病例報告。

#### Materials and Methods

Dorr 分型的測量分級使用 Calcar to Canal 比值，以股骨 AP 影像計算小轉子中點下方三公分除小轉子中點下方十公分處骨髓腔寬度，比值大於 0.64 定義 C 型，介於 0.59-0.64 定義為 B 型。Pauwel 分級測量方式為 AP 影像上骨折線與髌白頂端的水平線夾角，50 度以上定義為 III 型，介於 30-50 度定義為 B 型。本案例系列報告中所有接受骨水泥雙極式半人工關節置換者均使用後外側術式側躺進行，股骨頸開放性復位及內固定使用外側術式，並使用三隻短螺紋海綿骨迫緊螺絲以倒三角模式固定。術後均安排復健科進行輔具使用教學及復健訓練並於出院後規律於本院門診追蹤。

#### Results

本次收案共三名患者，平均年齡 59 歲，共六個髌部，包含一個第二型以五個第三型 Garden 股骨頸骨折，Pauwel 分型皆為第三型(平均 Pauwel 角 68.1 度)，所有患者均為 Dorr C 型股骨。所有患者先前均未接受過副甲狀腺手術或腎臟移植手術，於手術週期為正常離子鈣或低血液離子鈣(正常範圍 4.65-5.28 mg/dL)，副甲狀腺素濃度均超出檢驗範圍(> 1800 pg/mL)，屬於次發性副甲狀腺功能亢進。四個髌部接受骨水泥雙極式半人工關節置換，一個髌部接受股骨頸開放性復位內固定，一個髌部因患者意願行保守性治療。術後 12 週後兩位患者可以使用助行器於居家環境活動。其中兩位患者後續接受副甲狀腺部分切除或全切除併自體移植手術。接受股骨頸開放性復位內固定的髌部後續發生植體失敗以及骨折錯位的狀況，一位患者後續因非骨科因素感染離世。

#### Discussion

洗腎患者的雙側自發性股骨頸骨折與年長者脆弱性骨折同樣以位移股骨頸骨折為主(Garden III, IV)。Pauwel 分型為第三型，近似於於高能量外傷患者，暗示患者本身的重量可能在骨折形成上扮演重要角色，Pauwel 第三型骨折內固定植體需要承受更多的剪力，相對而言正向於骨折的壓迫分力少，加上腎臟骨病變合併副甲狀腺亢進對於骨質代謝的影響，極度不利於骨癒合。許多相關文獻討論 Pauwel 第三型最佳的開放性復位內固定手段，力學研究多顯示固定角度植體如滑動式髌關節螺絲合併抗扭轉螺絲或是轉子迫緊螺絲(trochanteric lag screw)相較於倒三角迫緊螺絲具有力學上優勢，臨床研究也多支持固定角度植體的使用，但僅是改變植體使否足以克服腎臟骨病變的影響依然無從得知。腎臟骨病變合併副甲狀腺亢進所造成的影響可以進一步從股骨皮質骨厚度上得到印證，患者均為 Dorr C 型股骨，更適宜使用骨水泥雙極式半人工關節置換。接受保守治療的髌部 12 週後依然無癒合且無骨痂形成。

#### Conclusions

如患者臨床狀況不宜接受進一步手術，腎臟骨病變患者的非位移性股骨頸骨折依然應考慮以(半)人工關節置換作為主要手段，以避免骨折位移或植體失敗的後遺症。

**Monitoring Femoral Stem Insertion: A Potential Device for Surgical Training****監測股骨柄植入：人工關節手術訓練潛在利器**

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**Introduction**

Hemiarthroplasty and total hip arthroplasty are successful in treating orthopedic conditions, such as femoral neck fracture, osteoarthritis, osteonecrosis of the femoral head. The primary stability of cementless femoral stem is fundamental in the success of those surgeries. Stem subsidence still remain one of the major complications. The incidence is significantly higher in surgeons in their early stage of practice. A major challenge in the excel in cementless technique is finding the balance between having a sufficient number and energy of impacts that is large enough to obtain an adapted primary stability of the femoral stem and not too high to cause fracture. We designed a sensor that is capable of monitoring the force and the advancing distance of each impaction. This study is intended to evaluate the difference in the pattern of stem impaction between experienced and young surgeons and evaluate effectiveness of the device in helping inexperienced surgeons get familiar with optimal stem impaction.

**Materials and Methods**

The device consists of a stem (Secur-fit, Stryker), and a sensing-component including an impaction load meter and an infrared distancer. The sensing-component is connected with an Android device with a customized app also developed by our team that records the value of each impaction. The device is firstly tested by three experienced arthroplasty specialists. During the examination, each participant impacts the stem until they feel the stem is tight enough for three series. The force and advancing distance are recorded. The last three impactions of each series are averaged and recorded as "Terminal impaction force." With the data from the experienced surgeons, five senior residents and five junior residents were then tested with the device. At the last part of the exam. Residents are given the terminal impaction force of the experienced surgeons and was asked to follow.

**Results**

Primary data reported the average terminal impaction force of an experienced surgeon is 665N. The variation of terminal impaction force is significantly larger in the junior resident group and senior resident group. All residents reported to have better understanding of the feeling of an optimal terminal impaction force with the device.

**Discussion**

The success of cementless total hip arthroplasty and hemiarthroplasty heavily relies on the primary stability of the stem, which determines by good stem impaction technique. Currently, there are no quantitative and objective measurement to help decide an optimal stem impaction. The best fit still relies strongly on experience and technique.

**Conclusions**

This device may be a helpful tool in the training of less experienced surgeons in the cultivation of skilled stem insertion. Complication during learning curve may be reduced in the long run.

## Acetabular Reconstruction and Cementless Total Hip Arthroplasty for Patients with Fixation Failure of Acetabular Fracture and Hip Subluxation

以髖臼重建和無骨水泥全髖關節置換術治療髖臼骨折固定失敗合併髖關節半脫位的病患

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### Introduction

Total hip arthroplasty (THA) for posttraumatic hip arthritis after acetabular fracture have inferior results compared to primary nontraumatic THA. The procedure became comprehensive because of much more problems might be encountered included nonunion or malunion of the fracture, severe bone loss, adhesive scar tissue, chronic subluxation or dislocation, and leg length discrepancy. Previously implanted hardware might also disturbed the procedure. By using of acetabular reconstruction with autograft and cementless THA, we successfully treated 2 patients with fixation failure of acetabular fracture and chronic hip subluxation.

### Materials and Methods

Two patients underwent acetabular reconstruction and THA for the hip osteoarthritis with bone loss on acetabular and hip subluxation. Leg length shortening more than 4cm was noted in both patients. The defect of acetabulum was reconstructed with autograft of femoral head. The hip center was resurfaced in true acetabulum with multi-holes cup and screws augmentation in cementless technique. Femoral stem preparation was the same as primary THA. Both pre-op and post-op bone stock, leg length were evaluating with radiography, lower limbs scanogram and computed tomography. The evaluation of hip function was measured with range of motion and modified Harris Hip Score.

### Results

Two patients were reviewed and follow-up for 18 months. Removal of all implants was necessary in 1 patient and partial removal in another patient. Both of acetabular reconstruction achieved bone union in the follow up radiography. The modified Harris hip score of them were improved significantly. No prosthetic loosening, osteolysis or need for revision by the final follow-up.

### Discussion

Recent studies reported patients after an acetabular ORIF were 25 times more likely to undergo THA than age matched control patients and an overall of 13.9% undergo THA. However, treated posttraumatic hip arthritis following prior acetabular fracture is in relatively high complication rates. The acetabular reconstruction with femoral head autograft is an efficient and accurate method. To improve chronic hip pain, restore the normal joint congruent and leg length are our main goals.

### Conclusions

The acetabular reconstruction and cementless total hip arthroplasty for posttraumatic hip arthritis proved to be safe, effective and significant improved outcomes.

## Total Knee Arthroplasty (TKA) Following Fixation Failure of Tibial Plateau Fracture with Schatzker Type VI

以膝關節置換手術治療脛骨平台粉碎性骨折內固定術後癒合不良

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### Introduction

Operative treatment for fixation failure of tibial plateau fracture with Schatzker type VI is challenging. In cases where revisional internal fixation may have a higher incidence of failure, such as with substantial bone loss and extensive comminution, or in patients with preexisting arthritis, TKA has become an option.

### Materials and Methods

From 2020 to 2021, two patients underwent TKA after fixation failure of tibial plateau fracture with Schatzker type VI in our hospital. Instability and deformity of involved knee in both patients were apparent. The first patient, a 79-year-old female with osteoporosis, underwent staged TKA four months after removal of implants. Revisional type prosthesis with long stem of tibial component and augment was chosen. The second patient, a 54-year-old female with end stage renal disease on hemodialysis, underwent removal of implants and TKA at the same time. Rotating hinge knee replacement prosthesis was selected. The parameters of range of motion, stability, Knee Society Score were recorded preoperatively and postoperatively.

### Results

After surgery, good results were achieved in both patients. At the latest follow-up, the Knee Society scores of first patient improved significantly from 35 points to 76 points for Knee score part, and from 0 point to 40 points for Function score part; the scores of second patient improved significantly from 37 points to 75 points for Knee score part, and from 0 point to 50 points for Function score part. They had an uneventful postoperative course and were discharged without complications of the operation.

### Discussion

Arthroplasty offers both patients the ability to immediately weight-bearing and eliminates fracture-healing issues. In addition, the use of augments, stemmed implants, and cementation is able to address bone defects and add to stability. Different type of prosthesis was chosen base on the extent of bone loss and ligament injury.

### Conclusions

TKA with constrained type prosthesis is a good option after fixation failure of tibial plateau comminuted fracture, especially in the elderly or in patients likely to be failed by revisional osteosynthesis.

## The Role of MRI in Oxford Unicompartment Knee Arthroplasty

### 核磁共振影像於牛津半膝置換之角色

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#### Introduction

The Oxford UKA is a successful treatment option for antero-medial osteoarthritis. The common indications for OUKA composed of 1. Full thickness cartilage loss in the medial compartment; 2. Intact full-thickness lateral compartment; 3. functionally intact MCL; 4. functionally intact ACL and 5. lack of severe damage to the PFJ. The preoperative evaluation normally included series of radiographic examination. Currently we regard medial bone on bone arthritis on plain film as full thickness cartilage loss in medial compartment. However, this may preclude some potential candidate with full thickness cartilage loss. Therefore, we proposed a MRI protocol for better patient selection.

#### Materials and Methods

We consecutively collected a series of 161 knees with isolated osteoarthritis (OA) of the medial compartment were implanted with the Oxford phase 3 UKR between April 2019 and April 2020. All patient received standard radiographic examination and MRI study preoperatively. The suitability was defined intraoperatively.

#### Results

All 130 knees were considered suitable for OUKA intraoperatively. However, there are 25 patients didn't have bone on bone lesion using merely x ray study preoperatively. 17 patient presented with medial bone edema presented. Medial meniscus tear presented in 19 patients. Both groups had comparable post op clinical functional score compared with group of patients with bone on bone lesion.

#### Discussion

MRI was not considered a standard examination before OUKA. However, as OUKA could quicker recovery, and higher patient satisfaction, the patient selection should be more precise. The findings of medial bone edema and medial meniscus root tear in MRI may be possible indication for OUKA.

#### Conclusions

We suggested using MRI as a preoperative examination before Oxford unicompartment knee arthroplasty for better patient selection.



## A Deep-learning Tool for Automated Measurements After Total Hip Arthroplasty from X-ray 以電腦深度學習建立人工全髖關節置換術後骨盆 X 光自動辨識模組及術後測量系統

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### Introduction

The trend for total hip arthroplasty increased as the evolution of the surgical technique and aging population. Hence, the routine follow-up for these patients should also be advanced with the growth. X-ray image is a necessary, quick and convenient diagnostic tool for post-total hip arthroplasty (post-THA) check-up. It can provide lots of information but needs well-experienced surgeon to interpret. Interpretation is extremely time consuming especially for parameters measurements. As a result, the purpose of this novel deep learning (DL) tool is fully automated measurements for post-THR X-ray images with a cost-effectiveness, high reliability and reproducibility.

### Materials and Methods

3,072 conventional pelvis-AP x-ray images from 3,021 patients underwent THA in 2013-2017 from Chang Gung Memorial hospital, Linkou branch, were retrospectively included in this study. Measurements of the parameters of post-THA x-ray images, i.e., inclination, anteversion, leg length discrepancy, femoral offset, acetabular offset, distance from cup to teardrop, femoral head size, cup size, stem position, eccentric wear, pelvic tilt, were obtained manually by identifying specific anatomical landmarks and by the fully automated DL tool (BKnet).

### Results

There were no significant differences between reference manual measurements and those obtained automatically by the DL tool (p value always above 0.05).

### Conclusions

The DL tool (BKnet) could provide equivalent measurements in terms of accuracy but superior measurements with cost-effectiveness, reliability and reproducibility.

## The Safety and Cost-analysis of Simultaneous Bilateral Total Knee Arthroplasty Compared with Staged Bilateral Total Knee Arthroplasty in the Taiwan Population

分析同時雙側人工膝關節置換及階段性雙側人工膝關節置換之安全性與費用

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### Introduction

With an aging population, total knee arthroplasty (TKA) has become one of the most commonly performed surgeries worldwide. In patients with advanced osteoarthritis (OA) of bilateral knees, there remains uncertainty as to whether a simultaneous bilateral TKA (SiTKA) or staged (StTKA) is the treatment of choice. The purpose of this study was to investigate the safety of SiTKA in the Taiwan population. Furthermore, we also determined the cost reduction of SiTKA in comparison with StTKA.

### Materials and Methods

We retrospectively reviewed all patients with severe OA of bilateral knees that underwent SiTKA or StTKA between 2010 to 2019. We assessed the immediate postoperative complications, length of hospital stay, 30-day and 90-day readmission rate, as well as the 1-year reoperation rate. Furthermore, we analyzed the cost of the two groups, total reimbursement from the national health insurance, total cost of the procedures, and total net income for each case.

### Results

2016 patients (1565 SiTKA and 451 StTKAs) were included in this study. There were no significant differences in terms of complication, 30-day and 90-day readmission, and 1-year reoperation rate between the two groups. In terms of cost, all categories of medical costs were significantly lower in SiTKA, while the net hospital income was significantly higher for StTKA.

### Discussion

The most significant findings of this study was that SiTKA is a safe surgery for patients with advanced OA of bilateral knees. Moreover, there was a significant cost reduction for the patient and the national health insurance when SiTKA is compared with StTKA. To our knowledge, this was the first cohort study performed in Taiwan to evaluate both the safety and cost reducing benefits of SiTKA.

### Conclusions

SiTKA is a safe and cost-effective surgery. Both SiTKA and StTKA have similar postoperative complication, readmission and reoperation rates, while SiTKA significantly reduces medical expenses for the patient and national health insurance.

**Promising Clinical Results with Cup-cage Construct without Trabecular Metal Technology for Large Acetabular Defect in Revision Total Hip Arthroplasty****非骨小樑金屬髌臼杯-支架系統於髌關節再置換手術併大範圍髌臼缺損之良好臨床結果**

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**Introduction**

One of the major challenges in revision total hip arthroplasty is how to deal with the bony defect over the acetabulum and restore the hip center, which could be difficult to achieve when large acetabular bony deficiency exists. Several options are available to address the problem, depending on the degree of bone loss. In recent years, cementless cup-cage construct technique has become popular and provides one promising solution, especially when highly porous metal implants like Trabecular Metal (TM) cups was applied. This concept of cup-cage is appealing but the limited availability and the cost-effectiveness restrain the widespread of this technique. This leads to the idea of using combination of available cementless cup and cage components to achieve osseointegration. Thus, the hypothesis of this study is that without tantalum TM cup, cup-cage construct with combination of cementless cup and cage could still result in good clinical outcome when coping with large acetabular defect or pelvic discontinuity.

**Materials and Methods**

A retrospective review of our surgical database from June 2011 to September 2019 was performed to identify all total hip revision surgeries in which a cup-cage construct was used. All the acetabular defect were Paprosky type III. The combination of our available component were Zimmer Trilogy cup, Smith-Nephew Contour acetabular cage, and Zimmer Longevity liner with cemented technique. The Harris hip score, Oxford hip score and EQ5D quality of life index score were the primary outcome scoring instruments used and recorded. Failure was defined as those cup-cage constructs that required revision surgery. SPSS 21 was used for data analysis. The Kaplan-Meier survival curve was used to assess cup-cage survival and functional outcome were compared using a paired Student's t-test

**Results**

31 cup-cages were included in the study. 12 patients (39%) were female and 19 (61%) were male. The average age at the time of the cup-cage surgery was 63.8 years (range 40-82). At a mean follow-up of 76.8 months (range 15-114) and with clinical failure as the end-point, the overall Kaplan-Meier survival rate for the cup-cage was 94% with 2 patients with subsequent periprosthetic infection developed that required revision surgery. Nevertheless, the majority of operated hips exhibit great bony remodeling over of the medial wall of acetabulum and even in the patient whose cup-cage construct was removed, solid bony restoration of medial acetabular wall and good bony ongrowth of cup was noted as well. The mean of Harris hip score, Oxford hip score and EQ 5D score(Japan TTO score) improved significantly from a mean of 45.8 to 81.3, 19.4 to 42.5 , and 0.47 to 0.85, respectively, as recorded at the most recent visit ( $P < 0.001$ ).

**Discussion**

In our study, we showed that the cup-cage construct without tantalum trabecular metal technology is a good option for large acetabulum defect with a survival rate of 94 % and a significant increase in the performance score. These data are encouraging and provide a rationale for use of this construct, which relies on the cage for initial stability and biologic fixation of the cup for long-term stability.

**Conclusions**

Cup-cage construct without trabecular metal technology could be applied successfully for patients with large acetabular defect in revision total hip arthroplasty, not only to restore the hip center but also provide good biomechanic function.

## The Difficult Differentiation Surface Aneurysmal Bone Cyst from Telangiectatic Osteosarcoma in Histology and MRI: Case Report and Literature Review

良性表面性血管瘤性骨囊腫與惡性血管性骨肉瘤在組織學與磁核共振之困難鑑別診斷：  
臺北醫學大學附設醫院案例報告及文獻探討

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### Introduction

Aneurysmal bone cyst (ABC) and telangiectatic osteosarcoma (TOS) share several clinical and imaging features, including young presentation, long bone involvement, lytic appearance on radiography and fluid-fluid levels on MRI. Therefore, they may be difficult to differentiate. We aim to make the differentiation based on one TMUH case and literature review.

### Materials and Methods

A case of 23 female patient was initially mentioned an enlarged mass on left thigh for 2 months. Physical examination showed palpable mass about 9 cm x 6 cm, solid, not movable on proximal thigh, local tenderness was noted, without redness or heat. Plain film on proximal femur shaft showed cloudy periosteal reaction without sclerotic margin, which may implied the tumor may invade cortical bone, malignancy can not be ruled out. Therefore, we arranged MRI for more confirmed differential diagnosis and fluid-fluid levels with bone invasion on cortical surface was noted. Initial surgical biopsy was done by further surgical strategy.

### Results

Pathologic report from biopsy showed giant-cell rich lesion, difficulties to differentiate from surface aneurysmal bone cyst to telangiectatic osteosarcoma based on MRI and initial histology was noted. We did research and evidence implied tendency to surface aneurysmal bone cyst. Therefore, the patient was arranged marginal resection with intralesional curettage for bone marrow lesion, adjuvant cryotherapy was done to assist decreasing recurrence of the tumor. Liquid nitrogen ice crystal through freezing and thawing could kill the remnant tumor cells. And the excisional tumor size was about 10 x7 x5 cm. Final pathologic report was diagnosed surface aneurysmal bone cyst.

### Discussion

As the recent diagnostic criteria for TOS including radiologic and histologic finding. We still can't differentiate the ABC from TOS. Due to literature review in recent years, we can see smaller tumor size, average about 46mm, had significant findings to favour ABC. As for fluid levels, if the image showed more than 2/3, even complete fluid levels, could imply ABC possibility. TOS had higher presentation with soft tissue mass and most of the ABC had enhanced pattern on thin septal. Histology showed blood-filled or empty cystic spaces both on TOS and ABC. Based on MRI finding, we tend to diagnose surface ABC on our case.

### Conclusions

Based on the evidence of image, surgery and histology finding, the final diagnosis was surface aneurysmal bone cyst on proximal femur with surgical marginal resection and prophylactic intramedullary nailing fixation. Several radiographic, MRI and histology features on literature review may help in the differentiation between ABC and TOS.

## Is Vascular Proximity of an Extremity Osteosarcoma a Negative Prognostic Factor for Patient Survival?

### 肢體骨肉瘤與重大血管間的距離是否影響病人預後?

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#### Introduction

Osteosarcoma is the most common primary bone cancer in childhood. Although current multidisciplinary treatment could achieve good overall survival in patients with an extremity osteosarcoma, disease recurrence remains a challenge and generally indicates a poor prognosis. It is unclear if a tumor's proximity to the nearby major vessel(s) correlates with the patient's clinical outcomes.

#### Materials and Methods

Patients with osteosarcoma were identified from our sarcoma registry between January 1994 and December 2017. Only patients with an extremity osteosarcoma were included. Patients with an axial-skeleton osteosarcoma or who had incomplete medical records were excluded. The vascular proximity was defined as the minimum distance between the tumor and the main vascular bundle in the same compartment. The vascular proximity was categorized based on the preoperative MRI after neoadjuvant chemotherapy into two types: type 1  $> 5$  mm; type 2  $\leq 5$  mm. We used the Kaplan-Meier method for survival analysis and the Cox regression model for multivariate analysis.

#### Results

A total of 51 patients with an extremity osteosarcoma were entered into the final analysis. The median age was 16 years (range from 8 to 60) and 70.6% were less than 18 years. 54.8% of patients were male. The most common locations were femur (68.6%), followed by tibia (21.6%). 5.9%, 74.5%, 2.0% and 17.6% of patients were AJCC (7th Ed) stages I, II, III and IV, respectively. Regarding vascular proximity, 35.3% and 64.7% of patients were type I and type II. In AJCC stage IV patients, 88.9% of patients were vascular proximity type 2. There was a significant association between vascular proximity type and distant metastasis at diagnosis. (Odds ratio=14.4,  $p = .016$ ). The overall survival rate at five years was 81.1%, and 84.8% for type I and II, respectively ( $p=0.37$ ). The five-year disease-free survival rate at five years was 62.4% and 45% for type I and II, respectively ( $p=0.257$ ). After surgical treatment, vascular proximity type was also associated with disease progression. (Odds ratio=15.0,  $p = .014$ ).

#### Discussion

T. Fujiwara, et. al reported that vascular proximity was associated with lower limb salvage rate, higher local recurrence rate and poorer overall survival. They theorized vascular proximity would elevate the risk of micro-metastasis. In our study, patients with vascular proximity type 2 had a higher chance of having metastasis at diagnosis. Type 2 patients also trended toward poorer disease-free survival, while their overall 5-year survival was similar to that of type 1 patients. In patients with distant metastasis, 81.3% had lung metastasis, of whom 91.7% were offered pulmonary metastatectomy and further chemotherapy. These aggressive measures may account for the favorable 5-year overall survival rates were similar between type I and type II patients.

#### Conclusions

Close proximity of osteosarcoma to major vessels was associated with distant metastasis at diagnosis, disease progression after surgery, and trends towards poor disease-free survival at five years.

**Results of Total Femur Replacement in Oncologic Patients****腫瘤病人經全股骨置換手術後的短至中長期追蹤**

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**Introduction**

Total femur replacement (TFR) is a limb-salvaging procedure for oncological patients with extensive femoral tumors. Although several study groups have reported their experience with TFR, the all-cause mortality rate, local recurrence rate and functional outcome after TFR have not been clearly elucidated. We present the clinical outcomes in a small cohort of patients who underwent TFR for the management of their femoral tumors.

**Materials and Methods**

We retrospectively reviewed our hospital's (NTUH) musculoskeletal tumor database and identified 8 patients who received total femur replacement as the means to treat their extensive femoral tumor between January 2009 and December 2020. The 8 patients consist of 4 patients with primary osteosarcoma and 4 patients with extensive femoral metastasis from a visceral cancer. All patients had the USTAR oncologic megaprosthesis (United Orthopedics, Taiwan). We examined the overall survival, local recurrence rate, radiographic outcomes (such as hip dislocation and tibial plate loosening), VAS, and the revised MSTS functional score in these patients.

**Results**

The mean age of these 8 patients was 36.7 years (13-60 years). The mean age of osteosarcoma patients was 22.8 years (13-33 years), and the mean age of metastasis patients was 52.8 years (46-60 years). The median preoperative ECOG score, preoperative VAS score, and VAS score at post-operative two weeks for osteosarcoma patients were 1, 2, and 1. The median preoperative ECOG score, preoperative VAS score, and VAS score at post-operative two weeks for cancer metastasis patients were 2, 5, and 2. Three of the four patients with osteosarcoma died within two years postoperatively (6, 13, 15 months). Three of the four patients with femoral metastasis died within 6 months postoperatively (4, 6, 6 months). All of the deceased patients (6/8) had known distant metastasis. The one osteosarcoma survivor underwent primary megaprosthesis knee replacement at the age of 7 in 2002, and underwent TFR in 2015 due to mechanical loosening and severe femoral bone loss. This patient subsequently received a second TFR in 2018 to correct leg length discrepancy. The revised MSTS score was only available in the two surviving patients. The MSTS score for the one surviving osteosarcoma patient was 23.3/100 points before the first TFR, 66.7/100 points after the first TFR, and 76.7/100 after the second TFR. The one surviving patient with metastatic cancer had a MSTS score of 6.7/100, 13.3/100 points before and after TFR. This patient had multiple spinal metastasis and compression fractures from L1 to L5 at 18-month follow-up. None of the 8 patients had experienced dislocation of their prosthesis. One patient with femoral metastasis had evidence of local recurrence clinically and radiologically at post-operative 5 months.

**Discussion**

Patients who need TFR had a poor prognosis. Only 25% patients in our small cohort were still alive at the time of data collection. Most patients had improvement in their pain and ECOG status after TFR. The revised MSTS score improved from 23.3 points to 76.7 points in the one long-term osteosarcoma survivor. However, the revised MSTS did not significantly improve in the one surviving metastatic patient, probably because of the presence of multiple metastases.

**Conclusions**

Patients indicated for total femur replacement generally carry a dismal prognosis. Although pain control can be expected after TFR, functional improvement might only be possible if the patient achieves long-term survival.

**Osteosarcoma at Unusual Age and Site****少見年齡及部位之骨肉瘤**

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**Introduction**

Osteosarcoma has a bimodal age distribution with the majority of the case occurred in adolescent and the second peak occurred in elderly. We herein report an unusual case of osteosarcoma that involved scapula bone with no sign of pain at beginning but accidentally found by masseuse months ago and grew rapidly. The notable aspects of this case include a short clinical history of symptom onset, rare site of lesion, uncommon type of osteosarcoma in adults and the technique of surgery.

**Materials and Methods**

A 67-year-old lady with no underlying disease came to our outpatient department for help due to rapidly enlarged mass over her right upper back with pain sensation gradually increase as days went by. We first arranged open biopsy for her and result revealed: proliferation of atypical epithelioid tumor cells exhibiting extensive osteoid and bone formation, thus osteoblastic osteosarcoma was suspected. After discussed with oncology experts, two series of chemotherapy were arranged and MRI showed decreasing size of lesion after treatment. We then arranged wide excision for her afterward.

**Results**

Wide excision was done in December and the pathology reports showed malignancy negative over resection margin. Post operation x-ray showed: bone graft over scapula bone defect with no dislocation of right shoulder joint and intact acromion and coracoid structure. Range of motion over her right shoulder was preserved. Adjacent chemotherapy was arranged for further treatment.

**Discussion**

Most of cases of osteosarcoma are adolescent, however, there's a second smaller peak in adult over forty years old which secondary osteosarcoma was commonly found. Osteosarcoma can arise in any bone and the most prominent sites are long bone of extremities that close to proliferative growth plates. Some case of osteosarcoma in jaw, pelvis and spine were reported in adult patient as well. Our case had osteosarcoma over spine of right scapula and close to acromion glenoid complex. We used burr to mark excision margin for preserving most structure of scapula neck and stability of acromion and coracoid process. No internal fixation of shoulder complex was required after wide excision. Also, supra-scapula nerve was identified and protected during operation.

**Conclusions**

Osteosarcoma is a hard nut to crack to tumor surgeon and easily to be underestimated in elderly patients. Despite the common occurred site of the tumor, scapula is one of rare location that have been recorded. In our case, surgical planning and technique is extra crucial for tumor close to shoulder joint due to high risk of instability afterward.

## A Novel Limb Salvage Surgery in an Osteosarcoma Patient over Proximal Tibia: A Case Report

骨肉瘤切除與重建的新型肢體保留手術：個案報告

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### Introduction

Osteosarcoma is not an uncommon tumor in primary malignant bone tumor. The tumor often arises in the location of metaphysis of long bones and is often delayed diagnosed for the nonspecific symptoms. As osteosarcoma is diagnosed, nowadays limb salvage surgery is now often chosen either before or after chemotherapy. Generally, we take down the tumor for ex-vivo treatment and then reconstruct the remnant with internal fixation. However, non-union of the fracture site is occasionally seen during follow up. Therefore, a novel, non-intentional fracture treatment is used in our case.

### Materials and Methods

A 11-year-old male student without systematic disease initially presented with his right knee swelling and pain only for 2 months. X ray and MRI demonstrated ill-defined heterogenous density lesion in right proximal tibia, major in metaphysis to diaphysis with some osteoblastic areas with periosteal reaction and cortical destruction. No obvious metastasis was found during the bone scan and whole body computed tomography examination. The patient received chemotherapy first and after the tumor volume size got shrinkage, surgery was then intervened thereafter.

### Results

The tumor was located over the diaphysis of right tibia, and epiphysis was free of invasion. Therefore, to keep the whole contour completeness, we chose in-vivo treatment on the surgical table. All the knee joint ligaments, ACL, PCL, MCL, LCL and even pes were marked and protected, and so were the both meniscus. We carefully dissect the interosseous membrane and made intentional fracture over fibular shaft, for the reason to our further procedure. Multiple drill of 3.0# K pin was made over the tumor location for penetration and then we rotated the right leg to a bucket of liquefied nitrogen for treatment.

### Discussion

The surgery went well but however, owing to the physics factor, the proximal tibia was still fractured without displacement. Intramedullary fixation was applied and cannulated screw were also used for ligament primary repair. With less invasive surgical method to the tumor excision to the patient, the post operation recovery and result seems to be in great satisfaction.

### Conclusion

No obvious complication was noted, vessels and nerve, especially peroneal nerve. However, because of the temporary fixation of the joint ligaments, now the patient uses knee brace for protection and keeps partial weight bearing status. This is such a hardcore treatment for the patient and surgeons, but it's still worth doing as the patient's smile shows up.



**Near~Miss Femur Shaft Pathological Fracture: A Case Report****幾近錯失的股骨幹病理性骨折：案例報告**

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**Introduction**

Pathological fractures account for 27 % of the initial presentation in metastasis bone disease. Bone metastases were predominantly located in the femur (28%) and spine (29%). The most frequent malignancies metastasizing to bone were breast cancer (23%). Breast cancer most frequently metastasized into the femur (51%), spine (27%), and humerus (12%).

**Materials and Methods**

A 56-year-old female presented in orthopaedic emergency department in January 2019 with alleged history of traffic accident while riding a motorcycle. On presentation, the patient had significant swelling and deformity of the left thigh clinically suggestive of femur shaft fracture. Review of digital plain radiographs revealed spiral fracture of the femur, and emergent operation with intramedullary nailing was arranged.

After satisfactory reduction with traction table, intraoperative fluoroscope imaging detected suspicious osteoclastic lesion. Intramedullary nail placement was halted immediately, with wound closure and temporary external fixator application. The mass like lesion at fracture site was excised for tissue proof and immunohistologic staining.

**Results**

Results were consistent to metastatic carcinoma of breast origin. <sup>99m</sup>Tc-MDP whole body bone scan showed active bone lesions in the left temporal bone, upper cervical spine, T4, T8, right posterior 3rd rib and left femoral shaft. Chest CT identified a lobulated lesion (about 2.3cm) in the upper outer quadrant of the right breast, likely the primary tumor. Follow-up operation for intramedullary nailing was arranged 1 week later, with bone cement filled at bone defect. Oncologist was consulted, and patient received hormone therapy and radiotherapy.

**Discussion**

Most series clearly show that breast, prostate, and lung are the most common origin of metastatic bone disease and that axial sites are much more common than peripheral sites. However, from a chart review of a tertiary orthopaedic surgical department, the most frequent primary malignancies metastasizing to bone are breast cancer and renal cell carcinoma, and that the skeletal structures most affected are the femur, spine, and humerus. Because the metastases are less likely to fracture (e.g., sclerotic prostate cancer metastases) or the patients do not survive long enough to warrant operative treatment (e.g., lung cancer metastases), that is no doubt where most of the prostate and lung cancer patients get lost.

**Conclusions**

We presented a case of near-miss femur shaft pathological fracture. This initial presentation as the pathological fracture was as high as 27% in patient with metastatic bone disease. Fracture occurring as a result of significant injury can masquerade underlying ominous bone pathology, which is highly likely to be missed in the garb of overwhelming traumatic aetiology. We need to be on the alert when patients present atypically, as the treatment for pathological fractures is far different from that for simple fractures.

## Comparison of Skeletal Oncology Research Group (SORG) Classical Algorithm (CA) and SORG Machine Learning Algorithms (SORG~MLA) for Survival Estimation in Spinal Metastasis: A Meta~Analysis of the Literature

比較 SORG-CA 和 SORG-MLA 對脊椎骨轉移病人之存活預測：一份統合分析研究

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### Introduction

Estimating survival in patients with spinal metastasis is crucial for clinical decision. Skeletal Oncology Research Group (SORG) classical algorithm (CA) and SORG machine learning algorithms (SORG-MLA) both demonstrate high accuracy of 90-day and 1-year mortality estimation. No previous studies compared the two algorithms. Besides, we previously found that the accuracy of SORG-MLA could be influenced by regions/races and hypothesized the underestimation was due to divergent body mass index (BMI) level. Thus, a meta-analysis and subgroup analysis could provide a more comprehensive picture of status quo.

### Materials and Methods

Three databases, namely PubMed, Embase, and Google scholar, were searched to identify published and unpublished researches. This study also provided another external validation with 387 patients for SORG-CA. Outcomes, namely discrimination of algorithms, of the studies were converted into odds ratio (OR) for pooling. Subgroup analysis by regions/races was conducted.

### Results

Six articles and one unpublished article were collected in this study. The pooling OR of SORG-MLA was significantly greater than that of SORG-CA (OR, 9.11 and 4.84; 95% confidence interval [CI], 1.36-61.1 and 1.57-14.9, respectively). Both algorithms performed significantly better in the US than in Taiwan. SORG-MLA's difference of  $\ln(\text{OR})$  by regions/races was 0.64 and that of SORG-CA was only 0.26.

### Discussion

Both algorithms provided a good discrimination, while SORG-MLA was the better one. All previous published studies took place in the eastern US, where Asians only account for <1% population. Since SORG-CA do not contain the BMI parameter as SORG-MLA do, also since the other parameters are alike, the result that SORG-CA's discrimination was less influenced by regions/races than SORG-MLA was might support our previous hypothesis.

### Conclusions

We argued that the SORG-MLA could be optimized by adjusting for Asians.

## High Grade Malignant Peripheral Nerve Sheath Tumor Arising from Common Peroneal Nerve Neurofibroma: How to Resect Whole Tumor While Preserving Motor Function? A Case Report

源自總腓神經纖維瘤之高度惡性周邊神經鞘瘤:如何切除腫瘤同時保存運動功能? 案例報告

謝逸樵 楊鎮源 李芳材  
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### Introduction

Benign neurofibroma is most common peripheral neurogenic tumor in neurofibromatosis type I (NF1) patients, however possible malignant change into malignant peripheral nerve sheath tumor (MPNST) should be cautioned in certain conditions. No matter benign or malignant these tumors could not be easily separated from normal nerve fascicles during surgery, therefore we present this case about surgical resection of MPNST without compromising motor function.

### Materials and Methods

A 45-year-old male patient with history of NF1, suffered from one palpable firm mass lesion over right popliteal fossa for more than 10 years. He had no motor weakness but surgical tumor resection was indicated because intractable tumor pain aggravated rapidly in recent 3 months that his knee joint cannot be fully extended even when sleeping on bed. MRI found a 7cm well encapsulated mass within peroneal nerve with core heterogeneous signal intensity and peripheral edema. During surgery, the tumor was explored and found tightly embedded within common peroneal nerve fascicles. With assistance of microscope and electric stimulator, we could differentiate normal nerve fascicle with motor function from the neurogenic tumor, and make sure that ankle dorsiflexion function was still preserved after tumor resection.

### Results

Immediately after surgery this patient felt mild numbness over dorsal foot/lateral calf and mild weakness of ankle/toe dorsiflexion. Nevertheless, the motor function recovered gradually that he ambulated well without assistance 4 weeks later and then returned to normal work and daily activities. The pathological diagnosis confirmed high grade MPNST arising from common peroneal nerve neurofibroma. Further tumor survey includes whole body bone scan showing no bony metastasis and chest CT found no lung metastasis but bilateral upper mediastinum mass suspecting bilateral vagal nerve neurofibroma. The patient underwent adjuvant radiotherapy (60 Gy/30 fractions) after the surgery. There is no local recurrence or distant metastasis after regular follow up for more than 18 months.

### Discussion

In this NF-1 case, differentiate benign neurofibroma from MPNST is important. Malignant transformation should be highly suspected when size >5cm and MRI showed plexiform pattern, core heterogeneity and peripheral edema.

### Conclusion

Although wide excision was generally suggested for MPNST, we recommend delicate intra-fascicle tumor resection with assistance of microscope and electric stimulator to achieve a faster and better function recovery than total nerve/tumor resection with nerve graft reconstruction.

**Wide Awake Enucleation of Median Nerve Schwannoma During Intravenous General Anesthesia**  
**靜脈全麻下清醒正中神經許旺細胞瘤摘除術**

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**Introduction**

The schwannoma is a benign peripheral nerve sheath tumor arising from the Schwann cell. It is the most common solitary tumor of the peripheral nerve. They arise within the nerve sheath and are surrounded by a true capsule consisting of epineurium. The treatment of choice is extracapsular or intracapsular removal under magnification. The use of Loupe or microscopical magnification is advised to prevent damaging the nerve fibers during epineural and endoneural dissection. We believe that the risk of neural damage is lower with intracapsular enucleation. Nonetheless, tumor removal without damaging any nerve fibers does not seem possible.

**Materials and Methods**

A 51-year-old female with a history of hypothyroidism under medication control was admitted due mass lesion over right wrist for 12 years. There was mild painful and palm numbness sensation off and on. MRI revealed ruled out schwannoma, 2\*2.8 \*4.7 cm in size, in volar aspect of right distal forearm abutting median nerve. We performed enucleation of median nerve tumor under intravenous general anesthesia and performed hand motor and sensory evaluation in awake during the operation. The test revealed intact opposition of thumb and fifth finger and sensation at volar tip of finger. The pathological report revealed schwannoma.

**Results**

The symptom of painful and palm numbness sensation diminished. There was no neurological deficit during operation and after operation for one day , two weeks, one month and two months.

**Discussion/Conclusions**

Wide awake enucleation of median nerve schwannoma during intravenous general anesthesia provides an effectively way to monitor nerve injury during operation.

## A Locking Plate as a Definitive External Fixator for Treating Posttraumatic Tibial Osteomyelitis 以鎖定式骨板作為外固定治療創傷後脛骨骨髓炎

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### Introduction

We evaluated the outcome of using a locking plate as a definitive external fixator for treating posttraumatic tibial osteomyelitis.

### Materials and Methods

Eighteen consecutive posttraumatic tibial osteomyelitis patients were treated using a staged procedure that included hardware removal, radical debridement, skeletal stabilization using a locked plate as a low-profile definitive external fixator, and bone and soft-tissue reconstruction.

### Results

The mean follow-up was 31 months (range, 18–48 months). The mean time until union was 38.2 weeks (range, 20–72 weeks). All but one of the patients were successfully treated using our protocol. The bone assessments indicated excellent results in 14 patients and good results in 4. The functional results were excellent in 14, good in 3, and poor in 1 patient. One patient had reverse sural flap necrosis and recurrent drainage. He underwent repeated debridement and soft-tissue reconstruction with a latissimus dorsi free flap. One patient had superficial infections that resolved with parenteral antibiotic treatment. Three patients had a length discrepancy of > 2.5 cm, and one patient's tibia united with a 10° procurvatum. There were no deep infections due to the external fixator, only minor screw track infections in 4 patients.

### Discussion

Using a locking plate as an external fixator is not a generally acknowledged technique, and only a few authors reported successful clinical results similar to ours. There is less stability in using a locking plate as an external fixator than as internal fixation. However, good relative stability was evidenced by the formation of good periosteal callus and hypertrophy of the vascularized fibula graft in our study.

### Conclusions

The locking plate used as a definitive external fixator provided good access for wound management and facilitated the treatment of associated injuries. While the locking plate is not totally rigid, it is clinically stable and provides the necessary element of flexibility for bone healing. Our patients experienced a comfortable clinical course, excellent knee and ankle joint motion, satisfactory functional results, and an acceptable complication rate.

**Association of Iron Deficiency Anemia(IDA)with Septic Arthritis (SA)****缺鐵性貧血及敗血性關節炎之關聯性**

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**Introduction**

Micronutrient deficiencies are a well-known global health threat, and poor nutritional status may predispose an individual to some infectious diseases. Anemia, a critical global health problem, is the most common micronutrient deficiency, occurring in approximately one quarter of the world's population. Iron deficiency anemia (IDA) is the most significant contributor, accounting for 50% of all cases of anemia. Septic arthritis (SA) is the most serious condition in the differential diagnosis of an inflamed, swollen joint. The diagnosis of SA can be challenging for doctors and patient. The primary objective of the present study was therefore to identify the characteristics Association of Iron deficiency anemia (IDA)with septic arthritis (SA)

**Materials and Methods**

The date of initial diagnosis of iron deficiency anemia (ICD-9-CM: 280) was defined as the index date, and the end of follow-up was the date of onset of septic arthritis (ICD-9-CM: 711.0), the date of withdrawal or death, or December 31st, 2013. Exclusion criteria were as follows: cases with the initial diagnosis of septic arthritis before the index date; cases aged less than 20 years; missing data in the age, sex, and follow-up duration. A total of 19,478 cases with iron deficiency anemia (IDA) were included in the case group. Cases without IDA were included in the comparison group, and were randomly sampled and matched with the case group in a 1:4 ratio. The propensity score matching (PSM) was carried out to make the case group comparable with the comparison group and reduce biases in the age, gender, and index date.

**Results**

The incidence rates of septic arthritis in cases without and with IDA were 2.64 per 10,000 person-years and 7.12 per 10,000 person-years respectively, and cases with IDA had a higher risk of developing septic arthritis compared to cases without IDA (aHR, 2.53 with 95% CI, 1.89-3.38). In addition, the  $\geq 65$  age group was associated with a higher risk of acquiring septic arthritis when compared to the 20-39 group (aHR, 4.53 with 95% CI, 2.56-8.04); the male population was at a higher risk of septic arthritis when compared to the female population; hypertension and chronic kidney disease might increase the risk of getting septic arthritis (aHR, 1.69 with 95% CI, 1.22-2.34 for hypertension; aHR, 2.24 with 95% CI, 1.40-3.60 for chronic kidney disease).

**Discussion**

IDA is more common in women, But, the male population was at a higher risk of septic arthritis when compared to the female population. Changes in iron status can thus affect the immune response in multiple ways, particularly in the context of infection, and even in septic arthritis. Except for human immunodeficiency virus infection, the profiles of baseline comorbidities between the comparison and case group were statistically significantly different.

**Conclusions**

In comorbidities of hypertension, diabetes mellitus, hyperlipidemia, COPD, and liver cirrhosis, it was found that cases with IDA were at a higher risk of developing septic arthritis than cases without IDA.

**Isolated Avulsion Fracture of the Femoral Lesser Trochanter in Adult– A Case Report****單純性股骨小轉子撕脫性骨折-病例報告**

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**Introduction**

Isolated fractures of the lesser trochanter are uncommon and have been reported predominantly in adolescent athletes. This injury is caused by severe impact, usually in context of contact sports and following a forceful and sudden muscle contraction of the iliopsoas with avulsion fracture of the apophysis. In adults, similar mechanism may result in muscle sprains. Thus, isolated fracture of the lesser trochanter without adequate trauma is a rare presentation of hip fractures in adults. It is closely related to an unknown tumor disease, usually metastatic tumor disease. In the literature, a few case reports describe this type of fracture as a sign of metastatic tumor diseases.

**Materials and Methods**

A 59-year-old woman without underlying disease presented to our orthopedic department with sudden onset of pain at the left groin after squatting down. A crack sound was heard at the same time. Physical examination revealed local tenderness and limited range of motion of the left hip. Pelvic radiograph demonstrated an isolated fracture of the lesser trochanter of the left proximal femur. Due to suspicion of pathological fracture, we arranged MRI of bilateral lower extremities and bone biopsy of left proximal femur for further evaluation.

**Results**

MRI of bilateral lower extremities showed heterogeneous contrast enhancement at left proximal femur and femoral shaft with pathologic fracture at lesser trochanter. Bone biopsy was arranged and result was metastatic adenocarcinoma. For primary malignancy origin evaluation, thyroid ultrasound and chest CT were done and right lung nodule was noted. The patient underwent total hip replacement with custom-made prosthesis to restore the hip function, and clinically improved after receiving chemotherapy although the response was only stable disease.

**Discussion**

For this patient, the result of biopsy revealed metastatic adenocarcinoma in acinar, papillary and micropapillary growth pattern with TTF-1 immunoreactivity, was compatible with pulmonary origin. She needed complete condition explanation to family. The final decision usually base on opinion of multiple medical teams, family members and social workers. Although current condition became stable, rehabilitation and care in the future were still long term challenge.

**Conclusions**

Isolated fractures of the lesser trochanter in adults are uncommon and have closely related to an unknown tumor disease, usually metastatic tumor disease. In the literature, a few case reports describe this type of fracture as a sign of metastatic tumor diseases. Thus, further and general evaluation is essential for low-energy associated isolated avulsion fracture of the lesser trochanter.

## Bone Plate Fixation Ability on the Dorsal and Lateral Sides of a Metacarpal Shaft Transverse Fracture

### 背側及外側骨板適用於掌骨幹橫向骨折之固定效果

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### Introduction

Metacarpal shaft fractures are a common hand trauma. Currently, the surgical fixation options for such fractures include percutaneous Kirschner wire pinning, nonlocking plate fixation, and locking plate fixation. Although bone plate fixation, compared with Kirschner wire, has superior fixation ability, a consensus has not been reached on whether the bone plate for fixation with plating should be placed on the dorsal or lateral side.

### Materials and Methods

Thirty-five artificial metacarpal bones were used in the experiment. Metacarpal shaft fractures were created using a saw blade, which were then treated with four types of fixation as follows: (1) a locking plate with four locking bicortical screws on the dorsal side (LP\_D); (2) a locking plate with four locking bicortical screws on the lateral side (LP\_L); (3) a regular plate with four regular bicortical screws on the dorsal side (RP\_D); (4) a regular plate with four regular bicortical screws on the lateral side (RP\_L); (5) two K wires (KWs). All specimens were tested through cantilever bending tests on a material testing system. The maximum fracture force and stiffness of the five fixation types were determined based on the force–displacement data. The maximum fracture force and stiffness of the specimens with metacarpal shaft fractures were analyzed initially using one-way analysis of variance and Tukey's test.

### Results

The maximum fracture force results of the five types of metacarpal shaft fracture were as follows: LP\_D group ( $230.1 \pm 22.8$  N, mean  $\pm$  SD) @ RP\_D group ( $228.2 \pm 13.4$  N) > KW group ( $94.0 \pm 17.4$  N) > LP\_L group ( $59.0 \pm 7.9$  N) @ RP\_L group ( $44.5 \pm 3.4$  N). In addition, the stiffness results of the five types of metacarpal shaft fracture were as follows: LP\_D group ( $68.7 \pm 14.0$  N/mm) > RP\_D group ( $54.9 \pm 3.2$  N/mm) > KW group ( $20.7 \pm 5.8$  N/mm) @ LP\_L group ( $10.6 \pm 1.7$  N/mm) @ RP\_L group ( $9.4 \pm 1.2$  N/mm).

### Discussion

Given the experimental setup and limitations of the current experimental study, our mechanics research results revealed that the mechanical strength offered by lateral plate fixation of metacarpal shaft fractures is so low that even KW fixation can offer relatively superior mechanical strength; this is regardless of whether a locking or nonlocking plate is used. Lateral plate fixation can reduce the probability of extensor tendon adhesion; nevertheless, the results of our mechanics research indicated that when lateral plate fixation is used for fixating metacarpal shaft fractures in a clinical setting, whether the mechanical strength offered would be strong enough to support bone union remains questionable.

### Conclusions

According to our research results, lateral plate fixation does not provide effective fixation effects for metacarpal fractures. Relevant studies have also indicated that lateral plate fixation would not lead to substantial enhancement of postoperative functioning. Therefore, fixation of metacarpal fractures using lateral plating is not recommended



缺繳

**Arthroscope-assisted Four Corner Fusion for Wrist Scaphoid Nonunion Advanced Collapse (SNAC): MMH Experience****關節鏡輔助四角融合術：馬偕紀念醫院的經驗**

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**Introduction**

Scapholunate advanced collapse (SLAC) and scaphoid nonunion advanced collapse (SNAC) wrist deformities are the most common causes of traumatic arthritis of the wrist. Four-corner fusion and scaphoid excision has proven to be an effective procedure for relieving pain and preserving range of motion in the wrist joint.

The wide intraarticular exposure of the wrist joint under arthroscopic view provides an excellent ground for various forms of partial wrist fusion. This report aims to evaluate outcomes of arthroscope-assisted four corner fusion.

**Materials and Methods**

In 2019, 3 cases of stage 3 SNAC received arthroscopic-assisted four corner fusion combining with percutaneous fixation technique by single surgeon. The average follow-up period was 19.6 months (from 14 to 24 months). Preoperative and postoperative outcomes including range of motion, grip power, VAS score were recorded.

**Results**

Improved range of motion, VAC score and grip strength were noted in all three patients postoperatively, No complication was seen, and no patient switch to total wrist fusion during follow-up. Bony union was achieved in all patients.

**Discussion**

The wide intraarticular exposure of the wrist joint under arthroscopic view provides an excellent ground for various forms of partial wrist fusion. Combining with percutaneous fixation technique, arthroscopic partial wrist fusion can potentially generate the best possible functional outcome by preserving the maximal motion pertained with each type of partial wrist fusion because the effect of extraarticular adhesion associated with open surgery can be minimized.

**Conclusions**

Arthroscopic-assisted four corner fusion showed comparable and satisfied results to traditional open approach.

## The Efficacy of Opening Wedge Trapezial Osteotomy and Augmented Soft Tissue Procedure for First Carpometacarpal Joint Arthritis

利用大多角骨開放式楔狀截骨治療拇指退化性關節炎之結果分析

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### Introduction

Symptomatic osteoarthritis (OA) of the first carpometacarpal (CMC) joint of thumb complicated with instability and dysplasia of the trapezium is difficult to manage. Noted pain, swelling, weakness and limited motion of the affected thumb in grabbing were experienced. Subtraction and addition of corrective osteotomy of metacarpal bone of trapezium with or without augmented ligament transfer procedure had been advocated. We report an innovative surgical procedure by opening wedge trapezial osteotomy with capsulorrhaphy to preserve thumb CMC joint integrity of structure with the results of 5 cases between 2012 and 2020.

### Materials and Methods

5 consecutive patients with symptomatic OA of thumb CMC joints treated with opening wedge trapezial osteotomy and bone grafted with ipsilateral iliac cortico-cancellous bone. The associated joint capsule, volar joint ligaments were plicated with or without anchor sutures. Indications for surgery are based on Eaton's radiographic staging III to IV for degenerative arthritis of the thumb CMC joint. Instability of joint soft ligaments and capsule and dysplasia of trapezium were noted pathognomonic characteristics. Of 5 female patients, 4 left and 1 right thumbs with mean age of 67.2 years (range 53-76) were recorded and followed up after surgical procedures for an average of 5 years (range 1-7). The functions of hand and thumb were assessed with visual analogue scale (VAS) for pain, quick DASH, thumb pinch and hand gripping strength. Radiographical measurement for the De'vers' axis angle between 2nd metacarpal bone and trapezium were evaluated pre and postoperatively.

### Results

A mean follow-up of 5 years (range 1-7) were evaluated postoperatively. The change of De'vers' angle improved by 17.2° (pre 155.5°- post 138.2°). Pain VAS from the mean value of 5.6 down to 1 postoperatively. Pinching strength improved 2.1 kg, and Gripping power improved 9.2kg. quickDASH score improved 30.2 (total score 35) than preoperatively.

### Discussion

Symptomatic OA of the thumb patients presented with an increased slope of the trapezium in dysplasia combined with a noted radio-dorsal instability of the base of the thumb metacarpal on trapezium should be treated with trapezial or metacarpal levels to relocate forces towards the middle of the joint. An opening trapezial wedge osteotomy to correct the dysplasia of the trapezium is not enough to restore the concentric forces on the thumb metacarpal base. To restore or correct the instability of the thumb basal joint, the added ligamentoplasty (plication or augmented with anchor suture) provides stabilization for the chronically stretched ligaments across the first CMC joint. In this study it was done in all patients as part of the surgical procedure.

### Conclusions

The combination of intraosseous trans-trapezial opening wedge osteotomy augmented with associated capsule and volar ligaments to restore the anatomic structural integrity of trapezium are the foundations to support the thumb loading and motion. The reconstruction of soft tissue envelope of thumb basal joint is mandative to counter the dynamic deforming force acting across the joint. This innovative technique to preserve the thumb CMC joint function is effective in our series.

## Biomechanical Comparison of Different Volar Screw Placement for Horizontal Oblique Scaphoid Fractures

水平斜向舟狀骨骨折在掌側入路下以不同位置鋼釘固定之生物力學比較

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### Introduction

We used to assume that transverse fracture had been the most common type of scaphoid waist fracture, and most studies were discussing the transverse fracture. However, recently, some studies reported that the most common fracture of scaphoid waist was horizontal oblique fracture, instead of transverse fracture. Therefore, the previous studies including clinical studies and cadaveric studies which focused on transverse fracture may not be suitable for most scaphoid waist fractures, and we needed new studies which focused on horizontal oblique fractures. We designed a cadaveric study which aimed to biomechanically compare fixation strength between central and eccentric screw placement for the volar fixation of this most common scaphoid waist fracture.

### Materials and Methods

We prepared 8 matched pairs of fresh-frozen forearm cadaver specimens and randomly assigned to 2 groups. Group 1 specimens were fixed by screw in a central placement, and group 2 specimens were fixed by screw in a eccentric placement. Horizontal oblique osteotomy was performed along the scaphoid waist. Then, each specimen was placed under the increasing load of a pneumatically driven plunger. We recorded stiffness, load to failure, and failure mechanisms between the central and eccentric screw placement groups.

### Results

2mm of displacement was defined as an endpoint and the other parameters were recorded for further comparison. The stiffness was defined as the slope of the force-displacement curve during the linear regression. Stiffness was higher in central screw placement (74.1 N/mm) than in eccentric screw placement (29.39 N/mm). The median loads to failure in groups 1 and 2 were 54.14 and 26.22 N, respectively. Regarding the failure mode of the screw-bone construct, all were fractured at the screw-bone interface.

### Discussion

This cadaveric study demonstrated that central screw placement would achieve superior fixation strength for horizontal oblique scaphoid waist fractures. However, several limitations restrict the scope of this biomechanical comparison investigation. First is its post-mortem nature. Other factors such as postoperative rehabilitation and bone healing could not be taken into consideration in this cadaveric study. Second, we focused our attention on the biomechanical stability of different screw placements, which is only one factor in choosing a fixation of scaphoid fractures.

### Conclusions

When doing volar screw fixation for horizontal oblique scaphoid waist fracture, central placement was superior to eccentric fixation. Additional research is needed to address other issues such as different screw designs, dorsal vs. volar approaches to the scaphoid, and proximal vs. waist fractures of the scaphoid.

## Chronic Distal Radioulnar Joint Instability Management: Comparison the Novel DRUJ Capsule Plication with the Traditional DRUJ Ligament Reconstruction

橈尺關節不穩定的處理方式：比較新式的橈尺關節囊摺疊術以及傳統的橈尺關節韌帶重建術

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### Introduction

Distal radioulnar joint (DRUJ) instability is a common but easily missed wrist injury which can influence normal wrist function and daily life activity. DRUJ is stabilized less with the radio-ulna bony joints, and mainly with the peripheral soft tissue structure, including triangular fibrocartilage complex (TFCC), plays an key role as the primary stabilizer, DRUJ capsule, interosseous membrane and pronator quadratus muscle. For enhancing the surgical result in moderate to severe chronic DRUJ instability, we orchestrate a novel technique: arthroscopic TFCC repair with DRUJ capsule plication. The aim of this study was to compare the surgical outcomes of the DRUJ capsule plication with the traditional DRUJ ligament reconstruction.

### Materials and Methods

We collected 45 patients with Atzei & Luchetti class 2&3&4 TFCC tear with chronic DRUJ instability, 20 patients with DRUJ reconstruction and 25 patients with DRUJ plication. DRUJ ligament reconstruction was performed with gracilis tendon graft through bone tunnels (Adams procedure). DRUJ capsule plication was imbricated with the suture anchor after arthroscopic TFCC repair. Preoperative and serial postoperative 6 months wrist functional and radiographic outcomes were collected and analysis

### Results

Compared to the preoperative status, the grip strength and was significantly recovered, and the Mayo Wrist score improved significantly 6 months after surgery in both groups. On the post-operative 6 months following, DRUJ capsule plication was superior to the DRUJ reconstruction in the wrist range of motion expect the pronation. Grip strength of the operation hand to the contralateral side was 56% to 80% with the significant difference, respectively.

### Discussion

DRUJ ligament reconstruction is an effective and widely accepted way to manage the chronic DRUJ instability. However, some drawbacks still exist, such as tendon donor site morbidity, bone tunnel erosion, risk of ulnar head avascular necrosis and arthritis due to cartilage injury. In the review of our series, arthroscopic TFCC repair with DRUJ capsule plication can not only avoid the complication from DRUJ ligament reconstruction but also achieve comparable surgical outcomes in postop 6 months follow-up.

### Conclusions

The early surgical outcomes of DRUJ capsule plication is encouraging. In the grip strength, functional score and wrist range of motion, included flexion, extension, ulna/radial deviation, pronation, supination, DRUJ capsule plication shows better result in comparison with DRUJ ligament reconstruction.

## Radiographic Analysis of Distal Radius Fracture of Different AO Classification with Variable Angle Volar Locking Plate Fixation

可變角度掌側鎖定鋼板固定手術在不同 AO 類型的橈骨遠端骨折後復位之影像分析

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### Introduction

Reduction loss is commonly seen even in the newly designed locking plate fixation for distal radius fractures. Fracture caused by different mechanisms is in accordance with a different AO classification and have a different prognosis. Our study aims to evaluate the differences in radiographic parameters by using variable-angle volar locking plates (VAVLP) fixation according to different AO classification of distal radial fracture.

### Materials and Methods

A total of 37 patients of unilateral distal radius fractures receiving VAVLP fixation were classified into Type A (19), Type B (7), and Type C (11) by AO classification. Forearm radiographs immediately after surgery and 3-months after operation were reviewed retrospectively for analyzing radiographic parameters including radial height (RH), ulnar variance (UV), radial inclination (RI), volar tilt (VT), tear drop angle (TDA), distal dorsal cortical distance (DDD) and Soong classification (SC).

### Results

There was no significance in RH, UV, RI, VT, TDA of all three types right after the operation and 3 months following the operation ( $p$ -value $<0.05$  respectively). Comparison of 3-month change in the value of radiographic parameters between the three types showed that only change in UV was significant ( $p=0.037$ ), but no significant differences in changes in RH, RI, VT, and TDA. Comparison of 3-month difference in Soong classification between the three types revealed significant dependence ( $p=0.001$ ) in Type A, but no significant dependence in Type B and Type C. By comparing the DDD right after the operation and of 3 months following the operation in three types by linear regression, only Type B showed significant dependence ( $p=0.007$ ) with  $R^2 = 93.6\%$ .

### Discussion

The result of comparing right after the operation and 3 months following the operation between different AO types was seen not only with VAVLP, but also with FAVLP. Our study discovered that RH, RI, VT, TDA had a similar degree of stability maintained among the three groups after VAVLP management, except UV which showed less variation in Type B. The possible reason might be trauma has less impact on the ulnar notch of the radius bone. The result of comparison in Soong classification between the three types is in accordance to a study in 2018. Our study revealed that DDD can only predict the degree of subsequent displacement in Type B. However, there is little research focusing on the mechanism of the above hypothesis.

### Conclusions

By using VAVLP fixation in treating distal radius fractures classified by AO classification had shown the ability to sustain the stability of radiographic parameters including RH, UV, RI, VT, and TDA. The change in the value of UV in Type B is less than the other two types. Among the three AO types, only Type A can maintain the stability of Soong classification in a 3-months change. Positive correlation of linear regression of DDD can only be used in predicting the degree of subsequent displacement in Type B.

**DRUJ and Intercarpal Ligament Injuries Associated with Distal Radius Fractures : Our Experiences with Wrist Arthroscopy****遠端橈骨骨折與遠端橈尺骨關節與腕骨間韌帶損傷之關聯性：馬偕醫院腕關節鏡之經驗**

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**Introduction**

Distal radius fractures are one of the most common fractures of the upper extremity. Distal radioulnar joint(DRUJ) and intercarpal ligament injury about the carpus can occur when the distal radius fractures. Once was thought to be rare. However more novel study reveal increasing incidence of these injuries, which is unnoticed initially but, if untreated, can lead to substantial disability. The aim of the study is to share our experience in treating distal radius fracture with arthroscopic assistance and analysis of DRUJ and intercarpal ligament injuries.

**Materials and Methods**

Between 2012 and 2020, we treated 123 patients surgically with arthroscopic assistance ORIF of distal radius fracture. The indications for ORIF included AO type C fracture of the distal radius with articular displacement following manipulation involving a gap or step deformity  $\geq 2$  mm on CT scans with or without a volar tilt  $< 0^\circ$ ; radial inclination  $< 10^\circ$ ; and radial shortening  $> 4$  mm. All patient was treated arthroscopic assistance. The mean follow-up was 15 months. Outcomes were measured by active ROM, Grip strength, DASH questionnaire and radiography.

**Results**

In the limited follow-up period, A total of 83 patients (68%) had a soft-tissue injury, including tears of the TFCC, scapholunate ligament and lunotriquetral ligament. 60 patients was treated by arthroscopic debridement or repair of soft tissue injuries. Mean DASH was 3.9. Flexion 75%, extension 90% and grip strength 90% compared to the contralateral side.

**Discussion**

Wrist arthroscopy is mainly used to assist fracture reduction and fixation and to diagnose and treat concomitant injuries mainly to the scapholunate, lunotriquetral ligament and the TFCC. Although there is not enough evidence to recommend arthroscopy for every patient with a distal radius fracture, evidence of static scapholunate injury on X-ray or widening of the distal radioulnar joint would be likely to have an acute injury and probably will benefit from further evaluation and additional management of soft tissue injuries if present.

**Conclusions**

Wrist arthroscopy appears to be beneficial in diagnosing intra-articular steps and gaps, as well as concomitant soft tissue injuries in distal radius fracture without additional side effect in the short-term postoperative follow-up time.

**Displaced tiny volar rim avulsion fracture of distal radius with radial carpal subluxation****遠端橈骨細小扯裂性骨折併發橈腕關節鬆弛之個案報告**陳暉軒<sup>1</sup> 唐逸文<sup>2</sup>高雄榮民總醫院骨科部<sup>1</sup>**Introduction**

Volar rim avulsion fracture of distal radius have been receiving more attention regarding to its role as volar ligament insertion. Various treatment option including trident plate, small segment-specific plate, wire looping have developed for better fixation. We present a case of displaced tiny volar rim fragment with radio-carpal volar subluxation, and complicated with dorsal carpal ligament laxity. We treated using two suture anchor for volar and dorsal fixation. We will investigate surgical indication and technique in acute or chronic stage.

**Materials and Methods**

This is a 30 year-old male, and suffered from right wrist pain after traffic accident. Wrist X-ray showed tiny volar fragment displacement was noted over right distal radius. Radio-carpal joint subluxation was found and short arm cast was applied after trauma one week. The displaced tiny volar fragment was still visible at lateral view of wrist X-ray after removal of cast and lunate subluxation with joint space narrowing over radiocarpal joint was noted. The patient received 3D CT and volar rim avulsion fracture without union and lunate subluxation was confirmed. He received ORIF with two Arthrex 3.5mm suture anchor with suture bridge technique and radiolunate pinning with 1.25mm K-wire. After operation, he received regular follow up at our OPD. However, follow up X-ray showed subluxation of radio-carpal joint and suspect dorsal carpal ligament loosening. Thus, the patient received re-operation of dorsal intercarpal ligament duplication and tightness using Arthrex metal anchor 2.8 mm\*1 on 2019/09/17.

**Results**

Active ROM of wrist is flexion/extension 50/600, supination/pronation 90/900. There are no pain and instability of wrist. Satisfactory result after operation 4 months follow-up.

**Discussion**

1. Surgical indication in initial X-ray ( conservative treatment (casting) or ORIF with anchor suture fixation)
2. Surgical technique include suture anchor, or specific mini-plate fixation in early repair
3. If chronic carpal ligament laxity, simultaneous repair of volar and dorsal ligament may be considered at first operation.

**Conclusions**

The tiny fragment of volar rim over distal radius fracture cannot afford to be underestimated for it plays an important role because of the insertion of volar radio-carpal ligament. Especially when the patient present symptom of pain and decrease wrist strength. Once conservative treatment failed, operation of ORIF and ligament repair should be underwent soon to prevent chronic laxity of dorsal carpal ligaments.



## Functional Outcomes Following Fixation of an Ultra-Distal Radius Fracture with Two Commonly Used Volar Locking Plates

### 極遠端橈骨骨折兩種鋼板術後功能性恢復之對比與評估

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#### Introduction

The volar locking plate(VLP) has been widely used for unstable distal radius fractures to provide early recovery of wrist function. Volar plate prominence to the watershed line has been reported to be related to flexor tendon irritation, and avoid implant prominence in this area was suggested. On the other hand, ultra-distal radius fracture patterns required the plate to cross the watershed line, making conflict over plate positioning on ultra-distal radius fractures. This study compared functional outcomes in patients with ultra-distal radius fractures treated with two different implants.

#### Materials and Methods

A retrospective study was conducted, all patients who received a Synthes 2.4mm LCP or an Acumed Acu-Loc VLP between January 2015 and December 2018 were reviewed. The ultra-distal fracture pattern was the most distal horizontal fracture line within 10 mm of the lunate fossa's joint line. The primary outcomes including patient-reported pain scores, range of motion, and grip strength were assessed. Secondary outcomes included patient-based subjective satisfaction scores of the injured wrist and hand function. The Mayo Wrist Score and the requirement for a secondary procedure related to hardware complications were also recorded.

#### Result

Forty-two patients met our inclusion criteria. Twenty-one patients were treated with the Synthes 2.4 mm LCP, and 21 patients with the Acumed Acu-Loc VLP. The primary outcome revealed that post-operative range of motion ( $P = 0.016$ ) and gripping strengths ( $P = 0.014$ ) were significantly improved in the Acu-Loc VLP group. The MAYO wrist score in the Acu-Loc VLP group was also significantly better ( $P = 0.006$ ).

#### Discussion

The watershed line concept was proposed by Orbay in 2005, and was further refined by Nelson and Orbay, it has been widely used as a distal reference point for distal radius volar plating positioning to avoid flexor tendon irritation, tenosynovitis and rupture. When treating patients with ultra-distal fracture patterns, placing the VLP distal to the watershed line is inevitable, and makes plate positioning a challenge during operations. When compared with the Synthes 2.4 mm LCP, the Acumed Acu-Loc VLP was a better fit to the volar cortex of the distal radius, and was less prominent on the lateral view. By carefully placing the Acumed Acu-Loc VLP in its designed-for position, these risks can be reduced, resulting in improved functional outcomes.

#### Conclusions

Despite advances in implant designs, flexor tendon irritation or rupture is still a complication following distal radius's volar plating. We believe the Acumed Acu-Loc VLP design provided better functional outcomes than the Synthes 2.4 mm LCP if appropriately and carefully placed into its designed-for position. This positioning results in promising patient satisfaction when treating ultra-distal radius fractures.

## The Management of Chronic Persistent Elbow Instability Using an Internal Joint Stabilizer with a Standardized Protocol

### 使用關節內穩定器治療慢性手肘不穩定之計畫

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#### Introduction

The treatment of chronic complex persistent elbow instability (CCPEI) following trauma can be a challenging problem. Although some studies have been conducted on this issue, they report an extreme variability of the surgical technique, which makes it difficult to find any therapeutic algorithms for CCPEI. In the present retrospective study, we aimed to analyze the results of management of CCPEI using an internal joint stabilizer with a standardized protocol.

#### Materials and Methods

We treated 14 cases of traumatic elbow dislocation. The reconstructive procedure comprised ulnar nerve neurolysis, joint release, removal of heterotopic bone, reducing elbow joint dislocation, restoration of bone and ligaments(capsule), applying internal joint stabilizer and early rehabilitation. All the patients were followed for 1 year at least.

#### Results

Median follow-up was 22 months (range, 12~48 months). Median range of motion before and after operation was extension 40°to 20°, flexion 80°to 120°, pronation 40°to 70°, and supination 20°to 60°, respectively. Substantial improvement was noted in median VAS (from 6 to 2). Median DASH Score improved from 45.5 to 20.5, and median Mayo Elbow Performance Score improved from 50 to 85. The complication included one severe radiographic deterioration, one recurrence of heterotopic ossification, and one subcutaneous seroma formation

#### Discussion

Although the current study involved only a small number of patients, and is not a generally acknowledged technique. It can provide a simple and comfortable treatment, restore mobility and stability in all patients.

#### Conclusions

The treatment method with standardized protocol may be a valuable alternative for the treatment of s chronic complex persistent elbow instability.

缺繳

**Analysis of Neurological Injury of Patients Underwent Surgery for Pediatric Supracondylar Humerus Fractures in Kaohsiung Veterans General Hospital****高雄榮總小兒肱骨髁上骨折手術前後之神經損傷分析**

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**Introduction**

Supracondylar fracture of the humerus is one of the most common injuries in children. It represents about 16% of all pediatric fractures and over 60% of fractures of the elbow in children. Neurological complications are frequently observed in these kinds of injuries. The primary goal of this study was to report the presentation, treatment, and outcome of nerve injuries associated with pediatric supracondylar humerus fracture in KVGH

**Materials and Methods**

We reviewed pediatric patients diagnosed of supracondylar fracture of the humerus who underwent surgical treatment in Kaohsiung Veterans General Hospital from 2014-2020 retrospectively. Of those patients, retrospective chart review was conducted to obtain demographic data, fracture grade, surgical treatment options, and neurological complications. In patients with nerve injury, the management of nerve injury and the recovery time were recorded and analyzed.

**Results**

From 2014-2020, a total of 76 pediatric patients with supracondylar fracture of humerus underwent surgical treatment in our hospital. The mean age was 6.9 years old. Forty-two patients underwent crossed pin fixation, 25 patients underwent direct lateral pin fixation, 3 patients underwent open reduction and percutaneous pinning (ORPP). Nine patients had single neural injury. Including 5 median nerve injury (all are AIN injuries), 2 radial nerve injury and 2 ulna nerve injury. One patient had two nerve injury involving both median nerve and ulna nerve. Nine patients presented with preoperative nerve injury, while 1 patient experienced postoperative nerve injury (AIN injury, treated with lateral pin fixation). No subsequent surgery was performed in these patients with nerve injuries. The mean recovery time of single nerve injury was 86.5 days for median nerve, 75 days for radial nerve injury, and 117 days for ulna nerve injury. The recovery time of two nerve injuries was 226 days.

**Discussion**

The occurrence of acute nerves injuries accompanying displaced supracondylar humeral fractures in children in different studies ranges from 10 to 20%. And the most often complication is median nerve injury. We obtained a similar result in our study (incidence 13%). All nerve injuries recovered spontaneously without further surgical managements. Concerning nerve recovery time, Shore et al indicates that isolated radial nerve injuries exhibited a longer mean time to recovery. While our study shows ulna nerve injury with longer recovery time (mean, 117 days). Some publications suggested that iatrogenic ulnar nerve injury is associated with crossed pinning. However, of all the patients underwent crossed pinning in our institution (42, 55.3%), none of which experienced postoperative neurologic deficit.

**Conclusions**

All of the nerve injuries with pediatric supracondylar humerus fracture recover spontaneously without further surgical interventions within 7 months. Multiple nerve injuries took longer to recover.

## Arthroscopic Treatment of Bucket-handle Tear of Lateral Discoid Meniscus: 2 Young Child Cases report

### 關節鏡下治療膝外側盤狀半月軟骨桶柄狀破裂：兩個小孩病例報告

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#### Introduction

Discoid meniscus is a congenital anatomical abnormality, which was firstly described by Young in 1889. The overall incidences are range from 3% to 5%, and the lateral meniscus is more common than medial meniscus. Due to no symptoms, most patients with discoid meniscus may be unrecognized or untreated. The discoid meniscus was classified by Watanabe systems, as type I(complete), type II (incomplete) and type III(Wrisberg), and type I is most common. Bucket-handle tear constitutes around 10% of all meniscal tear, but rarely accompanied with discoid meniscus, especially in patients who less than 6-year-old and only had rare case reports. We described 2 less than 6-year-old children with lateral bucket-handle tear of complete type discoid meniscus and underwent arthroscopic saucerization with meniscal repair.

#### Materials and Methods

There were 2 cases, including a 28 months-old girl and a 5-year-old boy. Both denied any underlying disease by parents and both had a traumatic episode of right knee noted before. Limping gait and hard to full right lower limb weightbearing were observed. The whole skeletal of right lower extremity was normal by radiographic surveys. MRI examination revealed a bucket handle tear of lateral discoid meniscus with knee joint extension impingement. The both cases received arthroscopic lateral meniscal saucerization. Instability of the lateral meniscus was still found while knee flexion more than 90° after saucerization, therefore, the posterior horn repair of lateral meniscus by No. 0 PDS II (Ethicon) using an inside-out technique was performed in both cases.

#### Results

After surgery, long leg casting was applied for keeping knee full extension. Under long leg casting, both children can ambulate with full weightbearing, and the cast was removed in one month after surgery. Then full range of motion and weight bearing were allowed after removal of casting. At 3-month follow-up, both children were able to get their knee full range of motion and symmetric compared with contralateral side without limping or antalgic gait. The MRI was surveyed at 6 months postoperative and it revealed good results in our 2 cases.

#### Discussion

In the past, the initial treatment of child discoid meniscus is nonoperative. Surgical treatment is indicated only in persistently symptomatic knees as our two cases. Total meniscectomy of torn discoid meniscus is an option of surgery. However, to respect the concept of sparing the meniscus and preventing progression to osteoarthritis over the longer term with total meniscectomy in pediatric population, it is best to be as conservative as possible and prefer meniscus repair for instability after saucerization.

#### Conclusions

Management for the torn discoid meniscus are variable, including total meniscectomy, saucerization or repair. The early results of both children after saucerization and repair are satisfactory, but longer follow-up observation is still needed.

**Experiences of Treatment for Pediatric Tibial Tubercle Fractures with Obesity****治療過重的小兒脛骨結節骨折的經驗分享**

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**Introduction**

Pediatric tibial tubercle fractures account for less than 1% of all physeal injuries in children, but the incidence is increasing because of greater participation in high-level athletics. Internal fixation is recommended for displaced tibial tubercle avulsion fractures especially in young athletes. According to the literature, most suggested screw fixation or percutaneous pinning to avoid iatrogenic physeal injury. However, obesity in children and adolescents has fast become a public health problem worldwide, and no article in the literature has discussed about the treatment suggestion for obese pediatric tibial tubercle fracture. We would like to share our experience and perform a review of related articles.

**Materials and Methods**

From July 2018 to July 2019, 2 cases of pediatric tibial tubercle avulsion fracture with physeal involvement were recruited by preoperative examinations of clinical data, symptoms, plain films, and knee CT. The age of the 2 boys were 14 and 13 years old, and the body weight were 99 kg and 105 kg each. Both cases were Ogden type 4b tibial tubercle avulsion fractures. Considering heavy body weight of the patients, we performed open reduction and internal fixation with 3 cannulated screws and lateral locking plate respectively, sparing the growth plate. We also searched on Pubmed and Cochrane for MeSH terms and synonyms of pediatric, tibial tubercle fracture, and obesity. No current article has focused on the influence of obesity on pediatric tibial tubercle avulsion fracture management.

**Results**

Both cases achieved bony union without growth arrest, loss of reduction, or other complication. Removal of implants were performed 6-11 months later, with body height increased 3 and 5 cm respectively during the time of removal.

**Discussion**

Obesity is known to increase the risk of surgical complications, including loss of reduction, malunion, nonunion, and refractures. Evidences have shown that increased body weight related to increased loss of reduction and complication rate in radioulnar and distal humeral fractures. As a result, casting or pinning may not provide adequate fixation strength for obese teenagers. Screws or even locking plate fixation may be a good alternative. Hill BW et al. recruited 8 pediatric proximal tibia physeal fractures in 6 years with internal fixation of plating, and showed only 1 early physeal closure with asymptomatic leg length discrepancy.

**Conclusions**

For obese teenagers suffering from tibial tubercle fracture with physeal injury, internal fixation with screws or even locking plate may be an optimal surgical choice with limited risk of growth arrest.

## Spine Deformity and its Progression in Pediatric Patients with Pectus Excavatum Following Nuss Procedure

小兒漏斗胸病患的脊椎變形以及接受 Nuss 手術後的變化

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### Introduction

Pectus excavatum is a common chest anomaly resulted from inadequate fusion of the costae and sternum during embryologic stage, leading to depression of the anterior chest wall. Other than external appearance, this deformity may also lead to exercise intolerance or dyspnea. Nuss developed a procedure for correction of pectus excavatum by placing a bar behind the sternum, and there are reports indicating that such procedure may cause or worsen scoliosis. The aim of this study is to assess the incidence of spine deformity in patients receiving Nuss procedure for treatment of pectus excavatum, and its effect in the change of Cobb angle.

### Materials and Methods

Data of patients under age of 18 years who received Nuss procedure at our hospital were reviewed retrospectively, and their posteroanterior chest X-rays as well as chest computed tomography (CT) images were assessed. The preoperative and postoperative Cobb angles were measured, from the X-rays, and Haller index as well as asymmetric ratio were calculated from the CTs.

### Results

A total of 78 patients were collected, average 14.4 years old, of which 63 were males and 15 females. Thirty-three patients (42.3%) were found to have spine deformity more than 10 degrees, with an average of 17.4o (SD=11.6o), mainly located from T1 to T6, occupying 69.4% of involved vertebrae. Of those with scoliosis, only 4 patients (5%) have deformity more than 40o, averaging 43.3o (SD=7.9o). There is no correlation between the Haller index nor asymmetric index and extend of deformity. When comparing the deformity before and after Nuss procedure, there is a significant increase of 2.5o in Cobb angle, and this difference is even higher in patients with scoliosis, leading to 5.1o. Furthermore, a trend is found that the greater the age of patient, the more severe the deformity.

### Discussion

The incidence of adolescent idiopathic scoliosis (AIS) is about 3%, and we found an incidence of 42.3% in patients with pectus excavatum. The difference between AIS and scoliosis found in patients with pectus excavatum is that the latter are mostly left side short curve locating at upper thoracic spine, and the severity of deformity is related to the deformity of chest wall. Although the incidence is much higher than normal population, most of the deformities are less than 40o, only 5% of patients meet the criteria for surgical correction.

This study found a significant increase of Cobb angle following Nuss procedure, but this increase may also be due to the natural course of scoliosis. Further study may be needed to compare with the population that has not received Nuss procedure.

### Conclusions

There is a higher incidence of scoliosis in patients with pectus excavatum, and most of the deformities are short curves located at upper thoracic spine. Although the majority of these patients do not require surgical treatment, we suggest that these patients should be followed at orthopaedic clinic as well.

## Pathologic Spine Fracture in Children

### 兒童脊椎病理性骨折

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#### Introduction

Pathological spinal fractures in children represent an etiologically diverse group of lesions, united by the syndromic principle. Besides, pathological spinal fractures are rare in the pediatric age group. Most of the publications on this subject are either individual cases or limited clinical series.

#### Materials and Methods

We retrospectively review our experience of nine cases of children with spine pathologic fracture due to different reasons. The material was obtained based on the following inclusion criteria: 1. Patient under 18 year-old. 2. Spontaneous fracture or minor trauma related 3. Radiology and Genetic or pathologic confirming the diagnosis.

The study examined the following: 1. Age and gender of the group. 2. Clinical symptoms, including aspects of neurological status. 3. Structure and outcomes of the lesions after conservative or operative treatment.

We divided those patients into four groups according to the etiology of pathological fracture.

#### Results

When it comes to distribution of pathological fracture, those with the tendency at cervical or thoracic-lumbar junction. Benign bone tumor or infection disease often with unilateral lesion and on the other hand, malignant tumor or metabolic disease often with multi-focal presentation.

#### Discussion

Pathological spinal fractures in pediatric patients are relatively rare, but in the structure of patients with destructive lesions of the skeleton, they represent a significant group. Since the causes of a pathological fracture are varied, it is necessary to treat with different methods and combined with other specialists.

#### Conclusions

Under appropriate treatment including protection, medication or operation for different etiology, most cases with pain relieve, deformity correction and bone remodeling.



## Guided Growth Improves Coxa Valga and Hip Subluxation in Children with Hereditary Multiple Exostoses: A Preliminary Report

### 生長板導引術治療多發性骨軟骨瘤併髌外翻及髌關節半脫位之初步報告

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#### Introduction

Coxa valga and hip subluxation are common and severe deformities in children with hereditary multiple exostoses(HME) without appropriate surgical intervention. However, only several case reports have reported surgical methods of hip exostoses, and no treatment consensus has been established yet. Based on our experience of guided growth applied to children with cerebral palsy, we aim to apply guided growth to correct coxa valga and hip subluxation in HME patients with hip exostoses and investigate the efficacy of this method.

#### Materials and Methods

We retrospectively collected all the HME patients with hip exostoses involvement who underwent guided growth of hip between 2012 and 2019. There are total 12 patients with mean age of 8 years(6 to 12). Among them, 8 patients(13 hips) have been followed up for more than 2 years(mean 54 months, 36 to 96) , and 4 patients(8 hips) have been followed up for 1 year. Radiographic parameters are compared including head-shaft angle, Hilgenreiner's epiphyseal angle, acetabular index and Reimer's migration index between preoperative and latest follow-up. Wilcoxon rank sum test applies to evaluating the difference of these radiographic parameters after the guided growth surgical intervention.

#### Results

With the available data, the improvements of coxa valga and hip subluxation were significant. In the cohort with a minimum of 2 years follow-up(13 hips of 8 patients), the mean reduction value of head-shaft angle was  $12.2^{\circ} \pm 6.1^{\circ}$  (95%CI 8.9 to 15.7;  $p < 0.001$ ), and the mean value of Reimer's migration percentage was  $7.8\% \pm 7.8\%$ (95%CI 4.2 to 11.4;  $p < 0.01$ ). There was also improvement of Hilgenreiner's epiphyseal angle with a mean difference of  $10.5^{\circ} \pm 5.4^{\circ}$ (95%CI 7.9 to 13.1;  $p < 0.001$ ). In the cohort with only one year follow-up(21 hips of 12 patients), the mean reduction value of head-shaft angle was  $3^{\circ} \pm 4.4^{\circ}$ (95%CI 1.1 to 4.9;  $p = 0.017$ ) and the mean reduction value of Reimer's migration percentage was  $3.6\% \pm 7.1\%$ (95%CI, 0.6 to 6.6;  $p = 0.021$ ). There was also improvement of Hilgenreiner's epiphyseal angle with a mean difference of  $4.8^{\circ} \pm 5.5^{\circ}$ (95%CI 2.4 to 7.2;  $p < 0.001$ ).

#### Discussion

This preliminary report is the first study to investigate the efficacy of guided growth on HME patients with coxa valga and hip subluxation. Makhdom et al. reviewed 21 case reports of surgical managements of hip exostoses, with no case underwent guided growth. Wang et al. observed the develop pattern of 57 hips in 30 children with HME and suggested guided growth for these patients to prevent coxa valga. In our study, there was significant improvement of coxa valga and hip subluxation in HME patients after early intervention of guided growth, in both groups of children at a minimum of 2 years follow-up and at a one year follow-up. Compared to other possible procedures such as varus osteotomy, guided growth is less invasive, which is more beneficial to children with HME.

#### Conclusions

The preliminary result indicated that guided growth in early age is promising to improve the radiographic parameters in hips of children with HME and prevent their further hip deformities. Due to the limitation of the small number of cases in this preliminary study, we aim to collect more cases to perfect our study.

## Clinical Outcomes of a New Treatment Algorithm for Thumb Polydactyly

### 小兒多指症新診療指引的臨床預後分析

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#### Introduction

Wassel classification is the most common classification for thumb polydactyly. It clearly classifies polydactyly by level of bone duplication; however, the value in guiding treatment and predicting outcome is controversial. We proposed a new treatment algorithm based on physical and radiographic assessments. This study aims to analyze the association of clinical outcomes and types of polydactyly.

#### Materials and Methods

45 patients with 47 thumbs with polydactyly underwent surgical treatments in 2012-2019 were reviewed. The new treatment algorithm classifies polydactyly to floating, symmetric, and asymmetric types. Clinical outcomes were assessed by the Japanese Society for Surgery of the Hand (JSSH) scores, including functional, cosmetic, and subjective outcomes. The relationship between the JSSH scores and two polydactyly classifications, Wassel and the new treatment algorithm, were analyzed.

#### Results

The mean age of surgery was 11 months, and follow-up time was 4.6 years on average. The asymmetric type was the most common (61.7%), followed by symmetric type (23.4%) and floating type (14.8%). In Wassel classification, the distribution was type I (4.2%), type II(19.1%), type III (2.1%), type IV (26.7%), type V(25.5%), type VI (2.1%), type VII (2.1%) and others(17%). The mean JSSH score was 18.2, and 41 of 47 (87.23%) thumbs had good or excellent outcomes. The symmetric type had the lowest JSSH scores (17.6), compared to 18.1 in the asymmetric type and 19.6 in the floating type (ANOVA,  $p < 0.05$ ). More symmetric type cases (4/11, 36.3%) had JSSH less than 17 than asymmetric type did (2/29, 6.9%) (Pearson,  $p < 0.05$ ). The main causes for worse scores in symmetric type were poor interphalangeal alignment (angulation  $11.5^\circ$ ) and poor interphalangeal joint active flexion (mean= $36.3^\circ$ ).

#### Discussion

It has been reported that pre-axial polydactyly patients who received reconstruction had good functional outcomes with residual deformity. Though 87.23% of all cases reported good or excellent clinical outcomes in this study, poor interphalangeal joint alignment and flexion function were found in symmetric type, which suggested that symmetry plays a significant role in the preoperative evaluation.

#### Conclusions

This newly proposed classification system for pre-axial polydactyly (floating type, symmetric type, and asymmetric type) may predict short to mid-term outcomes after the reconstruction. Also, symmetry of the duplicated thumbs plays a significant role in surgical outcomes.

**Joint Hypermobility and Preschool Age Flexible Flatfoot****韌帶鬆弛和學齡前兒童扁平足之間的關係**田英俊<sup>1</sup> 蔡佳純<sup>2</sup> 池宇佳<sup>3</sup> 石佳隴<sup>1</sup> 陳姝蓉<sup>1</sup> 沈柏志<sup>1</sup>Yin-Chun Tien<sup>1</sup> Chia-Chun Tsai<sup>2</sup> Yu-Jia Chih<sup>2</sup> Chia-Lung Shih<sup>1</sup> Shu-Jung Chen<sup>1</sup> Po-Chih Shen<sup>1</sup>高雄醫學大學附設中和紀念醫院骨科部<sup>1</sup> 輔英科技大學護理系<sup>2</sup> 輔英科技大學醫學檢驗生物技系暨碩士班<sup>3</sup>**Introduction**

Generalized joint hypermobility was widely considered as one of the predispose factors of pediatric flexible flatfoot. However, using Beighton score to define joint hypermobility with cutoff of  $> 4$  was thought too low and was not appropriate for use in children. Therefore, two new scoring methods: thumb to forearm test and thumb

thrust test were created in this study to evaluate the joint laxity which will classified the joint laxity to four grades: normal, mild, moderate, and severe. The purpose of this study is to analyze if this new gradings of joint laxity exist the correlation with flexible flatfoot in preschool child.

**Materials and Methods**

293 children (boy:156, girl: 137) with mean age of 5.35 year (range:2.92-7.33) were included in this study. The Staheli plantar arch index (PAI) of foot print was calculated and the flexible flatfoot was defined with cutoff of PAI  $> 1.07$ . The joint laxity was evaluated by following three methods. 1. Beighton score. 2. Thumb to forearm test: bend the thumb to volar surface of forearm and four grades were defined according location of the thumb tip can reach. When tip can't touch volar surface of forearm defined as normal, just touch the volar surface defined as mild, between volar and dorsal surface defined as moderate, and beyond the dorsal surface defined as severe. 3. Thumb thrust test: bend the thumb to ulnar border of palm and four grades were defined according which part of the thumb can reach the border. When thumb tip can't reach ulnar border of palm defined as normal, tip just touch the ulnar border defined as mild, thumb IP flexor crease can reach the ulnar border defined as moderate, and IP flexor crease beyond the ulnar border defined as severe.

**Results**

Person correlation analysis demonstrated there are no correlation between PAI and Beighton score ( $p=0.329654$ ), between PAI and thumb to forearm grade ( $p=0.6980708$ ), and between PAI and thumb thrust grade ( $p=0.306215$ ).

Logistical regression (PAI: normal or vs.  $> 1.07$ ) demonstrated there are no correlation between PAI and Beighton score ( $p=0.755$ ), between PAI and thumb to forearm grade ( $p=0.136$ ), and between PAI and thumb thrust grade ( $p=0.627$ )

The two sample t test (PAI: normal vs  $> 1.07$ ) demonstrated there are no significant difference on Beighton score ( $p=0.756$ ), on thumb to forearm grade ( $p=0.136$ ), and on thumb thrust grade ( $p=0.627$ )

**Conclusion**

According these results, we found no correlation between joint hypermobility and preschool age flexible flatfoot.

## The Outcome of Selective Ultrasound Screening for Developmental Dysplasia of Hip: A Retrospective Survey During 2015-2020 in KMUH

選擇性超音波檢測髖關節發育不良的成果：2015 年至 2020 年於高雄醫學大學附設中和紀念醫院的回溯性調查

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### Introduction

Early diagnosis and treatment are crucial for the prognosis and outcome of developmental dysplasia of the hip (DDH). Hip ultrasound examination is the preferred modality for the diagnosis of DDH in infants younger than six months old. Although the optimal screening strategy of hip sonography is still debating, selective ultrasound screening is generally recommended in Taiwan. The aim of present study is to report the outcome of selective ultrasound screening program for the DDH in the single center.

### Materials and Methods

We retrospectively reviewed the infants received selective ultrasound screening in our institution during 2015-2020. Patients with age younger than six months old referred for hip ultrasound examination due to risk factors or abnormal physical examination finding from generalists and pediatric physicians were enrolled. Barlow test, the Ortolani test, limited abduction of the hip, thigh fold asymmetry and the Galeazzi sign were performed to investigate the hip stability. The ultrasound examinations were performed by two pediatric orthopedic surgeons using Graf technique to assess hip morphology and stability. Infants with normal physical examination and hip ultrasound examination were continued routine well-body exams in pediatric clinics. Infants with abnormal physical examination or hip ultrasound finding were received scheduled ultrasound follow-up. Pavlik harness or abduction treatment were prescribed for the positive Barlow test, Ortolani test or persisting abnormal re-examination of ultrasound finding. Close reduction with hip spica immobilization or open reduction were indicated for patients fail to Pavlik harness.

### Results

1058 infants (624 girls and 434 boys) were enrolled in the present study and 2033 hip ultrasound were performed. 657 patients (62%) were the first-born child and 335 patients (32%) were breech delivery. Asymmetric thigh fold (397 patients) were the most common abnormal physical finding at initial visiting. The average age at initial visiting was 4 months old. 516 patients (49%) had negative finding and return to regular well-baby examination at the initial visiting. 542 patients (51%) needed for re-examination. Pavlik harness were prescribed for 92 patients and close reduction with hip spica immobilization were performed in 6 patients.

### Discussion

Late diagnosis of DDH in children may lead to increased surgical intervention and the risk of early joint pathology. Pediatric hip ultrasonography has proven ability to early recognize abnormal hip position, instability, and dysplasia. The present study provides the latest outcome of selective ultrasound screening conducting in Kaohsiung. These results may provide the evidence to improve the screening efficacy and maximize the cost-effectiveness in DDH care.

### Conclusions

The appropriate referral criteria selection and clinical guidelines is crucial for the efficacy of the selective ultrasound screen program for early detection of DDH.

## Comparing Ultrasound Measurements of Neonatal Hips Using Modified Graf's Method and Original Graf's Method

### 新生兒髖關節超音波測量：使用改良式 Graf 方法和傳統 Graf 方法之比較

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#### Introduction

As early and accurate diagnosis of developmental dysplasia of the hip(DDH) is crucial for early intervention, various screening methods were proposed. Manual hip stress tests as described by Ortolani and Barlow were commonly performed to assess stability. However, they were operator-dependent and displayed significantly higher sensitivity when used by experienced examiners. Ultrasonography Graf's method is gaining favor in the screening for DDH in neonates and infants. Dysplastic hips were classified into four grades according to static morphology. While hip stability was not assessed and therefore could miss out cases who are morphologically normal but sonographically unstable. We proposed a modified version of Graf's method by integrating provocative maneuver to the original Graf's method to assess hip morphology under dynamic stress. Our goal was to determine the reproducibility of the modified Graf's methods and whether this method is superior to the original Graf's method regarding diagnostic sensitivity.

#### Materials and Methods

2052 consecutive neonates were prospectively investigated using the methods of Graf's and the modified Graf's. In the modified Graf's method, patient was set at lateral decubitus position with both hip and knee flexion in 90 degrees and maximal hip adduction. A posterior directing pressure was applied by assistant. Examiner identified landmarks including the iliac bony rim, lower limb of the iliac bone, and center of the acetabular labrum and drew the base line, cartilage roof line, and acetabular bony roof line on the screen. The ultrasound machine calculated the alpha and beta angles automatically according to Graf's method. In order to determine the reproducibility of the modified methods, 420 hips were evaluated by three skilled examiners. To assess inter-observer reliability, Six examiners (three experienced orthopedic physicians and three orthopedic residents) evaluated 150 images, which were evaluated on ten occasions at one weekly intervals by one of the authors(Chen). To assess intra-observer reliability, one author(Chen) evaluated 30 hips five times at intervals of one weeks. Bland-Altman approach was applied for statistical evaluation.

#### Results

All patients enrolled (1102 females, 950 males) were less than seven days old. The mean alpha angle was 65.4° and 62.3° in Graf's and modified Graf's method, respectively. The mean beta angle was 44.7° and 48.3° in Graf's and modified Graf's method, respectively. According to Graf's method, 1.3% of hips were pathological, compared with 1.7% according to the modified Graf's method. Eight patients who received DDH treatment were pathological according to the modified Graf's but normal according to Graf's method. Conservative treatment was successful in these cases. The Bland-Altman approach shows similar reproducibility in experienced hands, inter-observer test and intra-observer test.

#### Discussion

The original Graf's method standardized patient position in a cradle and could be complete with single examiner. However, only static morphology was evaluated. A modified version of Graf's method was proposed by applying a posterior directing stress to the hip joint. Hip subluxation could be produced. We believed that this provocative maneuver was beneficial for the early diagnosis of DDH, especially in cases with mild degree of dysplasia. Nevertheless, it required two examiners and was relatively difficult to standardize patient position compared to the original Graf's method.

#### Conclusions

The modified Graf's method demonstrates superior sensitivity of diagnosing DDH. Inter-observer and intra-observer evaluation show equal reproducibility of both methods.

## 3D Printing Model for Pediatric Multiplanar Tibia Deformity Correction with Taylor Spatial Frame

三維列印模組於使用泰勒環外固定矯正脛骨變形之應用

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### Introduction

Pediatric Tibia deformity was caused by varies of etiologies and cause serious daily activity impairment and cosmetic problem. The optimal treatment was to correct the deformity with surgical intervention. The Taylor Spatial Frame(TSF) was designed to correct multiplanar deformity with a pair of frames and six crossed struts with different elongation rate based on computerized calculated protocol. The surgery required meticulous pre-operative planning with knowing the principles of deformity correction and local anatomy for pin insertion. We describe our experience of 3D printing model for pediatric multiplanar tibia deformity correction with TSF.

### Materials and Methods

Five pediatric patients with seven tibia deformity was treated with TSF and pre-operative 3D printing model simulation. The diagnosis leading tibia deformity included Blount disease, constriction band syndrome, skeletal dysplasia and post-traumatic infective non-union. Before the surgery, the 3D model was printed based on the computerized tomography data. Proper size of rings were chosen for individual patients. A simulation surgery was performed on 3D printed model. The frames were placed parallel to the knee joint line. Six struts were assemble to the frame and osteotomy was performed as close as possible to the center of rotation angulation(CoRA). We then adjust the struts to the final length and check for deformity correction. Then the assembled TSF were marked and sent for real surgery.

### Results

The average patient age was 6.6 years old. Before the surgery, the family were all clear and understood the surgery with the explanation using the 3D-printed model. During the surgery, only one TSF (1/7) required re-assemble. The average OP time was 162 minutes per limb including combined procedures (removal of implants, sequestrectomy and bone chipping, guided growth, bone transport technique and distal tibial wedge osteotomy) . The average corrected angle was 19.8 degree in varus or valgus. The average lengthening was 43.8 mm. One patient was still in serial follow up.

### Discussion

The tibia size of the pediatric patient were small and usually require the smallest size of frame and struts. In our experience, TSF pre-operative planning using 3D printed model helped us to optimize the Kirshner wires and Schanz screws insertion sites. Avoiding struts malposition and lower the intra-operative re-assemble rate. Theoretically decrease OP time and blood loss. Also it was a good virtual simulation with the advantage of good education and demonstration to the patient's family.

### Conclusions

Pediatric tibia deformity correction surgery using TSF was a complex surgery which required difficult pre-operative planning. 3D-pirnted model helped us to perform good preoperative simulation and planning.

**Bipartite Patella****先天性分裂髌骨**

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**Introduction**

Bipartite patella is a common condition encountered either accidentally or found after trauma examination. The lesion may be mistaken as, or mimick a fracture. We report the experience in treatment of 5 such cases.

**Materials and Methods**

We had 5 cases of such patients and operated on for pain with or without obvious trauma since 1997. There were 4 boys and 1 girl, their average age was 13.9 years-old (12.2~14.9). There were 3 right knees and 2 left knees. All patients received excision of the bipartite fragment.

**Results**

There are 4 cases of type 3 with lesion located at superior lateral aspect and 1 case of type 2 with lesion located at lateral aspect according to Saupe's classification. All patients had significant symptomatic relief after excision of the bipartite associated lesions. Sychondrosis of the bipartite fragment to the main patella body with degenerative change of bipartite fragment were found in all cases without actual bony fracture. But there is a chondral fracture from the inferior edge of bipartite fragment found in the Saupe type 2 case, who had history of pain occurred after sports activity.

**Discussion**

Bipartite patella is not an uncommon encounter in our daily clinics. It may be linked to sports activity in some patient. Surgical management with excision may be indicated if conservative treatment failed.

**Conclusions**

Careful monitoring and investigation in bipartite patella may be needed to avoid missed chondral fracture lesion not detected by conventional roentgenographic study which should be dealt with surgical intervention.

## Hook Plate Fixation with and Without Coracoclavicular Ligament Augmentation with Suture Anchors for Acute Acromioclavicular Joint Dislocation

在肩鎖關節脫位的病人使用鎖骨鉤骨板時，喙鎖韌帶有使用縫合鉗釘加強與無使用的比較

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### Introduction

The purpose of this study was to evaluate the radiographic and clinical outcomes of hook plate fixation with and without coracoclavicular (CC) ligament augmentation with suture anchors for acute acromioclavicular (AC) joint dislocation.

### Materials and Methods

The study included 67 patients (48 males and 19 females; average age: 45.5 years) with acute AC joint dislocation (Rockwood types III and V) treated with hook plate fixation. The patients were divided into two groups: those treated with hook plate fixation with or without CC ligament augmentation with suture anchors. We used the CC distance and ratio as radiographic outcomes. We evaluated the American Shoulder and Elbow Surgeons (ASES) score and the Constant Shoulder Score as functional outcomes. The following were considered major complications: symptomatic acromial osteolysis, peri-implant fracture, acromial cut-out, and hook plate disengagement

### Results

Among the Rockwood type III patients, there was no significant difference between the two subgroups in terms of the functional outcome after adjusting for sex and age. However, among the type V patients, treatment with CC ligament augmentation with suture anchors revealed a superior outcome in terms of the ASES score ( $P = 0.01$ ). There was no difference in the risk of developing major complications between the two subgroups among type III and type V patients. The risk of residual subluxation of the AC joint was significantly lower in the CC augmentation subgroup among the type III patients ( $P = 0.04$ ), and a similar result was obtained among the type V patients with borderline significance ( $P = 0.06$ ).

### Discussion

This is the first study to compare functional and radiographic outcomes between hook plate fixation with and without CC suture anchor augmentation for acute AC dislocation. We found that hook plate fixation with additional CC suture anchor augmentation provided radiographic benefits in both type III and type V patients and showed superior functional outcomes in type V patients after implant removal. However, this combined treatment did not demonstrate a significant influence on the complication rate, which has been discussed in previous studies

### Conclusions

Hook plate fixation with CC suture anchor augmentation provided radiographic benefits in both type III and type V patients and yielded better functional outcomes in type V patients after implant removal but had no significant influence on the complication rate. Additional CC suture anchor augmentation may prevent residual subluxation and yield better functional outcomes.



## Surgical Treatment of Acute Acromioclavicular Dislocation: Percutaneous Knowles Pinning Versus Hook Plate Fixation

急性肩鎖關節脫位的手術治療：經皮以諾力氏鋼針與鉤板固定之比較

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### Introduction

Acromioclavicular (AC) disruptions represent the most frequent injuries to the shoulder. Among various surgical techniques, hook plate fixation has been adopted as the first option for AC joint reconstruction. Still, complications like infection, hypertrophic scars, and acromion osteolysis are noted. In our study, we manage to provide a novel alternative treatment using Knowles pin insertion in closed reduction internal fixation. We hypothesized that this method can help reduce the complications comparing with hook plate fixation, leading to better patient satisfaction.

### Materials and Methods

Between February 2013 to October 2020, 51 patients with acute acromioclavicular joint dislocation were included in this retrospective study. 33 patients were treated with hook plate fixation (Group A) and 18 patients were treated with percutaneous transacromial Knowles pin fixation under C-arm guiding (Group B). For clinical evaluations, constant score, wound length, operation time, implant duration and length of hospitalization were recorded. Radiographic outcomes, typical reported complications, such as secondary dislocation, clavicle fracture, acromial erosion were also surveyed.

### Results

Group A achieved better radiographic outcomes after operation, but there was no statistically significant difference in constant score between two groups. Besides that, in comparison with Group A, Group B revealed smaller wound length, less operation time, shorter implant duration, lower complication rate and shorter length of hospital stay with significant differences ( $P < 0.001$ ).

### Discussion

A multicenter randomized clinical trial had showed no significant differences in Constant shoulder scores between surgical and conservative groups in 1 year or 2 years after injury. Besides that, Dunphy et al. conducted a research investigating the functional outcomes of patients received conservative treatment. The authors indicated that type V AC injuries have the potential to retain the CC distance by nature healing. Therefore, minimal invasive intervention can be taken into consideration.

In our study, we perform a closed reduction using Knowles pin insertion through lower angle of acromion into clavicle to provide stability in AC joint without exposure of injury site. There were no significant differences in constant score compared with hook plate fixation. Moreover, Knowles pin fixation can perform well in wound length, operation time, complication rate and length of hospitalization with statistically significant difference, indicating relative cost effectiveness due to the lower price of implant and less injury to patients.

### Conclusions

Percutaneous transacromial Knowles pinning can be an alternative choice for the treatment of acute acromioclavicular dislocation in consideration of cost effectiveness and patients suffering.

## Acromioclavicular Separation after Osteosynthesis Operation of Clavicle Fracture-A Neglected Concomitant Injury with a High Incidence

鎖骨骨折術後發現之肩鎖關節脫位 - 易忽略且具高發生率之合併傷害

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### Introduction

Urgent operation becomes a common decision for clavicle fractures with appropriate surgical indications. Unfortunately, scattered cases of acromioclavicular (AC) joint separation were disclosed postoperatively. The purpose of this study was to investigate the etiology or mechanism for the discovery of AC separation after the operation of clavicle fracture.

### Materials and Methods

We retrospectively reviewed the medical record of patients who had received internal fixation of clavicle fracture at our hospital from May 2019 to December 2019. The collected data included demographics, fracture patterns, associated injuries, surgical decisions with fixation devices, and radiological follow-ups. We excluded patients with old AC joint injuries, preoperative AC joint separation and hook plate fixation.

### Results

Among 110 patients undergoing internal fixation for clavicle fractures, 14 patients (12.7%) presenting with AC separations postoperatively were mid-shaft clavicle fractures entirely. Nine patients were excluded due to preoperatively diagnosed AC joint injury. Four and ten patients were classified as type II and III respectively based on Rockwood's classification. There was no significant association of age, gender, BMI and multiple traumas with postoperative AC separation. Regarding fracture patterns of mid-shaft clavicle, 6 of 43 patients (14%) with AO/OTA type A, 6 of 23 (26%) patients with type B, and 2 of 26 patients (7.6%) with type C had neglected AC joint injuries. Although patient demographics, fracture patterns, and associate injury revealed no significant association with the neglected AC joint injuries, patients with type A or B mid-shaft clavicle fractures had a higher incidence of AC joint injury.

### Discussion

Fourteen out of 110 patients (12.7%) were found to have AC separations after clavicular osteosynthesis in this study. Notably, all 14 patients belonged to the mid-shaft clavicle fracture. Considering the injury mechanism by means of biomechanical analysis, a lever arm effect caused by mid-shaft clavicular fracture was supposed to transmit more force onto the AC joint subsequently. The effect might be enhanced by reducing the fracture site to expand AC separation. A pre-operative contralateral radiograph is recommended to avoid neglected AC injury. Fluoroscopy immediately after internal fixation is advised to confirm the integrity of the AC joint. Stress film of bilateral shoulder joints is required for early detection of AC separation during postoperative follow-up. All 14 patients were asymptomatic and treated conservatively.

### Conclusions

Concomitant injury of AC joint and clavicle fracture is not rare but easily neglected. Patients with type A or B mid-shaft fractures had relatively greater risks. Therefore, thorough examination before and during clavicular osteosynthesis should be emphasized to prevent misdiagnosis.

**Arthroscopic Assisted Reduction and Internal Fixation (ARIF) Versus Open Reduction and Internal Fixation (ORIF) for Glenoid Fracture: A Comparative Retrospective Study****回溯性研究：針對肩關節盂骨折，肩關節鏡輔助復位與傳統開放性復位內固定手術之比較**

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**Introduction**

This study aims to explore if the arthroscopic assisted reduction and internal fixation (ARIF) technique is superior to the traditional open reduction and internal fixation (ORIF) technique in the treatment of glenoid fractures.

**Materials and Methods**

Thirty patients with glenoid fracture (Ideberg type II-IV) treated with ARIF or ORIF from 2011 to 2020 were included in this retrospective study. All patients received pre-operative radiographs and CT scans. The patients were divided into two groups (ARIF or ORIF). All patients had a minimum follow-up of 12 months and an average follow-up of 14.3 months. The clinical outcomes were evaluated according to the Constant Murley Score, DASH score and shoulder ROM.

**Results**

Of twenty-three patients, two patients expired in the following period, 5 patients lost to follow-up, total 16 patients (6 ARIF cases and 10 ORIF cases) completed the functional score evaluation. The average Constant Murley Score of ARIF and ORIF is 84.6 and 79.5. The average DASH score is 15.4 and 17.6. Mean motion was as follows: forward flexion, 170 and 153; lateral elevation, 150 and 156; external rotation, 77.5 and 76; internal rotation to T11 and T12 in ARIF and ORIF group respectively. There were no known neurovascular injuries in ARIF group.

**Discussion**

Intra-articular glenoid fractures remain a difficult medical condition to managed. The traditionally addressment of ORIF through Judet or modified Judet approach may lead to potential morbidity of suprascapular artery and nerve. The use of arthroscopy gives direct visualization of the articular surface for fracture reduction , which avoids a larger open incision and its comorbidities. The shoulder scope portal, anterior, posteroinferior, lateral portal is enough and safe for fragment reduction, screw trajectory and application in most cases. Seldom case needed Neviaser portal for reduction, which may lead to risk of suprascapular nerve and vessel injury. Furthermore, the arthroscope provides the primary repair for the intra-articular soft tissue injury, such as SLAP lesion and labrum tear.

**Conclusions**

Arthroscopic-assisted reduction for complex glenoid fractures allows accurate fracture reduction, diagnosis, and treatment of associated intra-articular lesions, and less soft tissue and neurovascular risk than ORIF.

## Locked Plating and Compression Plating for Osteoporotic Fractures of the Diaphyseal Humerus: A Retrospective Study of 31 Patient

鎖定式與加壓式骨板於骨質疏鬆肱骨幹骨折固定之比較 - 31 位病患的回顧性研究

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### Introduction

Humeral shaft fractures are common geriatric fractures. Locked construct theoretically could have superior fixation strength. This study aims to assess the clinical and radiographic differences between locked plating (LCP) and conventional compression plating (DCP) for osteoporotic fractures of the diaphyseal humerus.

### Materials and Methods

Between April 2005 and October 2012, 31 consecutive elderly patients (older than 60 years) with displaced humeral shaft fractures and who underwent plate osteosynthesis in our institute were classified to 1 of 2 treatment groups retrospectively: the LCP group and the DCP group. The Constant and Disabilities of the Arm, Shoulder and Hand (DASH) scores were recorded for clinical assessment. Fracture union and radiographic complications were recorded for radiographic assessment. There were no significant differences between the groups with regard to demographic data and duration of follow-up.

### Results

There were no significant differences between the groups in operative time, blood loss, hospital stay, union time, DASH score, and revision surgery. However, the outcomes of the patients in the LCP group were superior to those in the DCP group in terms of Constant scores and radiographic complications. Nonunion were found in 2 patients, both of whom were in the DCP group. One plate end fracture occurred in the LCP group.

### Discussion

Locking constructs theoretically have better strength than DCP when treating osteoporotic fractures. Locking screw-plate systems do not rely on good bone quality to generate enough screw torque to maintain fixation, and demonstrate superior stability to the DCP. However, some studies reported that locking constructs offer no obvious biomechanical benefit. Our previous clinical report on the treatment of distal femoral fractures showed that locking constructs and dynamic compression screw constructs both achieved good outcomes, but locking constructs seemed to have a lower risk of early implant loosening. In this study, we found fewer radiographic complications such as screw loosening, secondary displacement of fractures, and nonunion when we treated osteoporotic fractures of the diaphyseal humerus using LCP.

### Conclusions

LCP was superior clinically and radiographically to DCP in treating osteoporotic fractures of the diaphyseal humerus. However, we should pay attention to fractures in the plate end when using locked constructs in the osteoporotic humeral shaft.

**Surgical Reconstruction of Irreparable Coronoid Fracture with A Radial Head Auto-Osteochondral Graft in Terrible Triad Injury:Two Cases Report****在手肘恐怖三聯症中利用自體橈骨頭骨軟骨移植手術重建難以修復的喙突骨折：兩個病例報告**

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**Introduction**

Coronoid deficiency in the acute elbow injury is challenging even for the most experienced orthopedic surgeon. Fractures of the coronoid process are commonly associated with elbow dislocation and radial head fracture in terrible triad injury. Coronoid process is crucial for elbow stability and use of structural allograft for coronoid reconstruction in chronic instability of elbow has showed mixed results. We reported our experience of surgical reconstruction of irreparable coronoid process fracture with radial head auto-osteochondral graft in acute terrible triad injury

**Materials and Methods**

Two cases of old woman sustained elbow acute terrible triad injury with combined irreducible coronoid process and radial head comminuted fracture. The radial head was too comminuted to be fixed, so we excised it and replaced with prosthesis and lateral collateral ligament was repaired. The coronoid process was reconstructed by using structural radial head fracture fragment as bone graft. The elbow joint was protected with long arm splint for 3 weeks. Then active and passive range of motion exercise was started after off splint.

**Result**

The joint stability was restored after elbow reconstruction. The radiographs showed union of radial head auto-osteochondral graft to the coronoid process in 3 months. Range of motion of elbow joint was loss of about 10-degree extension without limited forearm pronation and supination.

**Discussion**

Rigid fixation is often difficult to achieve for comminuted coronoid and radial head fracture where the fragments may be too small to allow proper fixation. Use of the radial head fracture fragment as an auto bone graft for coronoid reconstruction may offer the elbow stability for early motion from our result. The radial head was replaced with prosthesis and lateral collateral ligament was repaired. However, more cases needed to be involved for further study in the future.

**Conclusions**

Coronoid reconstruction with auto radial head fragment bone graft must be considered as salvage procedure when both coronoid and radial head fracture are comminuted to be rigid fixation in acute terrible elbow injury. These two cases reported showed rapid complete union of the graft to the remaining coronoid support the use of the convex articular surface of the radial head autograft as a valid option.

**Postoperative Immobilization for Distal Radius Fractures: Volar Versus Dorsal Splint****遠端橈骨骨折的術後固定：掌側與背側夾板**

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**Introduction**

Distal radius fracture is the most common fracture. It accounts for 17.5% of all fractures in adults. Plain radiograph is the most widely available diagnostic imaging technique. Open reduction internal fixation with locking plate is a standard management for patients who is eligible for surgical indication. The wrist is usually be protected with a short-arm splint after operation. This study was designed to compare the displaced rate of volar splints versus dorsal splints for post-operative immobilization of distal radius fractures.

**Materials and Methods**

This study retrospectively reviewed 113 patients who was diagnosed distal radius fracture and receiving volar locking plate fixation from an institute in 2020. Plain radiograph was used for preoperative diagnosis and postoperative follow-up. 71 of them were applied postoperative volar splint and the others(n=42) were applied dorsal splint. The patients were followed for around 3 months evaluating maintenance of fracture reduction and comparing the displaced rate.

**Results**

The average age is 68.3 years old and female accounts for 85.7%. All of the patient received open reduction internal fixation with volar locking plate. In 3 month follow-up, 4.2% (n=3) of displaced rate in volar splint group while 4.8%(n=2) of displaced rate in dorsal splint group. There is no significant difference in displaced rate between volar splint group and dorsal splint group.

**Discussion**

There are many treatment options for a distal radius fracture depending on many factors, such as fracture pattern, patient's age and activity level, and the surgeon's personal preferences. Postoperative splint is mainly for preventing the immediate displacement after operation. Some reasons that may also cause postoperative displacement, including patient's compliance, second trauma and the initial fracture type. The ideal surgical treatment would provide stable support with minimal soft tissue disturbance and allow safe, early active wrist rehabilitation.

**Conclusions**

The displaced rate of distal radius fracture after a volar locking plate fixation is very low. There is no significant difference between volar splint and dorsal splint. In clinical decision making, surgeons could choose volar splint or dorsal splint depending on the wound position, surgeon personal preference, and clinical situations.

## Use of Corticosteroids as the Prevention of Fat Embolism Syndrome in Patients with Long-bone Fractures

### 使用類固醇預防長骨骨折病人脂肪栓塞症之效果探討

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#### Introduction

Fat embolism syndrome (FES) is recently recognized as a common complication in patients with long bone fractures, and it can be potentially fatal or lethal condition. Of the various medications tested and used as prophylactic measures of FES, corticosteroids have been the most studied and have been shown to have beneficial effects. Yet, there is no universal agreement about its role in this situation. Our study was aimed to assess whether the use of corticosteroids decreases the risk of FES in patients who have suffered long-bone fractures.

#### Materials and Methods

The PubMed, Embase, and Cochrane Library databases were searched before January 2021. Individual effect sizes were standardized, and a meta-analysis was conducted to calculate the pooled effect size by using a random effects model. The primary outcome was development of FES. Secondary outcomes were development of hypoxemia (as confirmed by arterial blood gas analysis) and occurrence of complications like infections, osteonecrosis, etc. during the follow-up period.

#### Results

Fourteen studies involving 819 patients were reviewed. The corticosteroid group significantly decreased the risk of developing fat embolism syndrome. The pooled relative risk for developing fat embolism syndrome was 0.26 (95% CI: 0.15-0.46) in the corticosteroid group as compared with the control group. The pooled relative risk for developing hypoxemia was 0.35 (95% CI: 0.21-0.59) in the corticosteroid group as compared with the control group. Moreover, the incidence rates of complication did not differ significantly between the corticosteroid and control groups.

#### Discussion

Recent prospect study indicated inhaled corticosteroid is a safe and effective therapy for prevention of FES and also an effective drug for treatment of hypoxemia in orthopedic trauma victims, but none of SRMAs analyzed inhaled corticosteroid group. Also, RCTs from Asia were excluded due to language limitation in previous studies. Our study included fourteen studies from EU, US and Asia and involved 819 patients. Based on our findings, corticosteroid is a safe and effective prophylactic therapy in post-traumatic FES. It reduces incidence of FES and improves hypoxemia in skeletally injured patients. Also, we found no significant differences in rates of any complications with the use of corticosteroids. For high risk patients, we recommended a single IV dose of corticosteroid as routinely administration.

#### Conclusions

The analysis of our study showed that corticosteroids decrease the risk of developing fat embolism syndrome and hypoxemia after long bone fracture of the lower limbs.

**Limb Salvage for Chronic Tibial Osteomyelitis: Treatment Strategies in the Case Who Sustained Long-Term Hemodialysis and Peripheral Arterial Occlusive Disease****脛骨慢性骨髓炎的肢體保留：對於長期洗腎且周邊動脈阻塞患者所採用的治療策略**林峻正<sup>1,2</sup> 王建順<sup>1,3</sup> 江昭慶<sup>1,3</sup> 張明超<sup>1,3</sup>臺北榮民總醫院骨科部<sup>1</sup> 國立陽明交通大學臨床醫學研究所<sup>2</sup>國立陽明交通大學醫學院外科學系<sup>3</sup>**Introduction**

The orthopaedic surgeon has to decide limb amputation or salvage for tibial chronic osteomyelitis caused by traumatic open fracture. The important factors include infection control and neurovascular condition. Limb salvage is much more difficult in patients with comorbidities, especially the peripheral arterial occlusive disease (PAOD). The author proposed some treatment strategies about limb salvage for chronic tibial osteomyelitis in the case who sustained long-term hemodialysis and PAOD.

**Materials and Methods**

One case was enrolled in the treatment protocol. A 63-year-old male with regular hemodialysis sustained right distal fibula fracture and Gustilo Type IIIb tibial open fracture. Chronic osteomyelitis of tibia was formed about 2 months later than the initial surgery of debridement. With one open wound and external skeletal fixator (ESF) over right leg, the patient was then transferred to the author's institute. After admission, total occlusion of major vessels was found by the CT-angiogram of legs. In the 1st stage, Vancomycin-embedded cement spacer and beads were implanted after radical sequestrectomy. Rather than the commercial product of vacuum-assisted closure (VAC) system, the author designed the negative-pressure-wound-treatment (NPWT) based on the underwater-sealed-drainage (UWSD) system. The UWSD system was connected with one foley catheter which was alongside the tibial open wound and covered by the sterilized surgical drape. In the 2nd stage, reversed sural flap was chosen for soft-tissue reconstruction. After soft-tissue reconstruction, additional locally injection with antibiotic were performed for 4 weeks. In the 3rd stage, an intra-medullary (IM) nail was applied for definitive fixation after wound cultures showed bacteria not found. The autogenous graft was obtained from the anterosuperior iliac spine.

**Results**

Limb length was maintained by the cement spacer and revised ESF. The NPWT system had 2-week working time without changing wound dressing. Local injection with antibiotic enforced the infection control. Finally, the IM nail had benefit of easy wound closure. The patient recovered well.

**Discussion**

Doing radial debridement in such a case with long-term hemodialysis and bleeding tendency encountered the challenge of massive blood loss. The hemodynamically dramatic change maybe increased risks both in the surgery and anesthesia. The NPWT was reliable and helpful for wound care, but it could not control the infection. The reversed sural flap in the case was supported by the peripheral capillaries and was like as a kind of island-type perforator flap. Under situation of severe PAOD, the reason of plentiful compensatory circulation was unknown. However, the circulation seemed unhelpful for IV antibiotics. Additional locally injection of antibiotic revealed good outcome for infection control after flap reconstruction. The priorities were focus on cement spacer, drainage and soft-tissue reconstruction rather than pending negative findings from wound cultures. The flap offered a closed space to local injection with antibiotic.

**Conclusions**

The author proposed the concept that limb salvage is feasible even in the case with severe PAOD as long as the compensatory capillaries are plentiful.



## Study on Improvement of Profit in Orthopaedic Patients Undergoing Removal of Internal Fixator Under Tw-DRGs System Tw-DRGsTw-DRGs

### 制度下骨科移除 2 處內固定器手術績效改善研究

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#### Introduction

Under the Tw-DRGs payment system, the management department of Kaohsiung Veterans General Hospital (KVGH) disclosed that 67.9% of orthopaedic patients undergoing removal of internal fixator caused loss of profit. Therefore, this study intended to investigate the factors causing the gain or loss of profit for patients undergoing removal of internal fixators over two sites that 84.4 % of them caused financial imbalance.

#### Materials and Methods

This study extracted the data of patients admitted to the hospital for removal of two sites of internal fixators from January 2019 to August 2020 from the clinical database of KVGH retrospectively, including characteristic information, emergency records, surgical records, hospitalization records, and declarations of expense from National Health Insurance Administration.

#### Results

A total of 58 patients underwent removal of internal fixators over two sites that 80% of the patients had removal sites located on the same upper or lower limb. Ninety percents of the patients were under 60 years old without complication. Among patients with only one surgical code, 65.4% had a negative balance of profit, moreover, all patients with 2 or 3 surgical codes caused loss of profit. The average loss was 564 points, 3443 points, and 3905 points respectively. The average cost of anesthesia for 51 cases of general anesthesia and 7 cases of spinal anesthesia was 7,150 points and 3675 points respectively. According to the health insurance regulations, ward fees and physician fees are calculated on a daily basis. No significant difference was noticed due to insignificant difference in hospital stay.

#### Discussion

1. The operators might gain more income by charging more surgical codes, but, the hospital did not achieve profit and even loss on accounting.
2. Among patients with two sites of internal fixators on same side of lower or upper limb, if spinal anesthesia were adopted in 23 cases with two removal sites on the same lower limb would save 57,523 points. Regarding 16 cases with two removal sites on the same upper limb, brachial plexus block anesthesia instead of general anesthesia was expected to save 111,808 points.
3. Patients undertaking brachial plexus block anesthesia might discharge from hospital by 6 hours postoperatively that could shorten hospital days.

#### Conclusions

Either spinal anesthesia or brachial plexus block anesthesia could save medical expense for patients undergoing removal of internal fixators at two sites of same limb. Patients with two sites of internal fixators on same upper limb might discharge by 6 hours postoperatively to shorten a hospital day.

**Non-concentric Reduction after Bipolar Hemiarthroplasty for Femoral Neck Fracture: A Case Report and Literature Review****股骨頸骨折經雙極人工半髖關節置換手術後未全然復位之個案報告**吳元祿<sup>1</sup> 許家豪<sup>1,2</sup>高雄醫學大學附設醫院骨科部<sup>1</sup> 高雄市立大同醫院骨科部<sup>2</sup>**Introduction**

Operative options for displaced adult femoral neck fractures include closed/open reduction internal fixation, total hip replacement, and hemiarthroplasty. Hip hemiarthroplasty is the preferred treatment because of the shorter operation time and less blood loss compared with total hip replacement. Non-concentric reduction had been reported in total hip replacement or open reduction for hip dislocation cases. However, to our knowledge, there is no literature focused on non-concentric reduction of bipolar hemiarthroplasty. Here, we present a rare case of non-concentric reduction after bipolar hemiarthroplasty and investigate the factors of non-concentric reduction following bipolar hemiarthroplasty surgery.

**Materials and Methods**

One case and related literature review

**Results**

The patient is a case of 73-year-old male with underlying disease of left hemisphere lacunar infarction, diabetes mellitus with wheelchair use for long time. He has operative history of left below knee amputation owing to previous diabetes mellitus foot infection with severe osteomyelitis. He was brought to our emergency department due to slipped down which resulted in left femoral neck displaced fracture. Left hip hemiarthroplasty with anterolateral approach is performed. During the surgery, nearly range of motion of left hip can be reached without dislocation after femur bipolar prosthesis application. However, left hip bipolar prosthesis non-concentric reduction was found in the post-operatively X-ray. To investigate, we reviewed the pre-operative radiograph and surveyed the common etiology. Linear acetabulum fracture with mild acetabulum incongruence was found in pre-operatively CT image as well as during the revision surgery. The occult acetabulum incongruence, we thought, is the main reason why non-concentric reduction occurred in this case. Revision operation was performed, and hip prosthesis full reduction was accomplished after we remove the obstruction.

**Discussion**

Non-concentric reduction had been reported in some literature. Wang et al published a case of nonconcentric reduction of the hip after a traumatic anterior dislocation because inverted anterosuperior labrum with avulsed osteocartilage entrapment. Incarceration of bone cement or entrapped loose bone piece in total hip replacement setting are also had been reported. During the bipolar hip hemiarthroplasty surgery, operator should inspect acetabulum carefully after femur head removal. The important step is, before prosthesis reduction, to check whether inverted lumbus or osteocartilaginous loose body in acetabulum to block full reduction. In our case, another factor leading to misdiagnosis of reduction is the amputated limb (the same limb as the fracture site), which make it unable to compare the limb length to another leg intra-operatively. Besides, the sarcopenia status of the patient should also be considered during the inspection of prosthesis reduction due to low muscle tone.

**Conclusions**

This case emphasizes the importance of clinical judgement during bipolar hemiarthroplasty with femoral neck fracture and highlights a previously unreported cause for non-concentric reduction in a hip joint replacement for trauma fracture setting.

**Pathological Subcapital Femoral Neck Fracture In A 66-Year-Old Woman Managed by Non-Operative Method: Rare Case Report****一位 66 歲女性接受保守治療的病理性股骨頸骨折：罕見個案報告**Abhishek Kumar 陳建銘 許弘昌 陳賢德中國醫藥大學附設醫院骨科部<sup>1</sup>Fortis Healthcare, Kangra, Himachal Pradesh, India; Department of Orthopedics<sup>2</sup>**Introduction**

Neck of femur fracture is very common among elderly population. There are many treatment options available for such fracture. Most of current literature suggest either in form of surgical fixation or replacement. Most of elderly femoral neck fracture are low energy stress fracture (insufficiency fracture).

Stress fractures can be subdivided into fatigue fractures, which is caused when normal bone is exposed to repeated abnormal stress, and insufficiency fractures, where normal stress act on abnormal bone. In patients under 70 years of age without co-morbidity, the secondary instability rate after non-operative treatment is very low: 5%.

Here I am presenting a case report of insufficiency fracture of femoral neck in 66-year-old woman which was managed by non-operative means - rest, analgesic and nasal calcitonin.

**Materials and Methods**

A 66 year old woman presenting in ER with complaint of falling at home and sustained injury to left leg. She is unable to put weight over left lower limb since trauma. On radiological evaluation diagnosis of fracture of shaft of left femur made. Radiological assessment of pelvis with both hips was done and found within normal limit. Left femoral shaft fracture managed with open reduction and internal fixation with intramedullary interlocking nail with standard approach. Her post-operative events were uneventful and suture removal was done on POD-13. She started touching down weight bearing with support of walker from POD-2.

On her regular follow up at 6 weeks from date of surgery, she complained about left groin pain and unable to put weight over left lower limb from past one month. Initially pain was intermittent but from past 2 week its persistent. On radiological evaluation there was undisplaced femoral neck fracture of left hip. Blood investigation for serum calcium, phosphorus, Parathyroid hormone, vitamin D and alkaline phosphatase was sent and low vitamin D, serum calcium and very low PTH could be measured. She was a known hypothyroidism on irregular medication and her BMI was 35.

Her groin pain got decreased subsequently after rest and treatment with analgesic, vitamin D supplementation, oral calcium and nasal calcitonin. After 6 week of treatment her VAS score was 6/10 and she was able to put weight over left lower limb. On radiological evaluation there is callus formation over neck of femur found.

**Results**

Short term follow up of undisplaced intracapsular femoral neck fracture is promising. This avoids numerous complications of surgical methods. Nonoperative method needs good nursing care at home, proper analgesia and support from family members. At the end of 6 week of conservative management, she is able to put weight on left lower limb with VAS score of 6/10. Radiological callus formation confirmed over X-ray. There was VAS score of 1/10 after 4 months and the patient was full weight bearing on left lower limb with support of elbow crutches.

**Discussion**

It seems evident that when these kinds of fracture detected without displacement and subjected to immediate non-surgical treatment, including no or reduced weight-bearing, there is favourable short- and long-term outcomes.

**Conclusions**

There is need to do big study for nonoperative management of undisplaced intracapsular femoral neck fracture in elderly population. Conservative treatment for lesser symptomatic minimally displaced impacted fractures should be borne in mind, as the inherent stability of the fracture can allow rapid healing without further surgical attempts. Non operative method is patient friendly and can be converted into surgical method during follow up period.

**Case series: Functional Outcome of Total Hip Replacement After Acetabular Fracture****病例系列: 髌臼骨折後經全人工髌關節置換的功能預後**

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**Introduction**

Total hip replacement (THR) after acetabular fracture is a complex procedure and a quite challenge for orthopedic surgeon. Most common clinical scenario for total hip replacement after acetabular fracture is post-traumatic osteoarthritis. Here, we analyzed the case series of acetabular fracture in our hospital, and proposed the post-THR functional outcome and the factors associated with secondary THR.

**Materials and Methods**

39 patients admitted with diagnosis of acetabular fracture in our hospital between 2006 and 2014 : 14 females. 25 males; mean ages 48.1 year-old (16-86); There were 17 elementary fracture and 22 associated fracture according to Letournel classification. Treatments included (1) conservative treatment with skeletal traction, (2) close reduction and fixation with ten-nails, (3) open reduction with/without internal fixation, (4) external fixation. We use Harris hip score to evaluate the functional outcome of secondary THR, and analyzed the relationship between fracture pattern and post-traumatic arthritis.

**Results**

Ten patients (10/39) had secondary THR after acetabular fracture, the average age of these ten patient is 52.5 year-old. The most common indication for secondary THR in our case series is femoral head avascular necrosis (FHAVN) with osteoarthritis (8/10). According the Letournel classification, 6 patients were associated type and 4 patients were elementary type. Five hip dislocation (5/10) were noted in the initial x-ray. The average Harris hip score is 81.6(65-97).

**Discussion**

Treatment of acetabulum fractures is a challenge which required surgical skill and mature judgment. Accurate reduction with good joint congruity is important for eliminating the risk of post-traumatic osteoarthritis, and maintaining acetabulum bone stock is crucial for secondary reconstruction. However, when the fractures associated with osteopenia, articular surface comminution, femoral head and acetabular surface impaction, accurate reduction and joint congruity are difficult to maintain by ORIF. Among the 39 patients, 19 patients subsequently had FHAVN with osteoarthritis, 8 patients had secondary THR in our series. Posterior wall involvement (16/19) and initial hip dislocation (13/19) were the relative common fracture pattern in the FHAVN group. Associated femoral head fractures were also noted in 4 patients. Posterior wall fracture was seen to be the factor of poor prognosis due to high comminution rate which inducing instability or joint congruence defect. Dislocation with involvement of femoral head cartilage is significantly associated with FHAVN and secondary THR. Orthopedic surgeon should consider acetabulum fracture as a bipolar lesion, the cartilage of acetabulum and femoral head were injured at the same time. Femoral head status should be evaluated before treatment. 1 patient with fair HHS score due to subsequent poliomyelitis, and the other with poor HHS score due to mild hip pain with no effect on average activities.

**Conclusion**

The clinical results of THR after acetabular fracture achieve significant pain relief and well functional improvement in our series. The limitation of the study is the relative little case number, and the long term functional outcome should be further investigate.

**Predictors for In-hospital Mortality in Older Adults Undergoing Hip Fracture Surgery: A Case-Control Study****髖部骨折患者術後於住院中死亡的預測因子：病例對照研究**

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**Introduction**

Despite surgeries including screws and plate fixation, nailing technique and hip replacement surgeries had proven to improve long-term survival in geriatric patients with hip fracture, in-hospital mortality directly result from repair of hip fracture was undesirable and may occasionally occur. This study aimed to identify potential prognostic factors to predict the risk of in-hospital mortality in geriatric patients receiving repair of hip fracture.

**Materials and Methods**

This case-control study retrospectively collected data from older adults with hip fracture admitted to a single medical center. Comprehensive clinical histories of each patient were examined. Age were chosen to be the cross-matching factor and a 1:3 ratios was adopted for pairing in-hospital mortality and over three-month survival groups. Univariate and binary multivariate logistic regression model was used to estimate the odds ratios (ORs) with 95% confidence intervals (CIs). Receiver operating characteristic curve (ROC) was constructed and the discrimination power of the model was quantified using the area under the curve (AUC).

**Results**

From a total of 841 older adults who received hip fracture surgery, 17 died (mean age: 86.53 ± 9.79 years) during their hospitalization, accounting for 2.02% of in-hospital mortality rate. In comparison with 52 age-matched patients (mean age: 85.90 ± 9.36 years) in over three-month survival groups, univariate analysis results demonstrated significant differences in surgical delay from falling to operation, type of anesthesia, estimated glomerular filtration rate (eGFR) value, proportion of type 2 diabetes mellitus (DM), hepatitis, and malignant cancer history between the two groups. In the binary multivariate logistic regression model, eGFR value and malignant cancer history were the only two factors significantly correlated with in-hospital mortality while DM was marginally significant. The prognostic values of eGFR and malignant cancer history were acceptable; AUC reached 0.761 and 0.667, respectively.

**Discussion**

Previous literatures had reported in-patient mortality of 2.1% to 2.4%, which is comparable to the present study. Literatures also showed ASA grade over 3, mental impairment, and impaired mobility were also related with 48-hours postoperative mortality. CKD patients with higher rates of infection and post-operative dislocations were reported as well. However, our study did not show significance in fracture-to-surgery time. Additional studies with larger sample size are required to follow the natural course and assess the clinical effect of these risk factors on the in-hospital mortality of older adults with hip fracture.

**Conclusions**

Prevalence of in-hospital mortality following hip fracture is low. After adjusting by age, eGFR value and malignant cancer history were factors significantly correlated with in-hospital mortality. The findings of this study could assist early screening and detection of those patients with high in-hospital mortality risks.

## Perioperative Management of Lower Extremity Fractures in Severe Type Hemophilia Patients 重度血友病患者下肢骨折手術全期之治療及處置

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### Introduction

Severe type hemophilia patients suffered from bleeding spontaneously or after trauma. Fractures in these group of patients may lead to uncontrolled hemorrhage thus caused compartment syndrome and other devastating problems. Internal fixation of the fracture site is the most useful method to treat these group of patients. Due to low clotting factor activity in severe type hemophilia patient (<1%), maintenance of hemostasis by transfusion perioperatively and postoperatively play a critical role if treated with surgical interventions. In this study, we present lower extremity fracture cases with severe type hemophilia in TMUH.

### Materials and Methods

From 2015~ 2021, patients with severe type hemophilia diagnosed with lower extremity fracture were included. The treatment indications and the principles of fracture are similar in hemophilia patients in comparison to other patients in our hospital who suffered from same fracture type and pattern. We give antihemophilic factor VIII perioperatively and postoperatively according to recommendation by pediatrician in our hospital who is an expert in management with hemophilia patients.

### Results

4 patients with severe type hemophilia A (<1%) were included in this study. 3 of them have HCV infection. 3 patients suffered from thigh fracture and the other one suffered from leg fracture. 1 patient with comminuted femoral shaft fracture have pending compartment syndrome while another patient suffered from proximal tibia and distal fibula fracture with compartment syndrome. Acute fasciotomy was performed followed by external fixation and shift to ORIF with locking plate later. Factor VIII replacement therapy was done perioperatively and postoperatively as hemostatic management. APTT level served as an indicator for adequate replacement of factor VIII. All of them were free from complications after surgery and have good outcomes.

### Discussion

Hemophilia can be classified into different types according to its deficiency to specific clotting factor. Severe type hemophilia was defined as factor activity < 1%. In 1982, a case series use the protocol with 25 units/kg/day of factors in hemophilia patients suffered from fracture. (7 days for upper limb and 14 days fir lower extremity fractures.) In our hospital, we treated severe hemophilia patients with 50 units/kg before surgery (double-dose in high-titer antibody) and keep APTT as 31-35 second with factor VIII level at 80-100%. In previous study, fasciotomy was not indicated in patients encountered with acute compartment syndrome due to concern of major bleeding. However, with adequate replacement therapy with factor VIII, 1 patient in our study with acute compartment syndrome was treated safely with acute fasciotomy.

### Conclusions

Double-dose factor VIII replacement therapy in severe type hemophilia patients with high-titer antibody can better reached a satisfied APTT level preoperatively. Keep APTT level ranged from 31-35 second can avoid major bleeding perioperatively and postoperatively. Besides, when encountered with acute compartment syndrome, acute fasciotomy is needed to avoid complicated situation. Due to limited cases in this study, future study should aim at including more cases to established protocol in this group of patients.

**Open-Book Pelvic Fracture – A Rare Case Report****開卷式骨盆骨折-罕見病例報告**

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**Introduction**

Open-book pelvic fracture, this rare injury typically occurs after high-energy blunt trauma, such as that caused in a motorcycle accident or by a fall from height. The injuries can be identified via plain anteroposterior pelvis radiographs, which demonstrating pubic symphysis dissociation more than 2 cm. This fracture may cause extensive neurovascular damage and urogenital injuries. Here we reported a case of open-book pelvic fracture accompanied with left sacroiliac joint diastasis.

**Materials and Methods**

A 45-year-old man was brought to our emergency department after a motorcycle accident. The physical examination was notable for a bruise in the pubic area, and manual compression elicited severe pain in the anterior and posterior pelvic areas, findings consistent with an unstable pelvis. Circumferential pelvic sheeting was applied to stabilize the pelvic ring. A radiograph of the pelvis showed a widening of the pubic symphysis of more than 5 cm. Due to suspicion of open-book pelvic fracture, we arranged pelvic CT for further evaluation.

**Results**

CT of the pelvis showed the pubic symphysis dissociation about 5 cm and left sacroiliac joint diastasis, without vascular or visceral injuries. The result of the examination was compatible to open-book pelvic fracture and left sacroiliac joint dislocation. To restore the stability of the posterior pelvic rim, a Pfannenstiel approach was used for internal plate fixation, augmented with a supra-acetabular external skeletal fixator for the anterior rim and a percutaneous sacroiliac screw for fixation of the left posterior rim. The patient was able to sustain partial weight bearing with crutches after the surgery and participated in rehabilitation.

**Discussion**

Severe pelvic injuries, including open-book dislocations, have a high mortality rate. In severe pelvic traumas, pelvic binders must be applied as soon as possible to reduce bleeding by realigning fracture surfaces and provide stabilization of unstable fractures. Definitive treatment is highly individualized and come secondary to controlling hemorrhagic bleeding. The most common method is open reduction and internal fixation although in some cases, external fixation can be sufficient to stabilize the pelvis.

**Conclusions**

Open-book pelvic fracture, this rare injury typically occurs after high-energy blunt trauma. Such injuries may cause extensive bleeding, neurologic damage and may be associated with urogenital injuries. Pelvic binders must be applied as soon as possible to reduce bleeding and provide stabilization of unstable fractures. Prompt identification and meticulous general evaluation and surgical plan were necessary for the injuries.

## Is Double Plating Better than Single Plating in Fixation of Traumatic Pubic Symphysis Diastasis?

對於恥骨聯合分離之骨盆骨折，雙鋼板固定治療效果是否優於單一鋼板固定？

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### Introduction

Traumatic pubic symphysis diastasis (PSD) is caused by high energy anteroposterior compression (APC) injury. There were several cases in our hospital treated with single plate fixation reported implant failure radiologically after the operation. Thus we want to discuss whether double plating provides better stability and clinical outcome than single plating in fixation of PSD.

### Materials and Methods

From January 19, 2017 to April 3, 2020, we retrospectively reviewed 12 cases, which had APC type pelvic fracture with pubic symphysis disruption. Six of them had the double plate fixation of pubic symphysis perpendicularly (Group A), while the other six cases had been treated with single plating (Group B). Sex and age distribution of patients, etiology of trauma, locations of the fractures, treatment modalities, time to treatment after the trauma, and intra-operative blood loss were recorded. Patients started ambulation with crutch 6 weeks and full-weight-bearing 3 months respectively after the surgery. For evaluation of functional outcome, we had EQ-5D-5L scores and Majeed pelvic score (MPS) as parameters, which were recorded 30 weeks and 52 weeks after operation respectively.

### Results

The average blood loss was 658.33 ml (Group A: 650.00 ml; Group B 666.67 ml). The average Injury Severity Score (ISS) was 15.75 (Group A: 17.17; Group B 14.33). All patients had improvement in EQ-5D-5L scores (mean value of EQ-5D-5L30weeks: 0.633 to EQ-5D-5L52weeks: 0.834; Group A: EQ-5D-5L30weeks 0.511 to EQ-5D-5L52weeks 0.760; Group B EQ-5D-5L30weeks 0.754 to EQ-5D-5L52weeks 0.907) and Majeed pelvic score (mean value of MPS30weeks: 70.5 to MPS52weeks: 88.8; Group A: MPS30weeks 69.83 to MPS52weeks 71.17; Group B MPS30weeks 86.17 to MPS52weeks 91.50). None of these cases showed radiological evidence of implant failure after 1-year following up after the surgery.

### Discussion

The PSD causes pelvic ring instability and surgery is indicated to restore stability. Generally most orthopedics preferred to treat PSD surgically with single plate fixation. In our study, no significant difference of outcome was observed while comparing these two groups. We suggested some contributing reasons: first, double plating fixation of pubic symphysis was performed in cases with more complex pelvic fracture or multiple fractures, whose baseline were relatively poor than other cases. Second, the stability of pelvis was contributed mainly from posterior pelvis, which is the key of fixation of pelvic fracture, while double plate fixation of pubic symphysis could enhance anterior stability.

### Conclusions

In conclusion, this retrospective study showed the importance of posterior fixation of pelvic fracture, and double plate fixation of pubic symphysis disruption could restore anterior stability, which resulted in fair functional outcome, and decreased implant failure rate in management of complex pelvic fracture.



## Spinopelvic Fixation with MIS-S2AI Screws in Posterior Pelvic Fracture

對於後側骨盆骨折，使用微創 S2AI 螺釘固定之療效

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### Introduction

The fixation techniques of the spinopelvic region have evolved over time with better results with S2-alar-iliac (S2AI) screws, which improves fusion rates across the sacropelvic junction. Here we reported the functional outcome of some cases with posterior pelvic fracture treated with S2AI screws for spinopelvic dissociation.

### Materials and Methods

From January 19, 2017 to April 3, 2020, we retrospectively reviewed 10 cases, which had posterior pelvic fracture with SI joint dissociation. Six of them had the posterior pelvic fracture fixed with triangular osteosynthesis (Group A: lumbopelvic fixation with S2AI screws technique), while the rest four cases had been treated with plating or L5-iliac screws (Group B). Sex and age distribution of patients, etiology of trauma, locations of the fractures, treatment modalities, time to treatment after the trauma, and intra-operative blood loss were recorded. Patients started ambulation with crutch 6 weeks and full-weight-bearing 3 months respectively after the surgery. For evaluation of functional outcome, we had EQ-5D-5L scores and Majeed pelvic score (MPS) as parameters, which were recorded 30 weeks and 52 weeks after operation respectively.

### Results

The average blood loss was 127 ml (Group A: 86.7 ml; Group B: 187.5 ml). All patients had improvement in EQ-5D-5L scores (mean value of EQ-5D-5L30weeks: 0.641 to EQ-5D-5L52weeks: 0.834; Group A: EQ-5D-5L30weeks 0.556 to EQ-5D-5L52weeks: 0.835; Group B EQ-5D-5L30weeks 0.770 to EQ-5D-5L52weeks: 0.832) and Majeed pelvic score (mean value of MPS30weeks: 68.9 to MPS52weeks: 87.9; Group A: MPS30weeks 61.67 to MPS52weeks: 88.83; Group B MPS30weeks 79.75 to MPS52weeks: 86.50), which were almost the same as healthy people. None of these cases showed radiological evidence of implant failure or nerve injury during post-operative following up. The average length of incision wound of triangular osteosynthesis was 7 cm.

### Discussion

Management of Sacropelvic complex fractures has always been a challenge due to its complex anatomy, and high amounts of biomechanical forces acting at this junctional area. In addition, the bone density of sacrum is relatively low, which causes higher rates of non-union and implant failure at this segment. S2AI screws technique is indicated in cases with transverse central sacral fracture, displaced or unstable posterior pelvic fracture. It gives good functional outcome and stability of spinopelvic fixation. Besides, it provided access for open reduction. The minimally invasive technique provides satisfying surgical wounds cosmetically. However there are still disadvantages of S2AI screws technique: technically demanding and good imaging necessary intra-operatively.

### Conclusions

MIS-S2AI screws fixation technique provided small surgical incision wounds, good functional outcome and reduced major screw-related complications in this retrospective series with short follow-up. However long-term results and more cases be enrolled are needed to evaluate the durability of S2AI screws.

## Comparison of Complications and Therapeutic Outcomes of Tension Band with Kirschner wire and Headless Compression Screws of Patella Transverse Fracture

比較髌骨橫向骨折使用張力帶鋼絲和克氏鋼針與無頭加壓螺釘固定之併發症與治療效果

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### Introduction

The anatomical reduction of patella fracture is significant for recovery. Tension band with Kirschner wire is commonly used treatment method for displaced patella fracture. Recently tension band with headless compression screws technique is becoming popular. Here we investigate and compare the complications and therapeutic effects of tension band wire fixation using K wire versus Headless compression screws for transverse patella fracture.

### Materials and Methods

We retrospectively revealed patients with transverse patella fracture from 2020/1/31 to 2020/12/31 with using either K-wires or headless compression screws with tension band technique. We then revealed their visual analogue scale (VAS) score, reoperation rate due to non-union/malunion, knee flexion degree and the activity of daily living scale (ADL) score that were recorded at regular outpatient department follow up at 1st, 3rd, 6th and 12th months. Among them, 40 patients received tension band with a headless compression screws (TBWCS group) and 55 patients received tension band with Kirschner wire (TBWKW group).

### Results

The time to begin postoperative functional exercise was earlier in patients with TBWKW, and the VAS score was lower, although no no statistical difference between two groups. Knee flexion angle was greater than patients who were treated in Kirschner wires. The reoperation rates of both groups were low, with patients with TBWKW slightly lower than the other one. ADL score were similar in both groups after one year of follow up.

### Discussion

Patients with tension band wiring technique with headless compression screws showed earlier postoperative functional exercise, lower VAS score, better knee flexion angle than those patients with TBWKW treatment. Limited number of patients is the limitations for this study. In addition, more than surgeon who did the operation in our center may cause bias due to surgeons preference and different surgical technique

### Conclusions

Tension band wiring with the use of headless compression screws was found better therapeutic outcomes in terms of early postoperative exercise, lower pain score and higher knee range of motion. Both reoperation rates were not high, but still patients who underwent TBWCS had a slightly lower non-union/malunion rate, which in turn had a relatively lower reoperation chances.

**Minimal Destruction Endobutton Placing Technique to Reduce Bird Beak Tibial Eminence Avulsion Fracture: A Simple, Efficient, Reliable Approach and Case Report**

微破壞內扣置放技術應用於脛骨隆突鳥喙型撕裂性骨折：簡單、效率、可靠的手法與病例報告

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**Introduction**

Bird beak tibial eminence avulsion fracture is an infrequent injury and usually resulted from high-energy trauma, and the surgical management remains diversified. Herein, we adopt minimal destruction endobutton placing technique to reduce the fracture and aimed to assess its feasibility.

**Materials and Methods**

A 19-year-old female presented with painful, swollen right knee with limited range of motion after falling in a motor vehicle collision. Plane fluoroscopy revealed bird beak tibial eminence avulsion fracture. The patient received arthroscopic reduction and internal fixation with the technique. Surgical and clinical parameters were recorded.

**Results**

The operative time was 45 minutes from making the first skin incision to wound dressing. Four weeks after the surgery, the pain reduced from 7 points to 1 points, the knee ROM improved from 0-10° to 0-150°, Lachman grade decreased from grade II to I, and the Lysholm score increased from 11 to 84.

**Discussion**

Compared with the existing surgical methods such as pull-out suture fixation or compression screw fixation, the minimal destruction endobutton placing technique revealed simplicity while provided adequate fixation stability.

**Conclusions**

Arthroscopic fixation with minimal destruction endobutton placing technique reveals efficiency and reliability for surgeons with less damage to the fracture fragment, and the clinical outcomes are satisfactory.

**Favored Location of a Stabilizing Screw for Syndesmotic Diastasis: Recommendation Based on Clinical and Theoretical Considerations****脛腓聯合分開時固定螺釘擺放的首選位置:根據臨床及理論做推定**

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**Introduction**

Although ankle injuries are common, combined malleolar fractures and syndesmotic diastasis (SD) are relatively fewer. The optimal technique for syndesmotic stabilization has yet achieved a consensus. We hypothesize that the optimal location of stabilization should be at the syndesmosis based on theoretical consideration. The aim of this study intended to compare varied location of a stabilizing screw and determinate the favored location from clinical and theoretical viewpoints.

**Materials and Methods**

For the 10-year period, we retrospectively studied 63 consecutive adult patients with combined injuries. After malleolar fractures were internally stabilized with screws and plates, stress tests were performed to re-confirm syndesmotic instability. The diastatic syndesmosis was stabilized with cortical screws under image intensifier guidance. In the present study, we only enrolled patients with one syndesmotic screw (55 patients) and divided them into the trans-syndesmotic (TR) or the supra-syndesmotic (SU) group. Clinical and functional outcomes between the two groups were compared. The favored location was speculated consequently.

**Results**

We followed 48 patients for at least one year (average, 1.8 years; range, 1.0-7.0 years). The TR group included 31 patients and the SU group, 17 patients. All clinical and functional comparisons were not statistically significant ( $p > 0.05$ ).

**Discussion**

Although statistical comparison is insignificant, TR screw insertion possesses biomechanical and biological merits. Unable to reveal advantages of TR screw insertion in clinical and functional comparisons may be imputed to insufficient sample sizes and early screw removal.

**Conclusions**

Practically, TR insertion of a screw with late removal ( $> 3$  months) may be a better choice.

**Latissimus Dorsi Muscle Transfer for Rotator Cuff Tear with Massive Defects****顯微闊背肌皮瓣在嚴重旋轉肌群撕裂傷之應用**

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**Introduction**

Complete rotator cuff tears is usually treated with open or arthroscopic rotator cuff repairs when repairable. However, when there is massive defect and the tear is irreparable, latissimus dorsi muscle flap transfer can be a surgical option.

**Materials and Methods**

From 2016 to 2020, we retrospectively collected 20 cases of massive rotator cuff tear. We performed EMG, and NCV pre-operatively for those with Pre-operatively, the plain films with shoulder AP axillary and scapular Y views were performed initially followed by shoulder MRI. For patients with also paralysis syndrome and evaluated by neurodiagnostic tools with positive finding for nerve injuries, we also performed MRI for brachial plexus. The massive rotator cuff tear was defined as more than 2 rotator components tear, or the gap of tendon region bigger than 5cm, or the repair had to be performed at patients' position more than 60 degree of abduction. We performed LD tendon transfer or L'Episcopo procedure for reconstruction of the cuff tear for massive rotator cuff tear without advanced osteoarthritis. If the patient also had brachial plexus injury, we also performed nerve reconstruction subsequently.

**Results**

From 2016 to 2019, we retrospectively collected 18 cases with 2 patients loss of follow-up after 8 months and 10 months. The shoulder ROM improved to anterior flexion 130-160 degree, abduction 80-110 degree, internal rotation 70-90 degree, external rotation 30-45 degree after surgery. Complications with seroma formation were noted in 2 cases and 1 case of long term muscle traction pain. Seroma formation was solved by elastic bandage use for 3 weeks. The long term muscle traction pain was under medication of pain killer for 3 months and then subsided.

**Discussion**

Massive rotator cuff tears can be a challenge to repair by conventional methods. Surgical methods including reverse total shoulder and tendon transfer may be options for these difficult cases. Latissimus dorsi provides synergic movement as original rotator cuff, and can provide good outcomes.

**Conclusions**

Latissimus dorsi tendon transfer is a feasible surgical technique for irreparable rotator cuff tears with massive tear and defect. It provides good clinical outcome with great improvements in range of motion and pain reduction after surgery.

## Tips and Tricks for Lower Trapezius Tendon Transfer for Massive Irreparable Posterosuperior Rotator Cuff Tears Using Autologous Semitendinosus Tendon Augmentation and Cortical Button Fixation

使用自體半腱肌肌腱及鈕扣固定之下斜方肌肌腱轉移術治療後上側肩旋轉肌巨大破裂之提示與技巧

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### Introduction

Irreparable posterosuperior rotator cuff tears remain one of the most challenging problems in the shoulder surgery. The lower trapezius tendon (LTT) transfer represents a promising treatment option. It is believed to provide better external rotation strength and a more natural vector compared to the latissimus dorsi tendon (LTD) transfer. However, there are variable techniques that have been described in this procedure. The purpose of this study is to describe our technique of an arthroscopic-assisted LTT transfer using autologous semitendinosus tendon augmentation and cortical button fixation.

### Materials and Methods

Indications for LTT transfer were 1. Symptomatic and irreparable posterosuperior rotator cuff tear with muscle atrophy and fatty infiltration (> grade 2 Goutallier classification). Contraindications were 1. Active forward elevation  $\leq 80^\circ$ ; 2. Irreparable subscapularis tear; 3. Advanced glenohumeral arthritis.

### Results

The patient was positioned in the beach chair position and the first step involved diagnostic arthroscopy to confirm the irreparability of the posterosuperior cuff. Harvest a semitendinosus tendon folded in 2-stranded fashion and fixed with Smith-Nephew 15mm Endobutton. Make a dorsal incision inferior to the scapular spine to harvest lower trapezius tendon and sutured with one end of semitendinosus graft. Incise the infraspinatus fascia to create a tunnel from the dorsal incision to the glenohumeral joint. Under arthroscopy, create a bone tunnel from the infraspinatus footprint to the bicipital groove anteriorly. Shuttle the Endobutton from the dorsal incision into the bone tunnel. The patient's arm was positioned at maximal external rotation and the strands of the Endobutton were tightened to introduce 2–3 cm of the graft into the bone tunnel. Secure the other end of the graft to the lower trapezius tendon.

### Discussion

Graft fixation plays an important role in the stability and healing of LTT transfer. Autograft has been proved to have better healing potential than allograft. Cortical suspensory fixation provides good graft-to-tunnel healing in the knee surgery. However, anchor versus transosseous fixation has not been clinically compared for LTT transfer. This study describes the use of autologous semitendinosus graft with cortical button transosseous fixation for augmentation of a lower trapezius tendon transfer, which aims to provide more reliable graft-to-tunnel healing.

### Conclusions

In this study, we propose a modification technique, which aims to provide more reliable graft-to-tunnel healing. Further clinical results should be followed in comparison to previous techniques.

## Is Global Compressive Loading Helpful for Entesis Healing? A Novel Combination of Ultra-Thin PEEK Button and Enveloped Porcine Dermal Matrix Patch Enhances the Tissue Regeneration of Rotator Cuff Entesis in Acute Healing Caprine Model

大面積壓力負載有助肌腱癒合？超薄 PEEK 墊片合併袋狀豬皮膠原蛋白敷料治療旋轉肌袖癒合之急慢性期山羊動物模型研究

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### Introduction

Approximately 75,000 rotator cuff repairs are performed each year in the United States. Up to 46% of tendons fail to heal back to bone and result in a worse functional outcome than those tendons that do go on to heal. The purpose of this study was to determine if a novel combination of enveloped porcine dermal matrix patch and ultra-thin PEEK button could improve tendon-bone healing when applied to an acute rotator cuff tear caprine model.

### Materials and Methods

Eighteen Taiwan Black male goats were divided into 3 periods and 6 groups. All goats underwent bilateral detachment of the infraspinatus tendon. Three periods included 12 weeks, 4 weeks, and 0 week. Zero week means sacrificing right after surgery. These 6 groups include AP-12, TOE-12, A-4, DR-4, A-0, and DR-0. The mechanical experiment was performed in AP-12, TOE-12, AP-0, and DR-0 groups. In A-4 and DR-4 groups, the specimens were harvested in the same way and split along the orientation of infraspinatus tendon fiber. Proximal humerus bone was removed except bone-tendon junction to survey fibrocartilage growth. Maturation of the entesis was assessed according to the scoring system developed by Ide et al that was initially used to characterize the histological features of the tendon-bone interface of rats. Type I, II, III Collagen was evaluated by IHC stain.

### Results

In the AP-12 group, the average of Maximum load is 393.75 (84.40)N; in the TOE-12 group, the average of Maximum load is 229.17 (43.94)N. The T-Test approach shows that the P value is 0.00086(<0.05) and concludes that there is significant difference between the AP-12 and TOE-12 groups. In the A-0 group, the average of Maximum load is 102.98 (23.14)N; in the DR-0 group, the average of Maximum load is 94.32 (29.32)N. The t-test shows that the P value is 0.291461(>0.05) which concludes that there is no difference between the A-0 and DR-0 groups. Histologically specimens of PEEK augment group also enabled good healing. In the AP-4 group, histologic assessment showed dense fibrous tissue formation above the entesis: average Grade 3 (well-developed collagen bands). All PEEK augments were buried under thick fibrous tissue. The median entesis maturation score in A-4 group is 3, whereas 2 in the TOE-4 group. IHC stain showed positive type III collagen only in tendon and bone of some A-4 specimens.

### Discussion

From the result of AP-12 and TOE-12 groups, the biomechanical stiffness of augmented patch is significantly higher than two anchor double row repair for 71.8%. In A-4 group, dense fibrous tissue, mature fibrocartilage, and positive type III collagen in tendon and bone were observed even without ECM patch, which means the PEEK augment itself provides benefits by its biomechanical uniqueness for entesis healing. The PEEK augment is buried under the dense fibrous tissue, no matter in AP-12 or A-4 groups. That is to say, even if PEEK augment is used alone, the repair can still provide superior potential for growth.

### Conclusions

In our study, the safety and effectiveness of the ultra-thin PEEK augment and enveloped ECM patch has been proven by biomechanical testing and histological results. PEEK augment with enveloped ECM patch significantly improves biomechanical resistance to failure. PEEK augment alone yielding globally even compression force on cuff tendon has comparable outcome when comparing with TOE repair.

## The Mid-term Function Outcome Results After Arthroscopic Biceps Tenodesis for Isolated Biceps Reflection Pulley Lesions

關節鏡二頭肌肌腱固定術治療單純二頭肌反射滑輪病變的中期功能性預後結果

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### Introduction

To investigate the mid-term functional outcomes after arthroscopic biceps tenodesis for treatment of isolated biceps reflection pulley lesions.

### Materials and Methods

40 patients with unilateral refractory anterior shoulder pain (> 3 months) were diagnosed as LHBT instability arthroscopically. During surgery, the integrity of LHBT and biceps pulley structures were meticulously examined. LHBT instability was confirmed by either static dislodge out of the groove or inducible subluxation by the hook probe (Ramp test). Totally 40 patients underwent arthroscopic tenodesis inside the bicipital groove. Subjective evaluations were obtained using American Shoulder and Elbow Society (ASES) scores and Visual Analogue Scale (VAS), and The Disabilities of the Arm, Shoulder and Hand Score(QuickDash) preoperatively and at postoperative at minimum 2-years follow-up. The function outcome was assessment by telephone, and preoperative and postoperative outcomes were compared with paired sample t-test by SPSS. A p-value of < 0.05 was considered as significant improvement.

### Results

We included 40 patients who accepted arthroscopic biceps tenodesis for isolated biceps reflection pulley lesions in 2013~2018. There were 30 patients (14 males and 16 females), who finished the telephone assessment, were available for analysis. 10 patients were lost to follow up. The mean follow-up time was 48 months (28.4 to 96.8 months). There was a single clinical failure in a patient who underwent revision surgery in another hospital for intolerable pain in postoperative 3 months. There were significant improvement in ASES scores ( $p=0.00017<0.05$ ), VAS ( $p=0.00054<0.05$ ), and quick DASH ( $p=0.00061<0.05$ ), compared preoperatively and postoperatively.

### Discussion

Biceps tenodesis is the preferred technique to manage LHB lesions especially in younger patients, laborers, athletes, and patients who want to avoid a cosmetic deformity. Recent studies revealed that arthroscopic suprapectoral techniques provide distinct advantages, including minimal dissection area and scar formation, decreased fracture risk based on level of fixation, and decreased risk of neurovascular injury. Our study revealed significant mid-term functional outcome improvement in the patients who accepted arthroscopic biceps for their refractory anterior shoulder pain. However, there were limitation in our studies, including small sample size and no comparison group.

### Conclusions

Arthroscopic biceps tenodesis is an appropriate and reliable intervention for patients with chronic, refractory anterior shoulder pain. Patients with a symptomatic isolated BRP lesion experienced encouraged functional outcome, little postoperative pain, and high degrees of satisfaction when treated with arthroscopic biceps tenodesis.



## Comparison of Short-Term Clinical and Radiographic Outcomes between Biceps Superior Capsular Reconstruction and Biceps Anterior Cable Augmentation for Different Sizes of Rotator Cuff Tears

針對不同大小的旋轉肌斷裂利用自體二頭肌上肩關節囊重建與自體二頭肌前肩關節強化手術之臨床比較結果

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### Introduction

Anterior cable augmentation using biceps long head (BACA) with proximal tenotomy leaves some biceps tissue at anterior cable along with anterior supraspinatus repair. Superior capsule reconstruction with biceps long head (BSCR) with distal tenotomy keeps remnant biceps tissue inside the glenohumeral joint and serve as an anterior spacer to hold the humeral head in place and increase the shoulder stability. The purpose of this article is to compare the clinical result of autologous BACA and BSCR for different size of rotator cuff tear.

### Materials and Methods

We retrospectively collected data from patients treated with arthroscopic BACA or BSCR with a minimum 3-month follow-up. The main inclusion criteria for patients in this analysis was patients with different sizes of supraspinatus tear who underwent BACA or BSCR along with supraspinatus repair during the time period of this report. Outcome analysis was performed to evaluate visual analog scale (VAS). Radiographic analysis of anteroposterior radiographs analyzed acromiohumeral distance (AHD) and superior capsular distance (SCD).

### Results

Sixty-eight patients with average age of 61.6 presented with rotator cuff tear and were divided into two groups (42 received BACA and 26 received BSCR). There were 8 small, 17 medium, 13 large, 4 massive cuff tears in BACA group and 1 medium, 4 large, 21 massive cuff tears in BSCR group. All patients with massive cuff tear were Hamada classification Grade 1. Outcome data revealed improvement in VAS in both groups at 3 months (4.0->1.2 in BACA Group and 4.2->1.5 in BSCR group). Radiographic analysis showed no difference in AHD (mean 9.7±1.9mm preoperatively to mean 10.1±2.0 mm at 3 months in BACA group (P=0.39) and mean 9.1±1.6 mm preoperatively to mean 9.1±2.7mm at 3 months in BSCR group(P=0.93)). There was also no difference in SCD (mean 38.1±5.0mm preoperatively to mean 38.1±6.4 mm at 3 months in BACA group(P=0.98) and mean 38.9±4.2mm preoperatively and 38.5±4.1mm at 3 months in BSCR group(P=0.72)).

### Discussion

Both BACA and BSCR groups yield patient satisfaction, including reduced shoulder pain. BACA is commonly used for smaller and relatively repairable mild cuff tear and BSCR is for large to massive and relatively irreparable cuff tears. However, the radiographic outcome regarding AHD and SCD in both groups showed no significant differences before and after the operation. This may be due to the fact that since all patients with massive cuff tear were Hamada grade 1, they may have similar satisfactory outcome with BACA for small to massive tears and BSCR for large to massive tears.

### Conclusions

This study proves that both BACA and BSCR were successful treatments in decreasing the patients shoulder pain regardless of the pre-operative torn size of supraspinatus. Radiographic analysis has also shown no significant change in acromiohumeral distance and superior capsular distance, indicating maintenance of the balanced shoulder. Therefore, different size of cuff tear should be treated individualized for better clinical outcome of patients.

## Comparison of the Operative Time and Cost Between Suture-bridge and Independent Double-row Techniques in Moderate to Massive Supraspinatus Tears

使用 suture bridge 與 independent double row technique 治療旋轉肌腱斷裂之手術時間與花費比較

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### Introduction

Rotator cuff tears, especially supraspinatus tears, are one of the most common shoulder disorders that reduce the quality of life. Nowadays, arthroscopic rotator cuff repair is the gold standard surgical method. Among all suture types, independent double-row (IDR) and suture-bridge (SB) techniques are popular ones. This study compares the differences in cost and operative time between each other. The result provides reference to improve medical economics and save cost in the future.

### Materials and Methods

Seventy patients from Taoyuan Chang Gung Memorial Hospital with moderate to massive supraspinatus tears were collected from 2017 to 2020. Both SB and IDR techniques were conducted in 35 patients each. We compared the patients' demographics, severity of supraspinatus tears, operative time, length of hospital stays and number of anchors used between each group. Chi-square and independent t-test were to evaluate the baseline characteristics between IDR group and SB groups. Statistical analysis was performed by SAS software version 9.4 (SAS Institute, Cary, NC, USA), and  $p < 0.05$  was defined as statistically significant.

### Results

The IDR technique required much less anchors than SB to complete the surgery ( $p < 0.0001$ ). Moreover, the mean operative time was shorter in IDR group (114.1min) than in SB (143.5min) group ( $p < 0.0001$ ). Although patients treated with IDR tend to have shorter length of hospital stay than those treated with SB, no significant difference was reached.

### Discussion

Both SB and IDR techniques are common suture methods for moderate to massive supraspinatus tears. Since the two methods provide similar reported clinical outcomes, we mainly discuss the difference of operative time and cost between groups. In addition to operative time, we also utilized the amount of anchors used and the length of hospital stay to estimate the cost. Based on our result, we found that IDR technique required much less anchors and shorter operative time, suggesting that it may be a more cost-effective surgical technique.

### Conclusions

Compared to SB, this study showed that IDR had shorter operative time, less anchors used, and similar length of hospital stay, which made IDR more cost effective.

**Surgical Treatment of Calcifying Tendinitis of the Supraspinatus Tendon: Arthroscopic Removal and Rotator Cuff Repair****棘上肌鈣化性肌腱炎之手術治療：肩關節鏡清除與旋轉肌袖修補**

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**Introduction**

Calcific tendinitis (CT) is a painful shoulder disorder characterized by either single or multiple deposits in the rotator cuff tendon. Although most patients respond well to conservative treatment, some eventually require surgical treatment.

**Materials and Methods**

This study retrospectively evaluated 12 consecutive patients with a mean age of 58.3 years. The mean follow-up was 10.6 months (range, 6-16 months). Pre- and postoperative functional assessment was performed using the Constant score, and Quick Disabilities of the Arm, Shoulder, and Hand (DASH). Pain was assessed by visual analog scale (VAS). Radiographs and ultrasound imaging were performed to evaluate the recurrence of calcifications and the stability of the supraspinatus tendon repair.

**Results**

Significant improvement was obtained for pain (mean VAS, 8 before surgery to 2 after). The mean Constant score increased from 20.8 preoperatively to 75.4 postoperatively, the mean Quick DASH score decreased from 47.3 preoperatively to 8.97 postoperatively. Ultrasound examination at last follow-up showed no tendon tears, and all of patients were satisfied with their results.

**Discussion**

After failure of conservative treatment modalities, surgical removal of the deposits is the remaining option. Although optimal results have been described with open removal of calcific deposits, arthroscopy has become the preferred technique to treat CT, offering similar results to open surgery but less invasive with little damage to the deltoid. The concomitant repair of rotator cuff limits the propagation of the tear and also helps in early patient rehabilitation.

**Conclusions**

Arthroscopic removal of calcific deposit and rotator cuff repair can lead to good results in patients with symptomatic calcifying tendonitis of the supraspinatus tendon.

**Olecranon Flip Osteotomy for Approach of Complex Distal Humeral Fractures****以尺骨鷹嘴突翻轉截骨術入路治療複雜性遠端肱骨骨折**

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**Introduction**

Trans-olecranon osteotomy is often used to provide adequate exposure of the fracture side when treating complex distal humeral fractures. However, literature has reported up to 30% non-union rate, and foreign body sensation due to hardware. Thus, we come up with our experience of olecranon flip osteotomy approach for complex distal humeral fractures.

**Materials and Methods**

We retrospectively reviewed clinical data in National Taiwan University Hospital. From 2011 to 2018, we collected 10 patients with complex distal humeral fractures. All of them received operation of open reduction and internal fixation by using the approach of olecranon flip osteotomy. First, we identified and protected ulnar nerve. Second, we entered lateral side by Kocher approach and made arthrotomy at the level of olecranon. Third, we elevated the triceps on the medial and lateral side off the humerus along with the pedicle of the anconeus. Finally, the whole insertion of triceps on the olecranon is detached with a wafer of bone. After fixation of fracture was done, we repaired the wafer of bone back onto the olecranon tip by 6 to 8 trans-osseous heavy sutures. After operation, all the patients received accelerated rehabilitation protocol including early range of motion. Union-time of osteotomy site was defined as radiological absence of osteotomy trace on plain film. We used the Mayo Elbow Performance score (MEPS) to evaluate clinical outcomes.

**Results**

The mean age of patient is 58.6 (31~81). Two men and eight women were collected. All the patients reached bony-union and no complication like infection or loss of reduction. The mean union-time is 10.7 weeks (8~19). Most of the patients have good to fair MEPS and there was no complaint of foreign body sensation. All the patients were satisfied with the operation.

**Discussion**

The traditional trans-olecranon osteotomy may provide better access to the joint surface of distal humerus, it may also give a chance of loss-of reduction, mal-union, non-union, hardware irritation or even infection. On the other hand, the advantage of olecranon flip osteotomy includes preservation of articular cartilage of olecranon, no need of hardware, less radiation exposure than tension-band wiring, good union-rate and no need of second surgery for removal of hardware.

**Conclusions**

For complex distal humeral fractures, olecranon flip osteotomy could provide adequate exposure of the fracture site and less complication than traditional trans-olecranon osteotomy. All the orthopedic surgeons should add this kind of approach into the armamentarium and use it appropriately.

## The Radiographic Evaluation of Massive Rotator Cuff Tear: The Correlation Between Acromiohumeral Distance and Fatty Infiltration

### 旋轉肌巨大破裂之影像分析:肩峰肱骨距離與脂肪浸潤之相關性

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#### Introduction

Decreased acromiohumeral distance (AHD) with superior migration of the humeral head indicate full-thickness tear of rotator cuff. The cutoff value had reported that  $AHD < 6$  mm is a sign of rotator-cuff rupture almost systematically involving longstanding total infraspinatus tear, not always amenable to suture repair due to advanced fatty degeneration. Our goal of this study aimed to analyze if the similar correlations between acromiohumeral distance and fatty infiltration also noted in massive rotator cuff tear.

#### Materials and Methods

From 2016 to 2019, we retrospectively reviewed a total of 28 patients diagnosed of massive rotator cuff tears in our institute. The inclusion criteria included tear with a diameter of 5 cm or a complete tear of two or more tendons. Measurement of the AHD was done and patients were divided into two groups by the value less (Group A) or more than 6mm (Group B). Tear location of the tendons and the condition of fatty infiltration (Goutallier classification) were reviewed and collected in MRI.

#### Results

Among the 28 cases, Group A (average 3.89 mm; 2.04mm – 5.76mm) and group B (average 8.09mm; 6.22mm-11.76) both had 14 patients. Among the group A, all of the cases had supraspinatus and infraspinatus tear (Collin type D) and 6 of 14 cases had additionally involved partial or complete subscapularis tear (Collin type C). 71% (10/14) of them were Goutallier grade 3 or grade 4 and the other were classified as grade 2. In group B, there were both 6 patients classified as Collin type C and Collin type D. 2 patients had lesion in supraspinatus and subscapularis (Collin type A). 86% (12/14) of them were classified Goutallier grade 1 or 2. Only 2 patients had moderate fatty infiltration noted.

#### Discussion

In previous study, tendon tears and fatty muscle degeneration in the rotator cuff correlate with reduced acromiohumeral distance were demonstrated. Goutallier et al. found  $AHD < 6$  mm is a sign of rotator-cuff rupture involving longstanding total infraspinatus tear. Due to the fatty infiltration, the tear is often difficult to suture repair. In our study, the cutoff value also can be applied in massive rotator cuff tear. All the cases with AHD less than 6 mm had involvement of infraspinatus, and 71% of them had moderate to severe fatty degeneration.

#### Conclusions

This study showed acromiohumeral distance less than 6mm indicate the advanced fatty infiltration and the involvement of infraspinatus in massive rotator cuff tear.

## Patients With Diabetes Mellitus Have a Higher Risk of Tendon Retear After Arthroscopic Rotator Cuff Repair

糖尿病患者在關節鏡旋轉肌修補術後有較高的肌腱再斷裂風險

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### Introduction

Retear of a repaired rotator cuff tendon, a common complication after rotator cuff repair, has become a major concern of shoulder surgeons. Diabetes mellitus (DM) is one of the most common and debilitating medical conditions. Previous studies have shown the regenerative capability of tendons to be compromised in patients with diabetes because of less fibroblast proliferation and lymphocyte infiltration in healing tendons associated with tendon weakness. Owing to the inconclusive findings associating DM with tendon re-tear risk after arthroscopic rotator cuff repair, the purpose of this meta-analysis was to determine whether patients with DM have a higher risk of tendon re-tear after arthroscopic rotator cuff repair.

### Materials and Methods

A systematic review was conducted. Inclusion criteria were articles written in the English language that included patients undergoing arthroscopic rotator cuff repair surgeries, reported the numbers of patients with and those without DM, and reported the number of rotator cuff retears. Data relevant to this study were extracted and statistically analyzed. Random-effects models were used to generate pooled odds ratio estimates and CIs.

### Results

A total of 160 studies were identified from the initial search, and 5 of them met the inclusion criteria. A total of 1065 patients (207 patients with DM and 858 patients without DM) were included. The pooled results showed that the patients in the DM group had a significantly higher tendon re-tear risk than did those in the non-DM group (relative risk, 2.25; 95% CI, 1.14-4.45; P=0.02).

### Discussion

This study has some limitations. First, only 2 of the included studies classified the patients with DM into controlled and uncontrolled groups. Therefore, the effect of glycemic control could not be illustrated in the current study. Second, all included patients underwent arthroscopic rotator cuff repair surgeries. However, some of them underwent double-row suture bridge techniques, whereas the rest underwent single-row rotator cuff repairs.

### Conclusions

Patients with DM have a 2.25 times higher risk of tendon re-tear after arthroscopic rotator cuff repair compared with patients without DM.

## Home-based Rehabilitation with Mobile APP Assistance versus Supervised Physical Therapy for Patients after Arthroscopic Rotator Cuff Repair — A Prospective Comparative Study 旋轉肌腱破裂修補術後利用手機 APP 行居家自主復健之前瞻研究

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### Introduction

Shoulder stiffness and rotator cuff re-tear are still the most common complications after arthroscopic rotator cuff repair. The crucial point is post-operative rehabilitation but an optimal form is still controversial. This is a prospective cohort study comparing two forms of rehabilitation after arthroscopic cuff repair. The hypothesis was that there would be no difference of clinical results between the home-based rehabilitation and supervised physical therapy at 24 weeks post-operatively.

### Materials and Methods

42 patients (mean age, 52.7 years; range 35—65 years) with small- or medium-sized rotator cuff tear undergoing arthroscopic repaired were recruited. 22 patients received the home-based rehabilitative exercise with mobile APP assistance and 20 patients received the supervised physical therapy. Patients were assessed pre-op and at 6, 12 and 24 weeks post-op. Functional results (the ASES and the Constant scores), shoulder active ROM and the ration of bilateral muscle strength (operative side/healthy side) in forward flexion (FF), internal rotation (IR), external rotation (ER) and abduction (ABD) were assessed. Self-reported compliance (full, partial or non-compliance) of the rehabilitation and additional cost of supervised physical therapy (instruction fee and transportation fare) were recorded. Healing status of rotator cuff was evaluated via MRI at 6 months post-operatively.

### Results

37 patients (the home-based group, n=20; the supervised group, n=17) completed the rehabilitation program and 24-week follow-up. Demographic characteristics did not differ significantly between groups. Comparing to the preoperative status, functional scores and subjective results significantly improved at 24 weeks postop in both group. For the home-based group, the mean of bilateral muscle strength ratio in FF and ABD improved from 0.47 and 0.36 at 6 weeks postoperatively to 0.86 and 0.80 at 24 weeks postoperatively. For the supervised group, the ratio in FF and ABD improved from 0.44 and 0.28 to 0.75 and 0.36. The strength of FF and ABD in the home-based group recovered significantly better than the supervised group.(p<.05) Regarding the rehabilitation compliance, there was no significant difference in two groups. Comparing to the home-based group, the additional cost ranged from NT\$16200 to NT\$22680. MRI revealed 5% (1/20) patients in the home-based group with partial re-tear and nil in the supervised group.

### Discussion

At present, mobile APP was becoming popular to educate patients on the post-operative rehabilitation because of ease of use, portability and minimal time commitment. Mobile APP could provide not only on-line demonstrations of rehabilitative exercise, but also be an interactive platform between patients and physicians. Our study demonstrated cost-benefits and safety of the home-based rehabilitation with mobile APP. Furthermore, patients exercising at home with mobile APP regained superior muscle strength. It was speculated that patients in this group had higher functional demand and better self-management.

### Conclusions

After arthroscopic repair of small- or medium-sized cuff tear, the home-based rehabilitation with mobile APP assistance is an alternative for the post-operative rehabilitation. It reduces financial burden and reaches better muscle strength recovery comparing to the supervised physical therapy.

## rKA-Total Knee Arthroplasty According to the Asian Knee Phenotypes: An Early Outcome 使用 KA 來執行全膝關節置換手術的早期預後

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### Introduction

The restricted kinematic alignment (rKA) technique in TKA aims to restore the native lower limb alignment and avoid outlier alignment of tibia component. There are still few study of rKA-TKA according to different original knee phenotypes by Huang et al . The purpose of this study was to study the distribution of Huang's phenotypes in OA knee patients and evaluate the clinical outcomes of this phenotype-oriented rKA-TKA using the generic instrument, with radiographic and functional outcomes.

### Materials and Methods

The clinical data of 70 patients (56 women, 14 men) who had undergone TKAs in our hospital were reviewed (2018-2019). All the TKAs were performed with alignment targets set according to the original phenotypes of the knee, with the r-KA method, using the generic instrument with caliper assisted osteotomy. The patients' demographics, preoperative and postoperative knee alignment angles, one-year postoperative range of motion (ROM), Forgotten knee score-12 (FJS-12) were collected and analyzed.

### Results

The 1 years survivorship was % for all cause of revision, and 100% with revision other than infection as the endpoint. The preoperative phenotypes of the knee were as follows: neutral alignment 25% (include type 1: 71.4%, type 2:28.6%), varus alignment 68% (include type 3 :16%, type 4:52%), and valgus alignment (type 5: 7%). Using our protocol, patients with different knee phenotypes could get similar great functional improvement though the postoperative alignment parameters were significantly different between the knee phenotypes.

### Discussion

Though Mechanically Aligned TKAs still prevalent but it seems KA aligned TKAs had early recover outcome. Of course, our study limited in single institute and was retrospective study and not long enough for follow up.

### Conclusions

This phenotype-oriented rKA-TKA using generic total knee instruments are similar with previous Huang's KA-TKA study. Setting individualized alignment target according to original knee phenotype is a practical policy. Long-term survivorship and functional outcomes need to be evaluated in future studies.



## The Efficacy of Infected Total Knee Replacement Treated by Arthroscopy Two-Year Retrospective Study

關節鏡治療人工膝關節感染-兩年追蹤之回顧性文獻

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### Introduction

Infection of total knee prosthesis is a nightmare for the orthopedist. The incidence was reported about 1%.

Many of strategies have been used to improve the infectious process. There were some reports revealed that arthroscopy debridement and irrigation for the initial infected total knee arthroplasty improve the infection status. Here we present 6 cases of the infected total knee arthroplasty treated by arthroscopic debridement, we compare the outcome including laboratory data , radiographic examination and the revision rate.

### Materials and Methods

From January 2018 to December 2020, six patients were diagnosed as periprosthetic joint infection of knee. We recorded these patients' symptoms and clinical course. We also collected laboratory data including white blood cell(WBC) count, c-reactive protein(CRP), erythrocyte sedimentation rate(ESR); also the duration of the antibiotic treatment and the revision rate.

### Results

Two of these six infected cases need a second arthroscopic debridement. There was one case eventually received revision of total knee replacement. The blood cultures were negative in all of the cases. Meanwhile, the most common species yielded from synovial fluid culture was Staphylococcus aureus. Others were Staphylococcus epidermis, Salmonella and E.coli. The white blood cell count was not correlate with infection status. Except the revision case, the c-reactive protein(CRP) declined in most of the cases and the erythrocyte sedimentation rate(ESR) declined in all of the cases. Most patients claimed to have clinical symptoms relieved after the arthroscopic treatment.

### Discussion

Although two-stage reimplantation is considered the gold standard treatment for periprosthetic joint infection, our study found that arthroscopic debridement is capable of alleviating the infectious process. No obvious complication or comorbidity occurred. There are a few limitations of this study. First, the sample size is too small to give statically significant result. Second, it need more time to follow up.

### Conclusions

For patient with acute infection of total knee arthroplasty, there is still a role for arthroscopic treatment.

## Tips and Tricks of Anatomical Double Bundle ACL Reconstruction with Extra-Articular Anterolateral Ligament Reconstruction and Internal Brace

### 解剖重建雙束前十字韌帶及關節外前外側韌帶與人工韌帶置入

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#### Introduction

Double-bundle (DB) Anterior cruciate ligament reconstruction (ACLR) with internal brace augmentation with suture tape and additional reconstruction with anterolateral ligament (ALL) is to provide possible efforts to decrease the residual anterior and rotational instability

#### Materials and Methods

Indication for anatomic DB ACLR and ALLR with hamstring autograft and internal bracing was 1. Grade 2 pivot shift or greater; 2. athletes participating in pivoting contact sports; 3. Severe anterior laxity with side-to-side difference >10 mm; 4. The length of ACL footprint on the femoral and tibial sides must be >14mm; 5. The width of femoral intercondylar notch must be > 12mm. The patient was positioned supine with a leg holder. Bony landmarks were marked as follows: lateral and medial joint lines, lateral femoral epicondyle, tibial tuberosity, fibular head, Gerdy's tubercle, and anterolateral ligament footprint.

#### Results

AM bundle was used with semitendinosus with EndoButton; gracilis was without folding as PL bundle and ALL graft. Femoral AM tunnel was drilled through anteromedial portal (AMP) and the PL tunnel was drilled through anterolateral portal (ALP) in an outside-in manner. The tibial drill guide was aimed about 2 cm below ACL tibial tunnel and drilled lateral to medial tibial ALL tunnel. Gracilis graft with Fibertape was passed from the tibial ACL tunnel to the femoral PL tunnel intra-articularly and exited from lateral thigh. Thereafter, the AM bundle suture tied with EndoButton was shuttled proximally until the button was flipped and fixed on the femoral cortical surface. A hydroxyapatite interference screw was used to fix the PLB and tibial end in the tibial ACL tunnel of both grafts. At last, the single gracilis and FiberTape were shuttled from the lateral end of the femoral PL tunnel, underneath the iliotibial band, to the lateral end of the tibial ALL tunnel as the ALLR. Gracilis and FiberTape were tied together with augmentation fixation.

#### Discussion

The objective of this technique is to provide any possible effort to decrease the residual anterior and rotational instability following ACLR and ALLR. Anatomical ACL reconstruction (ACLR) with additional procedures could probably be necessary for patients with increased preoperative rotational instability. Suture tape augmentation has been proposed to be used along with allograft or autograft ACLR with lower failure rates than the conventional ones.

#### Conclusions

In the current study, we develop this technique is to provide DB ACLR with ALLR at the same time. Further clinical results should be followed to see its clinical significance in reducing residual rotational instability in comparison to conventional ones.

## Transosseous Equivalent Repair with Double Row Suture Bridge Fixation in Patients with Posterior Cruciate Ligament Tibial-Sided Avulsion Fracture—Case Series

使用雙排縫合鉗釘內固定手術治療後十字韌帶脛骨側扯裂性骨折—病例系列

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### Introduction

Posterior cruciate ligament (PCL) tibial-sided avulsion fractures are relatively rare knee injuries in the Western world. However, in countries where motorcycle accidents are more frequent, these injuries are more common. While surgical intervention is generally suggested for displaced PCL bony avulsion fractures, the optimal surgical technique remains a controversial topic in knee surgery. Here we present the following cases treated with transosseous equivalent repair technique to investigate the reduction quality and clinical outcomes.

### Materials and Methods

Between July 2016 and January 2019, 10 patients with PCL tibial-sided avulsion fracture received transosseous equivalent repair surgery at our institute. Open reduction was performed and the avulsion fragment was fixed by double row fixation with one suture anchor and two footprint anchors. The reduction quality was evaluated with serial follow-up radiography at 3 months, 6 months and one year post-operatively, and compared with the uninjured opposite knee. Preoperative and postoperative pain severity changes were recorded by visual assessment scale (VAS) and patient-reported functional outcomes were evaluated by Lysholm score, International Knee Documentation Committee (IKDC) score and knee injury and osteoarthritis outcome score (KOOS). The operative time was also recorded.

### Results

The mean age of our cohort was 40.2 years (19-70). Six of the patients had type 3 avulsion fracture and four of the patients had type 2 avulsion fracture. The mean operative time was 75.3 minutes (55-100). The operative time was counted from skin incision to complete wound closure. Two of the patients suffered from multiple injuries and received concomitant surgery at the same time so their operative time were excluded. During up to 4 years follow-up, no displacement of fractured fragment was noted on radiography. The stress view of both knees showed no instability in all the cases, while compared with the healthy opposite knee. The mean 10-cm VAS decreased significantly from 2.8( $\pm$ 0.9) preoperatively to 0.6( $\pm$ 0.8) postoperatively ( $p < 0.005$ ). The mean postoperative Lysholm score was 92.5( $\pm$ 8.9), IKDC score was 77.6( $\pm$ 7.7) and KOOS score was 92.5( $\pm$ 5.7).

### Discussion and Conclusions

Transosseous equivalent technique has been widely use in rotator cuff repair with fair outcomes. However, studies evaluating such technique in PCL avulsion fractures was relatively rare. Our data showed transosseous equivalent repair technique achieved good functional improvement and symptom relief without noted complications. The procedure also provided promising fixation by optimizing tendon-to-bone contact dimensions and no secondary displacement was noted in our cohort. In conclusion, transosseous equivalent repair technique provided reliable bony fixation for PCL tibial-sided avulsion fractures as well as considerable functional improvement and pain relief.

**Spontaneous Knee Fusion after Soft Tissue Injury: A Case Report and Literature Review****軟組織傷後引發之自發性膝關節融合-病例報告及文獻回顧**

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**Introduction**

Spontaneous knee fusion is a rarely reported clinical challenge, which leads to functional impairment and low quality of life. Conversion of a fused knee to total knee arthroplasty (TKA) has been demonstrated to improve the range of motion (ROM) but concluded technically demanding and prone to complications. We report the short-term result of TKA combined with pie-crusting release of quadriceps in a patient with spontaneous and progressive knee fusion from soft tissue injury around the knee region. Detail surgical technique and literature review is presented on a best effort basis.

**Materials and Methods**

A 26-year-old female suffered from a motorbike accident which caused extensive soft tissue loss and open joint injury over right knee region. The soft tissue was reconstructed with staged reverse gastrocnemius flap and split thickness skin graft after a serial of debridement and wound care. However, progressively loss of motion to spontaneous knee fusion developed after a long-term immobilization. We performed TKA with pie-crusting release of the quadriceps tendon three years since the fusion was initially diagnosed. The clinical data were recorded with the use of the Knee society score (KSS), Hospital for Special Surgery (HSS) knee rating system and the knee ROM, preoperatively and postoperatively at one-month, three-month and final follow-up.

**Results**

The ROM increased from preoperative 0° to 90° at one-month, 85° at three-month and 80° at six-month follow-up. The KSS improved from 56 points to 74 points; the HSS knee rating system improved from 57 points to 89 points. There was no postoperative extensor lag and knee instability on manual stress testing recorded. The patient was satisfied with the regained quality of life as she had been gradually independent in daily activity.

**Discussion**

Spontaneous knee fusion usually occurred from advanced inflammatory arthritis or bony traumatic arthritis. In the literatures over the past five decades, only ninety-two cases of clearly defined spontaneous ankylosis of the knee were reported; twenty-two of these cases were involved in infectious events. Two patients chose to live with an ankylosed knee, and twenty received TKA conversion. Although high satisfactory rate had been achieved, but limited ROM, extensor weakness and infection remain as the main concerns of TKA.

**Conclusions**

Comprehensive surgical planning should include the ways of arthrotomy, sequence of gaps creation, soft tissue release and degrees of constraint of prosthesis. Preparation of flap coverage for wound closure should also be made before surgery.

# Free Paper

# 壁報論文

## Major Complications Following Total Knee Replacement in a Polycythemia Vera Patient: A Case Report and Literature Reviews

真性多紅血球症病患接受全人工膝關節置換後之嚴重併發症：病例報告及文獻回顧

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### Introduction

Polycythemia vera (PV) is a stem cell disorder giving rise to the proliferation of clones of hematopoietic precursors, arising from a mutation in the JAK-2 gene. Hematocrit is usually found to be >54% in these patients. Diagnosis is made by pan-elevation of the 3 cell lines, as well as a low erythropoietin level. When there is increase in the hematocrit beyond 50%, there is increased viscosity of blood, resulting in increased risk for thrombo-embolic complications. New evidence suggests that PV patients may also suffer from hemorrhagic complications. We report one PV patient who had major complications after total knee placement (TKR).

### Case report

This is a 78-year-old man with history of hypertension and ischemic stroke. He suffered from right knee pain for more than ten years and was diagnosed of knee osteoarthritis. Routine hematologic investigations revealed hemoglobin level of 21.4 g/dL, hematocrit of 73.6%, total WBC count of 7,500/ $\mu$ L, and a platelet count level 3.57 lakhs/ $\mu$ L. Serum erythropoietin level was subnormal (<1.00 mIU/mL). JAK2V617F mutation was detected and the diagnosis of PV was confirmed. After adequate hydration, he received TKR with uneventful intra-operative course. However, massive bullae formation with progression was noted over operated knee on postoperative day (POD) one. Dorsalis pedis pulsation was not palpable at the same day. Vascular sonograph showed right posterior tibial artery total occlusion. Plavix and Pletaal were prescribed as cardiovascular surgeon's suggestion. On POD5, the patient had high fever, abdominal pain, jaundice and shock. Lab data showed leukocytosis, direct type jaundice, acute kidney injury, and elevated CRP level. Under the impression of sepsis with suspect wound infection, toxic shock syndrome and intra-abdominal infection, Targocid, Mepem and Clindamycin were given as infection specialist's suggestion. However, conscious change, shock with multiple organ failure progressed. After discussing with his family, do not resuscitate (DNR) form was signed and he was discharged against medical advice on POD8.

### Discussion

PV is considered when hematocrit is >48% in women and >52% in men. Hematocrit levels >60% can be life threatening; and are at risk of venous and arterial thrombosis. The treatment modalities include phlebotomy and myelo-suppressive therapy with hydroxyurea. Recent retrospective database review showed PV significantly associated with deep vein thrombosis (DVT), pulmonary embolism (PE) and surgical site infection following primary TKR. A guideline for management PV patients suggested preoperative phlebotomy to bring down the hematocrit and adequate hydration to lower the risk of both thrombosis and hemorrhage in such patients in the peri-operative period. In our case, phlebotomy should be considered before TKR to avoid thrombosis risk.

### Conclusions

PV are associated with DVT, PE and surgical site infection after TKR. Phlebotomy, adequate hydration, and recognition of thrombotic and bleeding problems are the keystones in the successful surgery of such patients. Our case demonstrates major complications following TKR in a PV patient.

## Patella Component Loosening – A Case Report 全人工膝關節置換後髌骨部件鬆脫之案例報告

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### Introduction

Replacement of the patella during total knee arthroplasty (TKA) remains controversial. Despite some attempts to establish guidelines for this procedure, there is still no consensus in the literature. When the patella is replaced, the patient is subjected to certain complications, including loosening of the component. The loosened patellar component most commonly migrates to the intra-articular region of the knee.

### Materials and Methods

An 83-year-old man who had under-gone cemented TKA (Zimmer) 9 years earlier presented at a routine annual outpatient consultation with loosening the patellar component of the prosthesis. He reported no pain or signs of local infection. The integrity of the knee extensor mechanism was preserved, with active and passive range of motion from 0 to 110. Radio-graphs performed on hospital admission showed that the tibial and femoral components of the TKA did not have signs of loosening, the remaining part of the patella bone had no signs of fracturing or osteonecrosis, and the patellar component was half inside and half outside the anterior soft tissues of the knee.

### Result

The patient was taken to the operating room for removal of the patellar component. Two weeks postoperatively, the wound had healed well and the stitches across the incision were removed. The patient maintained the initial knee range of motion, with a complete extensor mechanism and no reports of pain. Evaluations performed 1, 3, and 6 months postoperatively found that the patient was asymptomatic with preserved function.

### Discussion

The current case involved extra-articular migration of the patellar component a long time after TKA. There had been no lateral release and the patella was complete on radiographs. Thus, the likely etiology was aseptic loosening of the component. Even after the component had loosened, the patient reported none of the complaints that are common in this situation, such as pain or restriction of knee movements. The patellar component alone was removed and the femoral and tibial components were left in place because they showed no signs of loosening.

### Conclusions

The current case is unique because the transcuteaneous migration evolved asymptotically and occurred with a complete patella, without signs of osteonecrosis. This emphasizes the need for periodic radiographic follow-up after TKA.

**Venous Carrying Vascularized Sural Nerve Graft for Facial Nerve Reconstruction****腓腸神經營養血管皮瓣重建顏面神經缺損**

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**Introduction**

Transection of facial nerve due to parotidectomy often results in the facial movement disturbance of the patient. Functional recovery after reconstruction with conventional nerve grafts is unsatisfactory due to several risk factors such as irradiation and poor wound bed condition. Recent clinical studies and series on the surgical methods of facial nerve reconstruction is limited and without consensus. We describe a case using a venous flap carrying vascularized sural nerve graft for facial nerve reconstruction.

**Materials and Methods**

A patient who diagnosed as parotid adenocarcinoma and underwent parotidectomy received a free venous flap carrying vascularized sural nerve graft to reconstruct facial nerves. The aim was to restore both facial movement function and improve life quality.

**Results**

The final diagnosis of the patient was parotid adenocarcinoma, pT4aN1cM0, stage IVA. Patient was discharged post operatively on day 9 without any unforeseen events or complications. The patient was followed up post operatively on day 11 to monitor his progress. We observed that the patient could close the right eye. The patient started adjuvant radiotherapy post operatively on day 30 with total 66Gy in 33 fractions. There was no influence to the function of vascularized sural nerve flap such as facial movement or blood supply under survey of Doppler.

**Discussion**

Venous flaps carrying vascularized sural nerve has never been used in the reconstruction of facial nerves after total parotidectomy. The treatment of facial nerve palsy is challenging and the facial movement disturbance caused by the tumor ablation of parotid gland needs to be treated immediately. Most recent reported cases have discussed reconstruction of nerve defects of the facial nerve with the muscle transfer and direct visible monitor flap. We used venous carrying vascularized sural nerve grafts without muscle and skin transfer for immediate reconstruction of the facial nerve in patients.

**Conclusions**

We describe a new surgical technique for facial nerve reconstruction in a patient with facial nerve transection after parotidectomy with favorable results. Using a venous flap carrying free vascularized nerve graft can provide a better vascularized environment for nerve regeneration and functional recovery.



**Combining Unicompartmental Knee Replacement And ACL Reconstruction : A Case Report and Literature Review****合併部分人工膝關節置換術與前十字韌帶重建手術：病例報告與文獻探討**施翰廷<sup>1</sup> 李坤燦<sup>2</sup> 李政鴻<sup>3</sup>

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**Introduction**

ACL deficiency or absence was used to be considered as contraindication to UKA. High prosthesis failure rate associated with early loosening of the tibial plateau was noted under this procedure. However, recent literature had shown to provide a valid alternative for young adults with unicompartment osteoarthritis (OA) and ACL rupture. We reported a case of combining of lateral unicompartmental knee arthroplasty and ACL reconstruction, and conducted literature review for this procedure.

**Materials and Methods**

This was a 44-year-old male without systemic disease before. He had persisted left knee pain after traffic accident for 7 years. Further MRI revealed ACL chronic tear and LM degenerative tear. Therefore, he visited our hospital where PE showed tenderness over left lateral joint line. Under the impression of left lateral compartment OA knee and ACL chronic tear, he received lateral unicompartmental knee replacement with ACL reconstruction in September 2018.

**Results**

The patient had improved ROM and subsided pain after operation, with post-operative ROM: -5° to 125°. There was no surgical complication noted.

**Discussion**

There were two kind to disease process of OA knee and ACL deficiency. First, progressing OA change with osteophyte formation narrowed the intercondylar groove and further destroyed the ACL. Second, chronic ACL injury might increase anterior tibial translation. Further injury to the posteromedial corner, rupture of the internal meniscus might damage to knee cartilage. This difference might explain conflicting reports following partial arthroplasty in ACL-deficient knees. According to literature review, candidates for combined UKA and ACL reconstruction were Young adults and those with history of knee joint instability secondary to post-traumatic ACL rupture.

**Conclusions**

In young and active patients with unicompartmental OA secondary to ACL rupture, combined ACL reconstruction with UKA may be indicated. In cases of ACL rupture secondary to progressive OA, total knee replacement may be preferred.

**Effect of Biologics on the Risk of Venous Thromboembolism**  
**生物製劑對於靜脈栓塞的影響**

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**Introduction**

In the United States, 100,000 to 300,000 patients die from venous thromboembolism (VTE) each year, with more than 500,000 people related hospitalizations. While in Europe, 500,000 people die from VTE each year. The use of biologics in patients with rheumatoid arthritis may be associated with an increased risk of VTE. However, this should be confirmed by further investigation.

**Materials and Methods**

This study investigated the risk and related factors of VTE in patients with rheumatoid arthritis using different disease-modifying anti-rheumatic drugs (DMARDs) in Taiwan. The study was a retrospective national population-based observational study. We identified all patients who had been newly approved for Catastrophic Illness Card of rheumatoid arthritis extracted the claims data from the National Health Insurance research database (NHIRD) and Registry for Catastrophic Illness Patient Database (RCIPD) from 2003 to 2016. VTE was defined as the presence of inpatient VTE diagnostic codes (including DVT or PE) according to the discharge diagnosis protocol.

**Results**

An analysis of VTE variables indicated that the incidence of VTE in the biologic group (14.33/10,000 person-years) was higher than that in the conventional drug group (12.61/10,000 person-years). As assessed by the Cox proportional hazards model, the relative HR for VTE in the biologic group versus that in the conventional drug group was 1.11 (95% CI: 0.79–1.55), but did not reach a significant difference.

**Discussion**

Patients with rheumatoid arthritis using (DMARDs) may be associated with an increased risk of VTE. According to our study, however, the use of biologics did not increase risk of VTE.

**Conclusions**

This study found no significant differences in risk were observed between the use of conventional DMARDs and biologics.

**Bilateral Valgus Knee Deformity after High Tibial Open Wedge Osteotomy in a Patient with End-Stage Knee Osteoarthritis: A Case Report****雙膝退化性關節炎經高位脛骨截骨矯正術後膝關節外翻：病例報告**

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**Introduction**

High tibial osteotomy (HTO) is a common surgical intervention for patient with isolated medial compartment knee osteoarthritis. A medial open wedge valgus HTO was performed to off-load the excessive load to the lateral compartment. Complication followed by HTO such as peroneal palsy, popliteal artery injury, hardware failure, malcorrection have been reported in literature. We present a case of bilateral knee end-stage osteoarthritis with bilateral knee valgus deformity after receiving bilateral HTO.

**Materials and Methods**

A 76-year-old man presents to the orthopedic clinic bilateral knee pain. The patient previously received bilateral high tibial osteotomy for bilateral end-stage knee osteoarthritis 5 years ago. Persisted symptoms after the surgery and the implant was removed after radiological union. However, x-ray showed bilateral valgus deformity with stage IV osteoarthritis over the medial compartment. A revision right total knee arthroplasty were performed individually in 2020. VAS and KOOS scores improved after the surgery and satisfactory surgical outcome reported by the patient.

**Results**

Bilateral stage IV knee osteoarthritis with varus deformity preoperatively were found in 2015. However, bilateral knee valgus deformity were recorded after high tibial osteotomy, 7 and 8 degrees of valgus deformity in the left and right knee respectively. Joint-line obliquity were found with marked medial compartment joint space narrowing despite of overcorrection of the varus knee with medial high tibial open wedge osteotomy. Revision right total knee arthroplasty was performed in 2020 improved the valgus knee to 3 degrees of valgus and improved ROM and VAS.

**Discussion**

According to protocol developed International Society of Arthroscopy, Knee Surgery and Orthopedic Sports Medicine (ISAKOS), high tibial osteotomy (HTO) was contraindicated in patient older than 65 years old, severe osteoarthritis of the medial compartment, ROM <120 degrees and flexion contracture >5 degrees. Despite valgus overcorrection in this patient off-loading showed no benefit in the operated knee, which also showed joint line obliquity in this patient. Thus, total knee arthroplasty could be a better treatment option in this patient.

**Conclusions**

High tibial osteotomy showed excellent results in literature in highly selected patient. Total knee arthroplasty should be a better treatment option in end-stage knee osteoarthritis.

## Total Hip Arthroplasty via Direct Anterior Approach for Developmental Dysplasia of the Hip – A Case Report

### 發展性髖關節發育不良經正前入路行全髖關節置換術之病例討論

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#### Introduction

Developmental Dysplasia of the Hip (DDH) is a disorder of abnormal development resulting in a shallow acetabulum with lack of anterior and lateral coverage, and often treated typically involves periacetabular osteotomies (PAO) for those with concentrically reduced hips with congruous joint space and total hip arthroplasty (THA) for those presenting with end stage osteoarthritis (OA). About 10% of all THA are performed as a result of dysplasia. Risk factors were breech presentation, female, primiparity, and family history. Abnormal movement of the femoral head within the acetabulum due to osseous and soft tissue abnormalities leads to overload of the acetabular rim leading to secondary OA.

#### Materials and Methods

A 59-year-old female patient, with past history of laparoscopic cholecystectomy, suffered from left hip pain with limited range of motion, especially abduction and flexion for many years. Pelvic plain film revealed left hip advanced OA and DDH, Crowe grade II and Hartofilakidis type B. Due to above, THA was suggested via direct anterior approach.

#### Results

During surgery, operation time was 120 minutes, and estimated blood loss was about 400ml, without blood transfusion and vital sign was stable. Patient walked with assistance in post-operation day 1 with normal muscle power without other neurologic symptoms. Post-op plain film revealed good prosthesis alignment. In opd two weeks later, walking status was smooth with well wound condition.

#### Discussion

DAA in THA was popular recently because of advantages such as decreased dislocation rate when compared to posterior approach, less abductor mechanism damage compared to anterolateral exposure.

Other unsupported advantages were decreased muscle injury, less post-op pain and quicker recovery.

Nevertheless, disadvantages were still exist such as steep learning curve, complication rates decrease after 100 plus procedures; surgical site infection rates increased in obese patients with large abdominal pannu; femoral exposure can be challenging and may require special operating room for increased exposure, lateral femoral cutaneous nerve paresthesias and intraoperative fracture rate may be higher.

#### Conclusions

Secondary hip OA resulting from DDH was more challenging because of more probability of femoral head dislocation superior to the true acetabulum, which may lead to inadequate reaming site compared to primary OA. However, we can overcome this problem through DAA with fluoroscopy assistance and may obtained better anteversion and inclination. Although DAA has pros and cons, practice makes perfect and most of disadvantage can be avoided.

## **Piriformis-Sparing Minimally Invasive Posterior Approach for Total Hip Arthroplasty-Surgical Technique and Literature Review**

人工髖關節置換梨狀肌保留微創後側入路-手術技巧及文獻回顧

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### **Introduction**

The standard posterior approach has been a popular and reliable approach for total hip arthroplasty (THA) surgery since it was popularized by Moore in the 1950s. Less invasive approaches aiming to minimize soft tissue trauma around the hip have become increasingly popular. Khan described a piriformis-sparing minimally invasive (PSMI) posterior approach involving a shorter incision and preservation of piriformis tendon and quadratus femoris, hypothesizing that hip stability would be improved as a result of preservation of soft tissues, and that postoperative recovery and rehabilitation would be quicker. We reported our surgical technique of piriformis-sparing minimally invasive (PSMI) posterior approach.

### **Surgical Technique**

The operations were performed by single experienced hip surgeon with two or three assistant. The patient is placed in the lateral decubitus position. Leg lengths are noted and the leg positioned in 45 of flexion at the hip and 90 of flexion at the knee. A 7-cm incision is made, starting 1 cm proximal to the greater trochanter tip along the axis of femur. Sharp dissection is continued to gluteus maximus and fascia lata. The leg is internally rotated with the hip in slight flexion and gravity adduction. A pointed Hohmann retractor is placed under the posterior edge of gluteus medius and over the femoral neck (thus retracting gluteus medius anteriorly) to expose the posterior structures. Piriformis tendon is divided and retracted with curved retractor. The capsulotendinous flap is incised along the inferior border of piriformis from the edge of the acetabulum to the posterior border of the femur in an “L” shape. The posterior capsule and tendons of the gemelli and obturator internus are detached as one from their insertion. Quadratus femoris may be partially detached. Once the femoral head has been dislocated, the neck is osteotomized. The acetabulum was exposed by Hohmann retractors. Inferior capsulotomy was done and trans-acetabular ligament was exposed. The acetabulum is then reamed in the normal manner and the cup inserted. The femur is presented by flexing, adducting, and internally rotating the hip. The femur is then prepared with broaches, placed in 20 degrees of anteversion. posterior capsulotendinous flap was repaired through two drill holes in the bone. The remaining tissues are closed in layers.

### **Discussion**

Goals of THA surgery are to relieve pain, improve function, and to achieve stability. Potential gains in these areas may be made by examining postoperative morphology and function of the muscles around the hip. Khan et al developed a “Less Invasive Total Hip Arthroplasty” which showed revealed less blood loss, shorter hospital stay and greater improvement in WOMAC scores for up to 1 year. A prospective study by Tan et al in 2019 showed improvement in piriformis muscle volume and muscle grade in the piriformis-sparing group compared to the standard group. preservation and superior bulk and quality of the piriformis muscle seen on MRI may reduce patients’ risk of dislocation.

### **Conclusions**

This approach is safe and relatively easy to perform. It is truly soft tissue sparing and therefore warrants the title less invasive.

## Control of Leg Length Discrepancy Using Short-Stem Femoral Prosthesis in THA Patients with Dorr A Femur

在 Dorr A 型股骨之人工髖關節病人使用短柄股骨柄控制術後雙腿不等長之使用經驗

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### Introduction

Proximal femur morphology is critical to both long-term survival of total hip arthroplasty (THA) implants and postoperative leg length discrepancy (LLD). Dorr classification is a good guide for selection of THA implants. Based on canal-to-calcar ratio, type A-C femur morphologies were defined. Dorr A femur has the lowest canal-to-calcar ratio and the highest cortical thickness ratio, making it more challenging THA implants selection. The distal portion of standard tapered stems might caught up in the narrow canal of diaphysis while the proximal portion not large enough to fit the wide metaphysis in Dorr A femur. Therefore, the post-operative leg length becomes difficult in Dorr A femur, especially in short-stature Asian female patients with small-size femur and short neck. In these circumstances, using of smallest-sized standard-length tapered femoral stem will still result in overlengthened leg length because the femoral stem cannot sit deep enough in Dorr A femur. In our opinion, the latest-developed short-stem tapered implants might be suitable in these cases. Here, we provided our experiences in applying short femur tapered stem THA in 3 short-stature Dorr A patients.

### Materials and Methods

These 3 patients were 52, 66, 70-year-old ladies. 2/3 have diabetes/ hypertension. One had early-stage colon cancer s/p endoscopic tumor resection. They came to our clinic due to affected side hips pain with positive Patrick's test/ difficulties wearing shoes for >6 months. Conservative treatments were provided with unsatisfactory responses. Pelvic AP/ lateral plain films showed hip advanced osteoarthritis (Tonnis grade 3) with Dorr A type femur (based on canal-to-calcar ratio/ cortical thickness ratio). After optimized their underlying conditions (Controlled HbA1C<7.5), they received THA (United UTS stem hip system) by single surgeon in single center. We completed preoperative templating using PACs imaging system and its modules for template. We used piriformis-sparing MIS posterolateral approach. Acetabular components were applied following routine fashion (TAL anatomical guide). Femur short tapered stem were applied with broaches and press-fit technique.

### Results

Postoperative evaluation of implant positions: as routine in acetabular component; femur component, good canal fill ratio >87% with LLD <2mm noted. Postoperative cares were smooth for all patients with ward THA PT training as our hospital's routine.

### Discussion

Dorr A femur is a challenging for joint reconstruction surgeons. With latest review articles showing much higher prevalence of Dorr A in eastern Asian population, understanding of such femur types is needed. Higher long-term failure rate/periprosthetic fracture/aseptic loosening rate has been reported in such hip. Also, LLD/ implant valgus position might cause immediate challenges during operation. Short femur tapered stem, as United UTS system might provide potential solution for these hips.

### Conclusions

Special technique and evaluations both pre-/ post-operatively are needed for such Dorr A hips and latest short femur tapered stem implants. We provided with our 3 successful cases experiences.

**Polyethylene Liner Fracture after Total Hip Replacement – A Case Report****全髖關節置換後聚乙烯全髖臼內襯斷裂-病例報告**

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**Introduction**

Polyethylene liner fracture is a rare complication following total hip replacement. Although uncommon, it can lead to serious sequelae and surgical management is required. Here, we described a cast of total hip dislocation following polyethylene liner fracture

**Materials and Methods**

We described a case of 65 years-old male with polyethylene liner fracture presented as dislocation 5 years after primary total hip arthroplasty at ER department. After failed closed reduction at ER, we shifted to open reduction at operation room where a 0.5cm polyethylene liner fracture was noted. We revised the broken insert with a new insert.

**Results**

No further dislocation or instability were noted after the operation. The patient regained good ROM and functional outcome after rehabilitation. No complications were noted during follow up

**Discussion**

This complication typically occurred in a region of thin and/or unsupported polyethylene. It is likely to be initiated at the rim-dome junction and propagate superficially to the articular surface. In a review published in the journal of arthroplasty in 2014 which reported the voluntary reports of fractured liners to the US FDA, only 74 reports of fractured Trilogy, Longevity (Zimmer) liners during 1999-2013. Possible risk factors includes: highly cross-linked polyethylene (HXLPE), a combination of small shell and large head (promotes the use of a thin liner), acetabular component malposition causing a relative vertical cup, an excessive femoral neck impingement on the PE liner, an extended lip liners, a shallow initiated cracks, and a significant traumatic event/dislocation. In the presence of this complication, rapid corrective surgery is needed to avoid soft tissue damage associated with metallic debris and damage to the locking mechanism. Usually a new liner will be used in a well fixed, well oriented acetabular shell

**Conclusions**

Although uncommon, we should always keep in mind of this possible complication following total hip replacement. Revision surgery with a new insert is an effective way of treating this situation.

**One-staged Surgery to Accomplish Revision TKA for Septic TKA and ORIF for Infected Nonunion of Distal Femur with Using VA Locking Plate – A Case Report****合併使用可變角度鎖定型鋼板同時完成感染性人工關節翻修與遠端股骨感染性骨未癒合固定病例報告**

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**Introduction**

Both the revision TKA for the septic TKA and ORIF for the infected nonunion of distal femur are difficult conditions to treat respectively. However, these two situations are rarely concomitant. In general, the 2-staged operations are chosen to deal with; ORIF for the nonunion of distal femur is performed, and followed by revision TKA after the complete union of distal femur. But, it indeed takes much longer time to recovery of the limb function. We report one case who undertook the one-staged operation to accomplish revision TKA and ORIF of distal femur with using VA locking plate to proceed intramedullary guide and extended stem of femoral prosthesis successfully.

**Materials and Methods**

A 67 year-old male undertook the primary TKA due to left OA knee smoothly. However, he suffered from the left distal femoral open fracture, and unfortunately got the infected nonunion of distal femur after the serial surgeries. Besides, the left TKA got infected and had to be removed. After the infection of both distal femur and knee was controlled, the decision-making of the one-stage operation was done. We used the AO VA locking plate of distal femur as long as possible. Combining the MIS technique, the long plating was performed to fix the distal femoral fracture stably; as well, it avoided interfering with the IM guide of femur while doing revision TKA. In addition, we adjusted the condylar screws of VA plate one by one in order not to impede the IM guide and distal femoral box cutting. Eventually, we did the long-stemmed revision TKA which the stem crossed the fracture site, and plating of femur simultaneously.

**Results**

The time of this one-stage operation was 4.5 hours from cut to suture. Blood loss was 760 ml. No major or minor complications happened postoperatively. The rehabilitation programs were smooth and similarly with that of revisional TKR only. Because of the very stable fixation of distal femur, the partial weight bearing was permitted. Six months later, X-ray showed almost union of distal femur, and the walker could be discarded. The ROM of left knee was 0-90 degrees. 12 months later, flexion of the left knee could be reached to 100 degrees. Afterall, the patient felt satisfied.

**Discussion**

It was hard to make the decision of the one-stage operation to accomplish revision TKA and ORIF of distal femur because of femoral IM guiding and long femoral stem during arthroplasty. Without VA locking plating to obtain the stable distal femur, there was no chance to proceed intramedullary guiding and extended stemming and distal femoral cuts for this one-staged surgery successfully.

**Conclusions**

We reported one case who undertook the one-stage operation to accomplish concomitant revision TKA for the septic TKA and ORIF of distal femoral infected nonunion successfully. For this situation, the long VA locking plate is necessary.



**Total Knee Arthroplasty in Patient with Post-polio Syndrome (Case Report)****小兒麻痺患者全膝關節置換手術 (病例報告)**

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**Introduction**

Patients with sequelae of polio are not suitable for knee replacement surgery because of muscular atrophy and osteopenia, even if the knee joint is deformed and painful. But for patients with milder polio, there is still a chance to perform total knee replacement surgery. The first consideration is that the knee joints, including the distal femur and proximal tibia, the thickness of the cortical bones of the femur and tibia is sufficient for artificial metal plate insertion. The medial and lateral ligament of the knee joint also determine deciding what form of artificial joint to use (Primary knee, L.C.C.K or RCK).

**Materials and Methods**

A 55-year-old woman with sequelae of polio, deformed and weak left lower extremity, left quadriceps muscle and anterior tibialis were tested 0 to 1 grade before surgery. The left knee joint was deformed with genu valgum and tibia torsion. The medial joint space of left knee was narrow with leg length discrepancy that left leg was 3 cm shorter than the right leg. The patient usually walked without relying on crutches or any assistive devices. The knee joint suffered from unbearable pain due to the weakness of the knee muscles and joint deformation for years. She decided to require left total knee replacement surgery.

**Results**

The left knee undergoes primary knee arthroplasty. After the operation of the knee joint, the knee joint flexion exceeds 100 degrees, and the extension is almost full. Genu valgum & tibia torsion were corrected at the same time. It is recommended to use knee brace after the operation to avoid back knee caused by insufficient muscle strength of Quadriceps.

**Discussion**

The sequelae of polio cause knee joint disease. At the femoral and tibia ends of the knee joint, the bone cortex must be thick enough to support the artificial joint metal. If the medial and lateral ligament tendons of the knee joint are intact, the primary knee arthroplasty can be used. If the strength of the medial and lateral ligaments is insufficient, semi-constrained LCCK (constrained condylar knee), RCK (rotation constrained knee) is required. Found at the time of the operation, patient's medial and lateral knee ligaments were normal. Therefore, the use of primary total knee arthroplasty can improve knee joint deformation and relieve knee pain.

**Conclusions**

For knee joint degeneration caused by the sequelae of polio, if joint replacement surgery is to be performed, it is necessary to consider whether the patient's own bone cortex structure can support the metal stress of the human joint. Another consideration is whether the medial and lateral ligaments of the knee joint are intact, so as to decide whether to use the material LCCK or primary total knee joint prostheses.

## Intertrochanteric Valgus and Lengthening Osteotomy to Treat Proximal Malunion and Leg Length Discrepancy: A Case Report

以轉子間外翻及延長切骨術來治療近端股骨癒合不良併長短腿 - 個案報導

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### Introduction

Varus malunion or nonunion is one of the most common complications following inadequate treatment of hip intertrochanteric fracture. Varus displacement results in limb shortening, gluteal muscle imbalance, and limp and overloading of the knee joint and lumbar spine. A dedicate intertrochanteric valgus osteotomy is often required to restore the biomechanics of lower limb. Here we described a case with left proximal femur marked varus and posterior angulation deformity, as well as 5 cm leg length discrepancy, undergoing 2-plane osteotomy to restore normal alignment.

### Materials and Methods

A 60 years old retired police man presented limping and left hip pain for 20 years. According to his statement, he sustained left proximal femur fracture after a fall to valley 20 years ago. Surgery was done then, however, the recovery was not satisfactory. Physical exams found a leg length discrepancy about 5 cm. Radiographic study further showed malunion of left proximal femur with marked varus deformity and posterior angulation.

The patient underwent valgus osteotomy to correct the coronal and sagittal alignment, and concomitantly adjust leg length discrepancy, by dynamic hip screw. However, nonunion of the osteotomy and implant failure were noticed at postoperative 7 months. A revision surgery was performed with longer DHS, and augmented with allogenuous bone plate. Autogenous bone graft from PSIS was also used.

### Results

After 1 year follow-up of the 2nd revision surgery, the patient returned to normal activity and radiographic union was reached. Lower limb scanography showed slightly lengthened left lower limb by 2 cm. There was no neurological deficit. The patient also tolerated the LLD well.

### Discussion

The reason of failure of 1st surgery in our patient was due to severe sclerotic change of the proximal femur after malunion. So autogenous bone grafting and bone plate augmentation were needed to enhance healing of the osteotomy.

### Conclusions

The technique of valgus intertrochanteric osteotomy for different diagnoses (osteoarthritis, posttraumatic nonunion and malalignment, avascular necrosis of the femoral head) was developed for a long time, and the results were mostly encouraging. Dynamic hip screw or fixed angle plate were often used. The operation required proper preoperative planning and accurate osteotomy designing.

## Failure of Bearing Exchange for Bearing Dislocation of Oxford Unicompartmental Knee Arthroplasty

針對牛津單髁人工關節墊片脫臼進行單純更換墊片手術的失敗案例

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### Introduction

Bearing dislocation is a rare complication after mobile-bearing unicompartmental knee arthroplasty (UKA), the rate of bearing dislocation in medial UKA ranges from 0.5% to 5% in the medical literature. Here we present a case of mobile-bearing dislocation at 4 months after unicompartmental knee arthroplasty, and re-dislocation after operation of exchange a thicker insert.

### Materials and Methods

The 58 years old female underwent Oxford mobile-bearing unicompartment knee arthroplasty due to osteonecrosis of medial femoral condylar of left knee. Postoperative recovery was satisfied. However, the patient complained severe knee pain when walking at 4 months after UKA, and the radiograph showed anterior dislocation of bearing.

### Results

Revision of dislocation of UKA was performed. During the operation, the anterior/posterior cruciate ligaments, medial collateral ligament (MCL) were intact, and the femoral/tibial components were all well-fixed. No residual osteophyte or loose bodies were found in joint space. Exchange a thicker insert was performed.

However, re-dislocation of bearing occurred at one month after revision surgery. Finally, the patient underwent another revision surgery with a posterior-stabilized total knee arthroplasty.

### Discussion

According to the current literature, most (about 55%) of the bearing dislocations occurred within 2 years. Risk factors of early bearing dislocation related to poor surgical techniques. In general, bearing exchange or conversion to total knee arthroplasty are the preferred treatment options. In the literature, a high rate (50%) of bearing re-dislocation after isolated, mobile bearing exchange for bearing dislocation following medial UKA.

### Conclusions

Bearing exchange as a sole treatment should be carefully considered in selected patients with correctable causes. If the cause of bearing dislocation cannot be determined or corrected during revision unicompartmental knee arthroplasty, conversion to total knee arthroplasty may be an optimal operation for definite treatment.

## Bilateral Total Knee Arthroplasty after Open Wedge High Tibial Osteotomy—A Case Report 開放式高位脛骨切骨術後之雙側全膝關節置換手術

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### Introduction

Total knee arthroplasty (TKA) for OA knees after failed close wedge high tibial osteotomy (HTO) is not uncommon. The difficulty in surgical exposure, poor wound healing and less favorable outcome were the problem the surgeon may face. But there are few reports of TKA for failed open wedge HTO. Dose the TKA in failed open HTO have same problems? We will report the outcome of TKAs for a patient with bilateral knees osteoarthritis after failed open wedge HTO.

### Materials and Methods

This 58 years old female had received bilateral open wedge HTO for her osteoarthritic knees 10 years ago. The postoperative result was satisfied with no pain and good function. The hard well in the knees was removed one year later. She had both knees severe pain 6 months before this admission. Her knee X-ray revealed severe OA with joint space narrowing. Her knees ROM was 120/120 degrees, and VAS pain score 6/6, and knees alignment was in valgus 3.7/4.4 degrees respectively. Left knee TKA was done via medial mid-vastus arthrotomy. The tibial cut was done with extra-medullary guide and femoral cut was done with intra-medullary guide. And all three components were cemented with U2 PS knee prosthesis and vitamin E-xpe insert. The operative time was 60 minutes and it was a little more than the ordinary primary TKA (50 minutes). Soft tissue contracture was noted and it made difficulty in surgical exposure. The right knee TKA was done with same procedure with a four week interval.

Partial weight bearing was allowed in the following day, and rehabilitation was done as usual. And full weight bearing was allowed 4 weeks post-operation. The patient was followed up regularly at OPD and outcome was recorded.

### Results

Six months later the patient had good functional and pain free knees. The knee score and function score was 100/100 for both knees. The ROM was 125/125. VAS pain score was zero. There was no complication. She was satisfied with the operation. The X-ray revealed both knees femoro-tibial alignment was in 7 degrees valgus.

### Discussion

TKA after failed open wedge HTO was few, and it was a technique demanded procedure. Though the patellar tendon is not shortening, the soft tissue contracture made the surgical exposure more difficult. And this may result in the mal-alignment of the implant and less favorable outcome as compared to primary TKA for OA without HTO. There are many reports of conversion of HTO to TKA in literature, but most of them are close wedge HTO. We treated this patient with delicate procedure on the base of our previous experience in converting close HTO to TKA and we had good outcome.

### Conclusions

Though TKA for failed open wedge HTO is technique demanded its result is comparable to that of TKA for failed open wedge HTO.

**Revision Total Knee Arthroplasty with Rotating-Hinge Prosthesis in a Patient with Poliomyelitis – A Case Report**

小兒麻痺症病患使用旋轉銜接假體行全人工膝關節置換翻修手術—個案報告

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Total knee arthroplasty (TKA) in patients affected by poliomyelitis is technically challenging owing to abnormal anatomical features including articular and metaphyseal angular deformities, external rotation of the tibia, excessive valgus alignment, bone loss, narrowness of the femoral and tibial canals, impaired quadriceps strength, flexion contractures, genu recurvatum and ligamentous laxity. Revision TKA for a patient with poliomyelitis is much more difficult than a primary one. The rotational knee prosthesis allows axial rotation and reduces the forces acting on the prosthesis anchorage. Advantages of the prosthesis comprise stable prosthesis anchoring for weakened ligaments, minor bone resection with primary implantation, preserves valuable bone substance, natural gait through physiological pivot and axial rotation, and anti-luxation.

**Materials and Methods**

A 72-year-old female patient presented herself to our out-patient service with chief complaint of unstable, painful right knee. She is a victim of poliomyelitis and had received a total knee replacement with LINK rotating-hinge knee prosthesis for the affected right knee 8 years ago at other hospital. Uneventful follow-up of right TKA persisting for six and half years, however, recurrence of instability and progressive functional deterioration noted since early of 2018. Physical examination of right knee showed valgus deformity, genu recurvatum and instability. Radiographic examination disclosed decreasing of thickness of insert. Under the impression of wear of lateral part of insert, revision surgery was arranged. Instead of insert wear, we found the “bushing wear” is the just cause of instability of right knee. We revised the right knee with another LINK rotating-hinge knee prosthesis, and stability of right knee achieved.

**Results**

There was no other major complication during the hospital stay, and post-operative image showed good implant's condition. OPD followup showed good result of ROM without any instability of right knee.

**Discussion**

Hinge prostheses are a way for severe instability. It has the disadvantage of a higher stress transmission to the bone-implant interface and a non-physiological movement pattern. By contrast, rotating-hinge implants have superiority, which combine the flexion-extension movement with rotation, improving the mechanics of movement and decreasing stress transmission with the fixation. The implant proved to be a solution for cases of genu recurvatum, severe instability, massive bone loss, and infection with extensive debridement.

In addition to insert wear, bushing wear is one of the major causes of implant failure of rotating-hinge knee leading to instability.

**Conclusions**

The rotating hinge prosthesis is effective at relieving pain and improving function in patients with poliomyelitis. The device compensates well for ligamentous insufficiency as well as for any associated bony deformity.

## Using Examination Under Anesthesia to Detect a Recurrent Hip Dislocation with Occult Hip Instability – A Case Report and Literature Review

使用麻醉下關節穩定度檢查來診斷一位反復性髖關節脫臼患者：個案報告與文獻回顧

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### Introduction

Recurrent traumatic hip dislocation in adults without osseous fracture is rare to see. It may result from peri-hip joint soft tissue weakness, such as ligamentous laxity, or muscle/tendon rupture, which leading to hip instability. We present a case using examination under anesthesia(EUA) to detect the occult hip instability.

### Materials and Methods

A 38 y/o male patient first visited our emergency department in August 2006 with a posterior dislocation right hip after falling from stairs, the dislocated hip was later successfully reduced at ED. Furthermore, from August 2006 to May 2019, he had totally experienced 7 times of right hip posterior dislocation. The CT for acetabulum structure evaluation disclosed that there was no posterior wall, column fracture, dysplasia, or retroversion of acetabulum. The MRI revealed a linear tear of posterior labral, and both the image findings couldn't fully compatible to clinical findings. The EUA was arranged for detecting hip instability, and he following three movements, hip hyperflexion, internal rotation, and adduction were carried out to test the stability of the hip. The result of EUA was positive. Operation was performed for suspected capsule defect repair, and a 4\*4 cm defect of posterior capsule was seen during surgery. Femoral head subluxation through the lesion would be reproduced while hyperflexion and internal rotation. The lesion was repaired with two suture anchors using double pulley technique and there was no further subluxation appeared under anesthesia.

### Results

In the first month, the patient was also not allowed to do squat or hip adduction, and he was allowed to have partial weight bearing ambulation with crutch. Weight-bearing as tolerated was undertaken since post-op 2nd month. At the post-op 6th month, EUA was performed again to evaluate the hip stability. There was no dislocation or subluxation found through the test.

### Discussion

Posterior dislocation of hip is rarely seen in normal acetabular geometry, especially in in patient without prosthetic hip, fracture of the acetabular wall, or congenital hip dysplasia. Some had disclosed that the peri-hip joint laxity could cause such symptoms. Previous study had indicated the injury be similar to shoulder instability caused by inferior glenohumeral ligament laxity. Furthermore, there was publication indicated the torn capsule might create a buttonhole effect, which lead the femoral head entrapped after dislocation. To close the torn capsule and reinforce the ligament intensity is the primary goal of treating this case.

### Conclusions

EUA can detect occult hip instability. The capsulorrhaphy by two chachor using double pulley technique could be a successful method of treating recurrent hip dislocation with capsule defect.

## Do We Need Check That Patient Is Hepatitis B Virus Carrier Before Total Knee Arthroplasty ? 我們是否需要在人工膝關節置換手術前，確認病人為 B 肝帶原者？

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### Introduction

Total knee arthroplasty (TKA) is a well-established modality with a high satisfaction rate for treating various knee disorders. It is estimated that approximately two billion people worldwide have evidence of past or present infection with hepatitis B virus (HBV), 5.1 to 7.6 percent in the Western Pacific. There is estimated 2.5-3 million carrier in Taiwan, 15% - 20% of all population. The main occupational risk for acquiring a bloodborne pathogen is a percutaneous sharps injury with a contaminated object. Because blood contact to face and eye or sharps-related injuries occur sometimes in operation, we want to know the prevalence HBV carrier in TKA.

### Materials and Methods

It is routine that we ask patient has any blood transmission disease in our hospital. If not, we asked patient his will to donate his bone. And then, we had checked blood transmission disease the next day of surgery. Inclusion criteria: 1. Patient denied HBV carrier history before TKA 2. Age over 50 y/o 3. We collected patient that received TKA in recent 10 years. Exclusion criteria: 1. HBV infection history 2. bone is unsuitable for donation.

### Results

We collected total 1206 patients, and result of Hbs Ag test is reactive in 61 patients. It is about 5.1%

### Discussion

Health care providers (HCP) should be immunized against HBV. In addition, HCP should be trained in techniques to minimize the risk of exposure to bloodborne pathogens. In American, there is about 385,000 sharps-related injuries occur annually among HCP in hospitals. The risk of developing serologic evidence of HBV infection after a percutaneous injury ranges from 37 to 62 percent if the source patient is both HBsAg positive and HBeAg positive, and ranges from 23 to 37 percent if the source is HBsAg positive but HBeAg negative. Vaccination is both safe and effective with seroprotection being achieved in 92 percent of health care providers aged <40 years and 84 percent aged  $\geq 40$  years

### Conclusions

There is high prevalence in TKA even patient denied HBV carrier. HCP should protect self more carefully, and we may check HBs Ag before TKA

**Tibia-Talus-Calcaneus Fusion with Retrograde Nail in Post-Traumatic Ankle Arthritis with Degenerative Subtalar Joint Patient-Case Report****用脛骨-距骨-跟骨骨髓內釘融合術治療創傷性踝關節炎合併距下關節退化之病人**

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**Introduction**

Multiple choices of surgical treatment for post-traumatic ankle arthritis are available nowadays. However, patient who suffered from ankle arthritis with degenerative subtalar joint was relative rare. This case report aimed to share our experience of treating this kind of patient with tibio-talus-calcaneus fusion(TTC fusion)

**Materials and Methods**

This is a 52-year-old woman with history of poliomyelitis. She suffered from left ankle sprained injury in 2015. She complained of left ankle pain with limited range of motion for since 2019. She came to our OPD for help, physical intervention showed diffuse tenderness and varus deformity. X-ray and CT showed talus tilting with subtalar joint space narrowing and sclerotic change. COFAS classification type 4 was diagnosed. Tibio-talus-calcaneus fusion with retrograde nail was performed on 2020/11/19. Ankle alignment was evaluated by X-ray. Comparison of preoperative and postoperative ankle functional score was documented by AOFAS score.

**Results**

Postoperative X-ray showed union of ankle and subtalar joint. AOFAS score improved from 42 to 72. No perioperative complications or other complained was noted.

**Discussion**

Arthrodesis was gold standard treatment for ankle arthritis. Other surgical intervention such as arthroscopy debridement, supra-malleolar osteotomy was indicated for early stage. Total ankle arthroplasty was indicated for old age, low BMI patient. Our patient's was relative young. Her daily life(house work) required high activity. As a result, we choosed TTC fusion as her treatment. Postoperative AOFAS score showed satisfactory outcome.

**Conclusions**

TTC fusion is an safe and effective treatment for post-traumatic ankle arthritis with degenerative subtalar joint patient.



**Muller-Weiss's Disease: A Case Report****穆勒·魏斯氏症之病例報告**

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**Introduction**

Muller-Weiss disease is a rare disease that characterized by osteonecrosis of the navicular bone. It can be uni or bilateral, of unknown etiology. This pathology mainly affects the young women. We report a case of a patient who had a primary osteonecrosis of the tarsal navicular, treated with talo-navicular arthrodesis.

**Materials and Methods**

This is a 62-year-old man without systemic disease. He suffered from right ankle pain since April 2020. He came to our OPD for help, physical examination showed bilateral flatfoot deformity, diffuse tenderness of right ankle, positive anterior drawer test of right foot. X-ray showed bilateral talo-navicular joint space narrowing and sclerotic change of navicular bone, right side was more severe. T2WI MRI showed edematous change and chondral defect of navicular bone of right foot. Under the impression of Muller-Weiss syndrome, talo-navicular arthrodesis was done on 2020/10/29. Postoperative outcome was evaluated by X-ray and AOFAS score.

**Results**

Postoperative X-ray showed union of talo-navicular joint. AOFAS score improved from 62 to 79. No perioperative complications or other complained was noted.

**Discussion**

Müller-Weiss disease (MWD) is a painful foot condition characterized by deformity, sclerosis, and fragmentation of the navicular. Etiology of Muller-Weiss syndrome is still unknown. Multiple foot deformities was accompanied with Muller-Weiss syndrome. Surgical treatment was indicated for patient with persistent symptoms. Choice of surgical treatment was unestablished. Our patient regained height of medial column after talo-navicular arthrodesis. Functional outcome improved as well.

**Conclusions**

Pathophysiology and etiology of Muller-Weiss syndrome required more studies to establish. Indication for various procedure was also controversial. However, our patient obtained satisfactory functional outcome and radiography after talo-navicular arthrodesis.

**Ankle Arthroscopic Debridement for Anterior Tibiotalar Spurs : Short-Term Results****踝關節手術治療前脛距骨骨刺：短期追蹤結果**

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**Introduction**

The advent of ankle arthroscopy has eliminated the need for open arthrotomy for a number of disorders ranging from loose bodies, soft tissue impingement, osteophy formation, osteochondral lesions, and even some arthrodesis. Impingement spurs are common from repetitive microtrauma from forced dorsiflexion or capsular avulsion from plantarflexion. We present some cases with arthroscopic surgery technique for the treatment of bony anterior ankle impingement with tibiotalar joint stiffness, and initial short-term results.

**Materials and Methods**

We collected 5 cases of bony ankle impingement associated with poorly tolerated range of motion restriction in retrospective series. Inclusion criteria were the presence of : anterior ankle impingement syndrome; poorly tolerated tibiotalar joint stiffness; anterior tibiotalar osteophytes. 5 patients (4 females, 1 male), mean age 60 years (range: 40 to 75 years), were managed by this technique. Etiology was in all cases traumatic, with capsuloligamentary lesion (ankle sprain). Mean time to surgery was 16 months (range: 5—30 months). AOFAS ankle function scores were calculated for all patients, pre-operatively and at follow-up. Quantitative variables were submitted to analysis of variance (ANOVA). X-ray assessment comprised loaded AP and lateral ankle views with Ahlbäck's classification. Joint assessment classified tibiotalar cartilage according to Béguin and Locker classification.

**Results**

At a mean 12 months' follow-up, all the patients were satisfied with their result. Anterior impingement symptoms had entirely disappeared in 5 cases. Mean dorsiflexion improved from 5° to 15° ( $p < 0.05$ ) and mean plantar flexion from 18° to 35° ( $p < 0.05$ ). Mean AOFAS score improved from 65/100 (50–80) to 85/100 (60–100) ( $p < 0.05$ ).

**Discussion&Conclusions**

In the particular case of bony ankle impingement associated with poorly tolerated range of motion restriction, both pain and joint mobility can be improved by simple arthroscopic surgical techniques combining anterior synovectomy. Short-term results are encouraging, providing clear functional improvement and overall ankle mobility gain. But we still need more cases and long term follow up.

## Metatarsal Floating Osteotomy for Charcot-Marie-Tooth Disease Patient with Poor Healing Plantar Ulcer, Case Report

以蹠骨浮動截骨術治療夏柯-馬利-杜斯氏症患者足底潰瘍，病例報告

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### Introduction

Patients with Charcot-Marie-Tooth disease (CMT) often develop foot and ankle problems, the cavovarus deformity is most common. We presented a CMT patient developed with plantar calluses and poor healing neuropathic ulcer under 5th metatarsal head for over one year. The ulcer was healed after 5th metatarsal shaft floating osteotomy.

### Case Report

A 39-year-old male patient was diagnosed with CMT for 17 years, he suffered from right foot plantar ulcer for over one years under 5th metatarsal head. He wears custom made ankle-foot orthoses to depressure his deformed right foot. His right foot was pronated and plantar flexed. Physical examination revealed ulcer with skin defect without joint extended and a negative probe-to-bone test. X-ray showed no any lytic lesion and the three-phase bone scan confirmed no bone infection on his right foot. Oblique and wedged osteotomy on 5th metatarsal shaft through dorsal skin incision under c-arm was performed. The osteotomy site did not fix with any pin or implant and kept fractured distal part of metatarsal shaft floating. The patient was allowed to walk with full weight bearing after operation. Wound healed in four weeks and there was no wound dehiscence nor recurrent in half year follow up.

### Discussion

CMT is the most commonly inherited neuropathy. Pressure ulcers are one of most common complication in patients with peripheral neuropathy. The first line treatment should be ankle-foot orthosis, and there is no evidence-base studies to determine optimal timing for surgery. Osteotomy and tendon lengthening were most recommended surgical methods, and patients should be kept non-weightbearing for 6 weeks after operation. Metatarsal shaft floating osteotomy can decrease the plantar pressure through internal off-loading with a very low complication rate due to the minimal soft tissue damage, otherwise, the patient is permitted full weight-bearing, which making the post-operative period easier.

## The Effect of Hip-knee-ankle Angle Correction on The Ankle Alignment During Total Knee Arthroplasty

### 膝關節置換術時 HKA 角度改變對踝關節的影響

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#### Introduction

It is well known that that changes may occurred in the ankle joint after acute correction of long-standing deformity of the knee using total knee arthroplasty. However, effect of amount of hip-knee-ankle angle correction on the ankle alignment during total knee arthroplasty is still not fully elucidated. In this study, we aimed to evaluate the radiological changes observed in the ankles after total knee arthroplasty and analysis the relation between HKA change and ankle parameter change.

#### Materials and Methods

We retrospective collected patients who underwent TKA, performed between 2009-2015, with pre-/post-operative triple films. Parameters, including mechanical hip-knee-ankle angle(mHKA), Tibial plafond-ground angle(PGA), Tibial plafond-ground angle(PGA), Distal medial clear space(Meidal space), Medial tibiotalar joint space(Superior space) were measured. The differences between pre-operative and post-operative parameters calculated. Paired-T test and Pearson analysis were performed.

#### Results

Ankle alignment changed significantly after TKA performed, with Pre-OP PGA  $-4.96 \pm 5.26$  and Post-OP PGA  $-0.92 \pm 5.18$  ( $p < 0.001$ ), Pre-OP TGA  $-6.16 \pm 5.31$  and Post-OP TGA  $-1.50 \pm 5.29$  ( $p < 0.001$ ), Pre-OP PTA  $-1.2 \pm 1.7$  and Post-OP PTA  $0.6 \pm 1.6$  ( $p = 0.001$ ). Correction analysis revealed significant negative correlation of the  $\Delta$ PGA ( $R = -0.541$ ,  $p < 0.01$ ) and  $\Delta$ TGA ( $R = -0.604$ ,  $p < 0.01$ ), and significant positive correlation of the  $\Delta$ PTA ( $R = 0.263$ ,  $p < 0.05$ ) with the  $\Delta$ HKA.

#### Discussion

We found ankle joint alignment was affected after total knee arthroplasty. The HKA correction amount had correlation between  $\Delta$ PGA,  $\Delta$ TGA, and  $\Delta$ PTA. Larger sample size, longer follow up, ankle AP, lateral view, and further clinical assessment were need for better ankle OA diagnosis

#### Conclusions

In this study, we found that ankle alignment will be corrected after TKA. Besides. PGA, TGA, and PTA are relative neutral position after TKA performed. The more HKA correction resulted in more ankle alignment change.

## Correlation Between Haglund's Syndrome and Insertional Achilles Tendinopathy: Image Finding

哈格蘭氏變形和跟腱附着點肌腱病變的相關性:影像學發現

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### Introduction

Haglund's deformity is defined as bony prominence of the superior aspect of the calcaneal tuberosity. The diagnosis of Haglund's syndrome requires some combination of clinical symptoms, Haglund's deformity, retrocalcaneal bursitis, supracalcaneal bursitis, and Achilles tendinosis. However, no studies have attempted to determine the frequency of insertional Achilles tendinopathy(IAT) population within the Haglund's syndrome. In our study, we want to find correlation between Haglund's syndrome and IAT via MRI finding.

### Materials and Methods

This study retrospectively investigated in patients with Haglund's syndrome treated by operation from 2015 to 2020. A total of 48 heels in 47 patients were enrolled. We measured Fowler-Philip angle, Heneghan-Pavlov angle and our new parameter from both lateral view radiograph and MRI of the ankle. Posterior calcaneal tuberosity bone marrow edema, retrocalcaneal fluid, degenerative changes within the Achilles insertion, Achilles tendon thickness were measured from MRI of the ankle.

### Results

In lateral view radiograph of ankle, only 8% and 56% of our enrolled cases reached the threshold of Fowler-Philip angle and Heneghan-Pavlov angle for Haglund's deformity separately. Retrocalcaneal fluid (89%, 43 of 48) was found in most of heels but posterior calcaneal tuberosity bone marrow edema(19%, 9 of 48) was rare. Degenerative changes within the Achilles insertion was noted in 73 % of heels(35 of 48) and 80% of them(25 of 35) was classified as severe group.

### Discussion

Patients with Haglund's syndrome who need to be treated with operative management may also has insertional Achilles tendinopathy. Calcaneoplasty is a popular operation for Haglund's syndrome. However, MRI may be indicated when operative was considered in order to recognize the condition of Achilles tendon.

### Conclusions

According to our study, Haglund's syndrome and insertional Achilles tendinopathy may coexist. MRI may be considered before operation.

**缺繳 E-Poster**

## **Surgical Treatment of the Symptomatic Accessory Navicular Bone Using Modified Kidner Procedure: A Case Report**

利用改良式 Kidner 手術治療有症狀的副舟狀骨：一篇病例報告

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### **Introduction**

According to previous literature, around 13% of the population might have an accessory navicular bone. Most remain asymptomatic while patients with symptomatic navicular bone that even require surgical intervention are not common. We presented a case with symptomatic accessory navicular bone that even impaired daily life. We report and discuss the diagnosis, treatment, and outcome of accessory navicular bone in this case.

### **Materials and Methods**

A 27-year-old female suffered from right medial foot pain for weeks and local tenderness was noted over right medial foot at out-patient department. Right accessory navicular bone, Geist classification type 2 was observed on plain radiography. Pre-operative pain Visual Analogue Scale (VAS) was 6 and American Orthopaedic Foot and Ankle Society (AOFAS) score was 72. She underwent modified Kidner procedure at our department.

### **Results**

During operation, an incision was made over medial foot around talonavicular joint, exposing the navicular bone and the insertion of posterior tibialis tendon (PTT). Ostectomy at the bulging bone mass over the navicular bone was done and preserved the insertion of PTT. PTT was sutured to native navicular bone with suture anchor (SwiveLock, Arthrex) for re-tensioning the PTT. Two months after the surgery, pain VAS was 0 and AOFAS score improved to 100.

### **Discussion**

While most patients with accessory navicular bone are asymptomatic, some are symptomatic that even require surgical intervention. According to literatures, surgical methods including simple excision, Kidner procedure, percutaneous drilling, and arthrodesis of the accessory ossicle had been proposed. However, no consensus has been reached with regard to the selection of treatment. We believed that Kidner procedure was biomechanically better than simple excision in preventing weakness of the longitudinal arch. Moreover, in order not to violate PTT insertion, we chose modified Kidner procedure in treating this patient.

### **Conclusions**

We highlighted a case of symptomatic accessory navicular bone treated by modified Kidner procedure. The clinical results showed good satisfaction with pain VAS improved from 6 to 0 and AOFAS score improved from 72 to 100.

## Transferring Resected Talus Head in Treating Flatfoot with Break-Down of Medial Arch with Double Arthrodesis; Case Reports and Literature Reviews

治療內側足弓嚴重塌陷扁平足使用雙關節融合術時合併距骨頭轉移:病例報告

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### Introduction

Painful collapse of the medial arch can be seen in posttraumatic or arthritic patients. To date, triple or double arthrodesis has been advocated for the operative treatment of such advanced stages of acquired flatfoot deformities. In the case of a peritalar destabilization, with valgus and pronation deformity of the hindfoot and associated breakdown of the medial arch, a triple or double fusion alone sometimes not address sufficient support. So we used resected talus head transferring to lateral sinus tarsi space to give additional support in double arthrodesis.

### Material and method

From 2018 to 2020, we recollected 4 cases (3 female, 1 male). The average age is 57.25 years old (41-70). Two younger patients are compatible with rheumatoid arthritis. One patient ever accept medial calcaneous deviation osteotomy with flexor digitorum longus tendon transfer before but failure after 3 months postoperatively. Patients had DM history, even though Charcot joint, were excluded. All patient accepted double arthrodesis (talonaviular and subtalar joint) for correction severe medial arch break-down flatfoot. To make reducing talonavicular joint easier, we resected partial talus head which was transferred to sinus tarsi space as additional support subsequently. Non-weight bearing ambulation with short leg cast protection in the initial 6 weeks. Then progressed to full weight bearing after cast removal in the following 6 weeks. Depending on the progression of fusion, the foot was protected by a walker in the initial 12 weeks.

### Results

The mean follow up duration is 11.75 months (6-17). In the last follow up, the AP talonavicular coverage angle improved from 58.2°(46.6°~66.4°) to 3.8°(0.6°~7°); the AP talo-first metatarsal angle improved from 29.6°(19.8°~45°) to 9.2°(3.4°~15°); the calcaneus pitch angle increased from 9.2°(5.3°~12°) to 15.3°(14.5°~16.1°); The Meary's angle improved from -24.1°(-19.9°~ -27.2°) to 1.7°(0.4°~3°). The union of fusion site was observed after 6 months follow up in all cases. No implants failure or loss reduction related medial arch re-collapsed was observed in the last follow up. Delay wound healing was noted in one rheumatoid arthritis case.

### Discussion

Double/Triple arthrodesis is an effective procedure to relieve pain and correct structural deformities associated with advanced adult flatfoot. Appropriate realignment is the most critical factor for achieving a functional outcome. The key to reducing the deformity seen in the typical planovalgus foot is to internally rotate the calcaneus under talus while subtalar screw been placed. The resected talus head filled in the sinus tarsi space can afford not only the support of anterior subtalar joint but also internally rotated calcaneus to make hindfoot valgus deformity been reduced.

### Conclusion

In treating severe adult flatfoot, transferring resected talus head to sinus tarsi space can improve double arthrodesis successful rate.



## **A Rare Etiology of Sinus Tarsi Syndrome: Tenosynovial Giant Cell Tumor – Case Report and Literature Review**

韃鞠巨細胞瘤作為跗骨竇症候群的病因：個案報告和文獻探討

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### **Introduction**

Sinus tarsi syndrome is a relatively unknown condition presenting with pain over lateral hindfoot. There were reports disclosed the etiologies of sinus tarsi syndrome, and the majority among those publications was traumatic ligament damage/inflammation, followed by foot deformities. We presented a case clinically diagnosed to have sinus tarsi syndrome caused by tenosynovial giant cell tumor(TSGCT)

### **Materials and Methods**

An 18 y/o female patient with intermittent right ankle pain for over 3 years and visited us due to progressive of pain in recent 2 months. She had such symptoms since a fall and be treated conservatively by the diagnosis of ankle sprain till now. Physical examination revealed tenderness over ATFL and sinus tarsi, and mild laxity was found through anterior drawer test. There was no abnormal findings on plain radiography of right ankle. MR arthrography revealed ATFL partial tear. The post-Gd-enhanced MRI image showed a well-defined enhanced nodular lesion, without adjacent bone marrow edema, about 2.5x0.8x1.8 cm in size at sinus tarsi.

### **Results**

Through the surgical excision, a solitary and well capsuled tumor, about 1.5cm x 1.5cm in size and having yellowish content, was obtained for biopsy. The histologic characteristic under low-power field was well circumscribed, partially encapsulated with diffuse growth pattern. Scattered siderophages, some epithelioid cells with glassy cytoplasm and round vesicular nuclei could be seen under high-power field. Osteoclast-like giant cells and occasionally seen mitosis without malignant pattern was confirmed by pathologist.

### **Discussion**

In the recent scoping review published in 2020, which enrolled 31 studies, still having difficulty to clarify what lead to sinus tarsi syndrome. Tumor has been reported to cause sinus tarsi syndrome but accounts for the minority etiologies. In the anatomic regional within foot and ankle, tenosynovial giant cell tumor was claimed to be the most common soft tissue tumor. However, the TSGCT is commonly found to located at dorsal surface of forefoot and manifest itself as a palpable mass with occasionally painful sensation. Different image diagnostic tools have been used in previous publications, but no tool was superior than other due to variety of etiologies. In our case, the plain film had no bone erosion, cysts or soft tissue calcification. The soft tissue mass was incidental found by gadolinium-enhanced MRI, and the tissue proof was not confirmed till the biopsy was obtained. The conservative treatment had limited effect compared to surgical excision on this case.

### **Conclusions**

We presented a case with sinus tarsi syndrome resulted from tenosynovial giant cell tumor. To consider the etiology of sinus tarsi syndrome, soft tissue tumor should be placed in differential diagnosis, which is easily to be neglect.

**Lapidus Procedure and McBride Procedure for Severe Hallux Valgus-A Case Report**  
**Lapidus Procedure 合併 McBride Procedure 治療嚴重拇指外翻之案例報告**陳宏諺<sup>1</sup> 李建穎<sup>2</sup> 莊柏堯<sup>3</sup>

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**Introduction**

Hallux valgus (HV), commonly known as bunion, is a deformity identified by the lateral deviation of the hallux and the medial deviation of the first metatarsal. Bunions form when the normal balance of forces that is exerted on the joints and tendons of the foot becomes disrupted. They are a symptom of faulty foot development and are usually caused by the way we walk, our inherited foot type, our shoes, foot injuries, neuromuscular disorders, or congenital deformities. After successful Lapidus procedure and McBride procedure are performed, deformity and pain from HV can be reversed.

**Materials and Methods**

A 54-year-old female has a long-standing complaint about painful, severe bunion deformity of bilateral feet. Her left foot hurts more than her right foot. IM angle of 15.8 degrees and HV angle of 43 degrees with MTP joint subluxation were revealed on the preoperative X-ray of the left foot. Lapidus osteotomy and McBride procedure were subsequently scheduled. The procedures would allow patient to start protected weight-bearing after the surgery.

**Results**

After the surgery, the patient was partial-weight-bearing on the left foot with the assistance of crutches. A cam walker boot was used as a method of protection. Two weeks after the procedure, she began protected walking in the cam walker boot. Patient progressed to full walking with boot only at about four weeks. The radiographic measurement of the postoperative IM angle is 8.8 degrees, in contrast to 15.8 degrees measured at preoperative consultation.

**Discussion**

There are several advantages of utilizing Lapidus procedure for severe bunion cases. One notable benefit is the excellent prognosis. It is necessary to begin early range of motion of the 1st metatarsophalangeal joint to prevent adhesions and a reduction in range. The addition of internal plating technology in a Lapidus procedure allows for a quicker return to walking. The cumbersome old method of 4-6 weeks non-weight-bearing in a cast will increase chance of 1st metatarsophalangeal joint stiffness. The prolonged period of non-weight-bearing is difficult for most patients and increases chances of falling.

**Conclusions**

Lapidus procedure and McBride procedure were performed concurrently to treat a healthy 54-year-old female patient diagnosed with painful, severe bunion deformity of the left foot. X-rays of the Intermetatarsal (IM) angle on the affected foot from preoperative and postoperative appointments confirmed the significant improvement as a result of the intervention.

## Lambrinudi Triple Arthrodesis with Posterior Tibialis Tendon Transfer and Lengthening of the Achilles Tendon for Correction of Adult Rigid Neurogenic Clubfoot: A Case Report and Review of the Literature

Lambrinudi 關節固定術併脛骨後肌腱轉移及跟腱延長治療成人神經源性馬蹄足:病例報告和文獻回顧

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### Introduction

Severe rigid clubfoot deformity is a common sequela from poliomyelitis infection which can result in neurogenic contracture and lead to pain and instability in stance phase of gait that affects quality of life. Initial treatment is most often with combination of casting, Achilles tendon release and bracing. This article presented the utilization of Lambrinudi triple arthrodesis with posterior tibialis tendon transfer and lengthening of the Achilles tendon for correction of adult severe rigid neurogenic clubfoot resulted from poliomyelitis infection and reviewed articles about surgical treatment of this deformity.

### Materials and Methods

The 55-year-old male with a history of poliomyelitis since 7-month-old presented with rigid equinovarus deformity of his right foot. He reported progressive right heel inversion and **difficulty** walking in recent years. On physical examination, the right leg was significantly thinner than the left one. Sensation of right lower limb and muscle power of right hip and knee were intact, but he couldn't perform right ankle and toes dorsiflexion ever since he can remember. Radiographs and CT of right foot revealed hindfoot varus and equinus with forefoot adduction deformity. The patient requested for acute correction. We performed Lambrinudi arthrodesis to correct and stabilize the bony component in combination with posterior tibialis tendon transfer to the lateral cuneiform to provide lateral ankle stability and active dorsiflexion. Lengthening of the Achilles tendon with hoke triple hemisection technique and plantar fascia release were also performed in order to obtain soft tissue balance.

### Results

Postoperatively, the patient was found to be neurovascularly intact without wound healing problems and remained non – weight bearing with short leg splint immobilization for 4 weeks on the right lower extremity. Gross appearance and postoperative radiographs revealed significant clinical improvement of adduction, equinus and varus deformity. Neither loss of correction nor further local complication was found at the last follow up.

### Discussion

Most of the literature on Lambrinudi triple arthrodesis for correction of poliomyelitis clubfoot reported the majority had fair to good outcome by MacKenzie' s classification with an average failure rate of 12.4%. A long-term follow-up article even demonstrates the outcome is still largely favorable even after nearly 37 years, but radiographs of the majority of patients showed radiological signs of adjacent joint arthritis; however, the presence of such alone did not invariably predict a poor outcome. Wound-healing problems occurred as shown in some reports, and other complications were also reported in the literature such as ankle instability (10% to 24%) and painful callosities (40% to 50%).

### Conclusions

Lambrinudi triple arthrodesis combined with posterior tibialis tendon transfer and lengthening of the Achilles tendon is a reliable and reproducible surgical option providing a stable correction with favorable short-term outcome for the adult rigid neurogenic clubfoot deformity, but further and longer follow-up of the patient is needed to evaluate dorsiflexion function and development of arthritis of the neighboring joints in the long term.

**Chopart Fracture-Dislocation with Severe Medial Column Injury and Lisfranc Dislocation: A Case Report and Literature Review of A Rare Clinical Entity**  
**Chopart 關節骨折脫位合併嚴重足部內側柱損傷及 Lisfranc 關節脫位:罕見的臨床病例報告和文獻回顧**

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### **Introduction**

Fractures and dislocations of the midfoot with involvement of both the Chopart and Lisfranc joints are uncommon and generally occur with high-energy mechanisms. However, misdiagnosis and inadequate treatment could lead to permanent disability. This article presented a case of Chopart fracture-dislocation with severe medial column injury and Lisfranc dislocation and reviewed articles about treatment of this rare clinical entity.

### **Materials and Methods**

The 42-year-old previously healthy female presented to outpatient clinic with progressive right foot painful deformity and difficulty walking after a motorcycle accident 3 months ago. At first, conservative treatment with short leg splint immobilization was suggested at local clinic. However, the symptoms persisted and progressed. On physical examination, the right foot was swollen with a bony prominence of the dorsum. The circulation and sensation of the foot were intact. Radiographs and CT of the right foot revealed a plantar dislocations of the talonavicular and calcaneocuboid joints in combination with navicular-medial cuneiform dislocation, medial cuneiform fracture, Lisfranc dislocation and 1st~3rd metatarsal base fractures. In view of severe midfoot injuries, we performed arthrodesis on calcaneocuboid and Lisfranc joint and ORIF with temporary bridge plating from talar neck to first metatarsal bone to achieve the balance between pain control and functional preservation.

### **Results**

Postoperatively, the patient was found to be neurovascularly intact without wound healing problems and remained non-weight bearing with short leg splint immobilization for 6 weeks on the right lower extremity. Postoperative radiographs revealed concentrically reduced Chopart and Lisfranc joints as well as maintenance of the length and the arch of the medial column. At the last follow up, neither loss of reduction nor further local complication was found, but one broken screw within the medial column bridge plate was noted.

### **Discussion**

Fracture-dislocations of the midfoot are uncommon due to the robust surrounding ligaments, and disruption of these ligaments may result in instability and shortening of foot column length. A review of literature revealed outcomes following these injuries are dependent on the length and stability of the medial column and poor results are related to initial unsatisfactory anatomic reduction. Treatment options for these injuries reported in the literature including closed reduction, open reduction with screw fixation, external fixation, primary arthrodesis and temporary bridge plating. Of these fixation types, temporary bridge plating solving the problems of external fixation with preservation of the soft tissue attachments and blood supply provides maintenance of the length of the bones with a stable construct for early mobilization.

### **Conclusions**

The treatment principle of fracture-dislocations of the midfoot is to restore foot column length and joint congruity with stable fixation that allows early mobilization and weight bearing. Anatomic reduction with temporary bridge plating is a reliable treatment option to achieve a favorable outcome without extensive dissection or vascular compromise.

## Talonavicular-Cuneiform Fusion in a Patient with Mueller-Weiss Syndrome– A Case Report 以距-舟-楔骨融合固定手術治療穆勒—魏斯氏症病人之案例報告

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### Introduction

Mueller-Weiss Syndrome is a rare spontaneous adult-onset tarsal navicular osteonecrosis which usually affects adults between 40-60 years old. Patients often present with chronic mid and hindfoot pain with swelling and tenderness, as well as Pes planovarus and pseudohindfoot valgus. Treatment goals include relieving of pain by fusing symptomatic degenerative joints and restoration of the plantar and medial longitudinal arches by correcting the Meary-Tomeno line. Currently, isolated talonavicular arthrodesis or talonavicular-cuneiform (TNC) arthrodesis are the treatment of choice for moderate stage Mueller-Weiss Syndrome.

### Materials and Methods

A 74-year old female presented herself to our out-patient service with chief complaint of right foot medial region weight-bearing pain for more than 2 months. According to her statement, the symptoms got worse recently. Physical examination showed right ankle painful swelling with some radiation pain over right calf and ankle. X-ray showed talonavicular osteoarthritis, and navicular AVN was suspected. Hence, MRI was arranged, revealing navicular body AVN with medial dislocation (Chopart injury) at right talonavicular and calcaneocuboid joints. Oral medication therapy was given, but in vain. Under the impression of Mueller-Weiss Syndrome, Maceira classification stage III, operation was suggested. Therefore she was admitted for talonavicular-cuneiform fusion with headless compression screws.

### Results

There was no other major complication during the hospital stay, and post-operative follow-up image showed good fusion results. OPD follow-up showed improved pain and patient satisfaction.

### Discussion

Reports have shown that both isolated talonavicular arthrodesis and talonavicular-cuneiform arthrodesis for stage III or IV Mueller-Weiss Syndrome have good clinical outcomes with solid fusion rate and improvement of patients' quality of life. Staples and plates are both eccentric fixation with potential disadvantages of extensive soft tissue dissection and impaired blood supply. Headless compression screws (HCSs) can generate a maximum compressive force, and have shown excellent clinical results for fusion. Hence, in this case we applied Talonaviculocuneiform fusion with headless compression screws.

### Conclusions

Talonaviculocuneiform fusion with headless compression screws is an ideal way to treat moderate stage Mueller-Weiss Syndrome.

**Outcome of Crushing Ankle Fracture, Open Type III After ALT Muscle Flap, A Case Report**  
**嚴重的腳踝開放性骨折，運用皮瓣及重建的個案報告**

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**Introduction**

The crushing injury always made sever consequence. We made effort to solve these kind of trauma and reconstruction concept. Also, contamination and risk of infection and vascular, nerve injury were what we cared about. Good result often relied on early fixation and associated soft tissue repair. A study even emphysis that whole surgical reconstruction should be completed within 2~3 days.

**Materials and Methods**

This is a 26 y/o female with severe crushing injury. Open fracture type IIIC was noted. The posterior tibialis artery was total tear with skin and bone defect. Anterior part of ankle was degoving wound with sand and many foreign body. We used much normal saline for irrigation at ER and sent to OR room for early debridement. The fracture site was stabliaed with external fixator. We followed soft tissue condition and use ALT(anterior lateral thigh) flap for reconstruction. Finally the fracture was healed after about 12 months follow up and the patient can weight bearing. Also, the condition of flap was stable. There were no infection sign noted and perfusion status was good.

**Results**

After good ALT flap cover and stable internal fixator following early damage control(early debridement, early infection control, early soft tissue protection), the patient recovered well. Several months later, the patient can walk with crutch and partial weight bearing. Wound healed well and there was no infection signs noted.

**Discussion**

Facing this case, we do much for pre-operation planning, including 3D computed telegraphy angiography, early debridement and external fixator. After soft tissue condition was stable, we arrange ALT flap and internal fixator. Study had showed compared with staged debridement and delayed cover, radical wound debridement and early healthy flap cover had better results.

**Conclusions**

About this case, we emphysis the importance of stage surgery, large soft tissue defect, vessel injury after this kind of severe trauma. We had satisfying outcome and recommend this kind of surgery for effective and safe purpose to restore bone and soft tissue defect.

## Bioabsorbable Screw in 5th Metatarsal Base Fracture - Two Cases Reports

### 可吸收螺絲應用在第五趾骨的基部骨折-兩個病例經驗

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#### Introduction

Traditional nonsurgical treatment of Jones fractures has high rates of delayed union, nonunion, and refracture. Internal fixation has become the treatment of choice in athletes and active patients.

#### Materials and Methods

We provide two cases with Jones fractures fixed with bioabsorbable cannulated screws (4 mm in diameter) were evaluated by chart review, review of radiographs. Mean follow-up from surgery to phone survey was 4 months. Screws length in size is 30 mm to 40 mm.

#### Results

Mean time to healing as shown on radiographs and by full activity after surgery were 8 weeks, respectively. All patients were able to return to their previous levels of activity. There was no refracture, wound infection.

#### Discussion

Surgical fixation of the acute Jones fracture has been shown to provide better results with shorter recovery times. Cannulated screws may allow easier insertion with less risk of malplacement as compared with conventional non-cannulated screws. There was few study to discuss bioabsorbable screws in fracture fixation. The benefit of it include no need to removal, low infection and less bone destruction. But other challenge its strength of fixation or implant failure. Our study showed as good as metal screw in early outcome.

#### Conclusions

In our patients, bioabsorbable cannulated screws fixation of Jones fractures was a procedure that was reliable, had low morbidity, and afforded a quick return to activity.

**Use of MIS Technique to Treat the Lateral Malleolar Fracture of the Ankle: A Case Series****應用微創技巧治療足踝外踝骨折:病例報告**

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**Introduction**

The operative fixation of fractures of the lateral malleolus may be complicated by skin complications and wound infection, especially in patients with open fractures or an unfavorable skin condition or soft-tissue injury. In complex fractures of the fibula (two or more intermediate fragments), anatomic reduction can be difficult, resulting in stripped fragments with impaired vascularity that may lead to pseudoarthrosis. The MIS technique was developed in a trail to prevent devascularization of the periosteum and major soft-tissue dissection. The goal of this study was to assess the technique of minimally invasive, distally inserted plate fixation for the lateral malleolar fractures of the ankles; some have the unfavorable skin conditions, including superficial abrasions, blisters, and contusions.

**Materials and Methods**

From 2020 January to 2020 December, 27 lateral malleolar fractures were treated with MIS-technique ORIF with AO locking plates, in which 17 cases were bimalleolar or trimalleolar fractures and 10 isolated lateral malleolar fractures. The patients were 5 males and 22 females. The age was from 33 to 78 year-old; average 56.6 year-old. In 6 cases, blisters were noted over the lateral aspect of the ankles.

**Results**

There were no complications of skin problems, infections, delayed union or nonunion in total 27 patients. The local swelling of all fractures disappeared one month postoperatively. Full weight bearing could be permitted 2 months postoperatively.

**Discussion**

The occurrence of the poor skin condition with complicated acute osteomyelitis after ORIF for the lateral malleolar fractures is extremely frustrating. MIS technique provide satisfactory outcomes to prevent such complications and enhance union especially in the cases of comminuted fractures of the distal fibula. We note the keyhole of MIS technique: restore the length of fibula by temporal pins through the end holes of the locking plate under traction. The addition pin or pinpointed clamp was used to fix the fracture site temporally. The alignment of the distal fibula was confirmed by Shenton' line of the ankle and the dime sign under fluoroscopy. Then, compression screws were fixed the ends of the plate step by step to prevent see-saw effect. Eventually, locking screws were applied.

**Conclusions**

Traditionally, ORIF with plate is the standard treatment for the lateral malleolar fractures. However, the long-lasting postoperative swelling is noted. Furthermore, if the patients have the comorbidity of DM or PAOD, the complications of poor wound healing and even osteomyelitis make the operation failed in the literatures. We present the case series of the MIS technique with excellent outcomes, and strongly recommend to replace ORIF.



## **Subluxation after Open Reduction Internal Fixation of Ankle Fracture Dislocation: A Case Report and Literature Review**

踝部骨折合併脫臼經開放性復位內固定手術後半脫位之個案報告及文獻回顧

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### **Introduction**

Fracture dislocation of the ankle represents a substantial injury to the bony and soft tissue structures of the ankle. Ankle fracture-dislocations have higher rates of concomitant injury including soft tissue damage, chondral lesions, and intra-articular loose bodies. Functional outcomes in fracture-dislocations were generally poorer rather than simple fracture. In the most time, irreducible status of the dislocation can be caused by soft tissue or bony fragment entrapment. Here, we present an ankle fracture-dislocation case of subluxation after open reduction internal fixation and review the etiology of malreduction.

### **Materials and Methods**

One case and related literature review.

### **Results**

The patient is a case of 75-year-old female present to our emergency department due to traffic accident which resulted in right ankle painful deformity. X-ray showed Lauge-Hansen classification supination-external rotation stage 4 right ankle fracture-dislocation. Open reduction internal fixation was performed. However, right ankle subluxation was found at the post-operatively X-ray. To investigate the reason why the subluxation occurred, we reviewed the pre-operative radiograph and surveyed the common etiology. Wagstaffe's tubercle was found in pre-operatively CT exam as well as during the revision operation, which is considered to make articular malreduction and ankle subluxation. Revision operation including arthroscopic inspection and revision open reduction internal fixation is performed smoothly and no subluxation noted after the second operation.

### **Discussion**

Functional outcomes and pain subscale of FAOS in ankle fracture with dislocations were poorer than ankle fractures without dislocation. Evidence of post-traumatic osteoarthritis of the ankle (PTOA) has been reported in up to 63% of patients sustaining an ankle fracture-dislocation. Fracture severity, osteoporosis, and surgeon's technique are considered the risk of ankle fracture malreduction. Irreducible status of the dislocation can be caused by soft tissue or bony fragment entrapment. Articular malreduction is known to be a major factor affecting outcomes of operatively treated ankle fractures. A study showed in supination external rotation (SER) fractures, articular malreduction during surgery was more common in the dislocated group as assessed by postoperative CT scan significantly (20% vs 3%). On the other hand, there is a case report showed the posterior tibial muscle tendon (TP tendon) is incarcerated between the tibia and fibula, thereby impeding reduction. For irreducible ankle fracture dislocation, Bosworth injuries should also be considered.

### **Conclusions**

Concurrent dislocation at time of ankle fracture is associated with worse radiographic and functional outcomes. Recognizing the fracture pattern, bony fragment, possible soft tissue entrapment and ligament injury is particularly important issue. CT is helpful for pre-operatively planning. Ankle arthroscopic inspection can assist intra-articular fragment reduction. This case demonstrates the complication of ankle fracture-dislocation of subluxation after open reduction internal fixation caused by Wagstaffe's tubercle entrapment.

## An Ignored and Irreducible Interphalangeal Joint Acute Dislocation Of Big Toe : A Rare Case Report

一個被忽略且無法復位的大腳趾趾間關節急性脫臼:一個罕見的案例報告

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### Introduction

Irreducible dislocation of the interphalangeal (IP) joint of the big toe is rare and the dislocation may be ignored due to rare incidence or poor image readings. We report a case of a 61-year-old gentleman who presented to the Emergent department specialist that ignored the dislocation IP joint of big toe and to the Orthopedic Surgery Specialist Outpatient Clinic with an irreducible IP joint.

### Materials and Methods

This 61-year-old denied any systemic disease except hypertension. He suffered from head injury, bilateral limbs multiple abrasions wound due to the traffic accident on 2020.12.28. However on 2020.12.30 due to stable condition, he was discharged. In this period of time, right big toe severely tenderness was complained and x-ray was arranged. Not only emergent specialist but also orthopedic doctor didn't find any abnormality. On 2021.1.6, he came to our OPD for the persistent pain of big toe. X-ray was reviewed and dislocation of IP joint was diagnosed. We try close reduction but failed so open reduction under local anesthesia was suggested.

### Results

We made the dorsal wound incision over IP joint of big toe and there was no incarcerated soft tissue in the joint. Moreover the reduction was easily failure when the patient tried some range of motion. We applied 1.8# k wire and suture repair the avulsion fracture of lateral collateral ligament. After one week, the patient came back to our OPD and pain got much improvement was told.

### Discussion

Dislocation of the IP joint of the big toe is an uncommon entity. The x-ray may be survey by the clinician carefully if the pain pattern is unusual. Moreover as we know there was only one report about irreducible IP joint of big toe closely owing to interposition of the sesamoid bone. We presumed the possible cause of irreducible IP joint of big toe of our case may be due to avulsion fracture of lateral collateral ligament or joint space involvement too much. If closed reduction is failure, open reduction and K-wire fixation are a good option.

### Conclusions

An ignored and irreducible IP joint acute dislocation of big toe is a rare condition but may be exaggerated to the medical dispute if the clinician ignored too much hints from the patient for example the pain pattern, the gross character of big toe. In conclusion, physical examination should be put more emphasis and every data clinician ordered shoulder be reviewed carefully to avoid the related complications.

缺繳 E-Poster

## The Efficacy of Intraarticular Corticosteroid Injection for First Carpometacarpal Osteoarthritis

### 關節內注射類固醇於第一指腕掌關節炎之成效分析

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#### Introduction

The study aim was to evaluate the efficacy of intraarticular corticosteroid injections for osteoarthritis (OA) of the first carpometacarpal (CMC) joint

#### Materials and Methods

This was a prospective case series of patients presenting to orthopedics clinic with osteoarthritis of the 1st carpometacarpal (CMC) joint (Kellgren-Lawrence grade II-III). Ultrasound-guided intra-articular treatment with a total of 0.25 ml of betamethasone was injected into the 1st CMC joint in 43 patients, who were followed for one year.

#### Results

A significant improvement in the visual analog scale (VAS) and Functional Index for Hand Osteoarthritis scores were noted at one month but not at 3, 6, or 12 months post-injection. However, 13 patients were pain-free at 12 months after first injection. Many patients noted improvement in tasks such as lifting a full cup and turning a faucet. Injections were well tolerated, with only 3 patients noting minor side effects.

#### Discussion

A recent systematic review summarized the findings of four randomized controlled trials investigating the effects of intra-articular corticosteroid injections in osteoarthritis. In only two further trials were significant improvements in pain scores noted with steroid compared with placebo, and the improvement was only noted at two week after the injection. In general the benefits of steroid injection appear to be short lived and at present it is difficult to identify any disease factors which may act as predictors of response.

#### Conclusions

These results suggest that intraarticular corticosteroid injection is effective and well-tolerated for the management of 1st CMC OA. However, a significant long-term benefit of corticosteroid injection for 1st CMC OA was not observed.

## Opening Wedge Trapezial Osteotomy for the Treatment of Osteoarthritis of the Thumb 以大多角骨截骨手術治療拇指關節炎之成效

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### Introduction

Trapeziometacarpal osteoarthritis, also known as osteoarthritis at the base of the thumb or as rhizarthrosis, is a reparative joint disease affecting the first carpometacarpal joint (CMC1). There are different treatment for this disease. The aim of this study is to evaluate the outcome of opening wedge trapezial osteotomy for basal thumb arthritis.

### Materials and Methods

Between July 2015 and November 2019, 8 opening wedge trapezial osteotomies were performed (4 right and 4 left) of 26 patients (5 women and 3 men) in Tri-Service General Hospital. Patients were evaluated using the Michigan Hand Outcomes Questionnaire and measured radial subluxation from anteroposterior radiographs before and after placement of a 15° wedge

### Results

The mean age of the 8 patients was 54 years (range, 30-65 years). Of the 8 thumbs, 6 had good or excellent results. Good thumb motion was present in all hands with no trapeziometacarpal instability seen. Michigan Hand Outcomes Questionnaire scores increased 27 (range, 1-55) points after surgery, with significant improvement especially in pain (+36 points), activities of daily living (one-handed tasks, +39 points), and satisfaction (+41 points), The average reduction in joint subluxation was 64%

### Discussion

This procedure is a useful alternative to metacarpal osteotomy. Clinical outcomes are favorable and, should symptoms persist, the procedure does not jeopardize satisfactory execution of trapezial resection arthroplasty in the future.

### Conclusions

By reducing radial subluxation and altering contact pressure and contact area, trapezial osteotomy may prove an alternative to first metacarpal extension osteotomy or ligament reconstruction in early stages of degenerative arthritis of the trapeziometacarpal joint.

## Effect of Figure-of-Eight Cerclage Wire on the Two K-Pins Fixation Ability of Metacarpal Shaft Transverse Fracture

### 8 字形環繞鋼絲對鋼針固定掌骨骨幹處橫向骨折的影響

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#### Introduction

Metacarpal shaft fracture is the most common type of fracture of hand. Although the bone plate can have the strongest fixing ability, but it still have many disadvantages. At present, K-wire is still one of the most commonly used fixation methods in clinical practice, but the fixation of the K-wire may still fail due to insufficient fixation strength. The purpose of this study was to evaluate the effect of figure-of-eight cerclage wire on the 2 K-wire fixation ability of metacarpal shaft transverse fracture.

#### Materials and Methods

We used a saw blade to create transverse metacarpal neck fractures in 14 artificial 4th generation third metacarpal bones (Sawbones, Vashon, WA, USA), which were then treated with two types of fixation as follows: (1) Two K-pins (KP) group. (2) Two K-pins with figure-of-eight cerclage wire (KP&F8) group. All specimens were tested through cantilever bending tests on a material testing system. The maximum fracture force and stiffness of the five fixation types were determined based on the force–displacement data. Mann-Whitney U test was used to compare the differences in maximum fracture force and stiffness between the KP and KP&F8 groups

#### Results

For maximum fracture force, KP group (96.75+26.53, median + IQR) was significantly worse than KP&F8 group (163.6+78.78) ( $p<0.05$ ). In terms of median, KP&F8 group is 69.1% higher than KP group. Similarly, for stiffness, KP group (18.23+11.54, median + IQR) is significantly worse than KP&F8 group (38.31+7.15) ( $p<0.01$ ). In terms of median, KP&F8 group is 110.1% higher than KP group.

#### Discussion/Conclusions

The use of Two K-pins with figure-of-eight cerclage wire can increase the capacity of maximum fracture force and stiffness by 69.1% and 110.1% respectively when using only two K-pins to fix the fracture of the metacarpal shaft. In the future, it is recommended that clinicians try to use K-wire to fix fractures at the metacarpal shaft and increase the use of figure-of-eight cerclage wire.

**The Rate of Insufficient Tying and Cut Through in Arthroscopic Fovea TFCC Repair**

三角纖維軟骨修補之縫合不良發生率

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台中榮民總醫院骨科部<sup>1</sup> 中國醫藥大學附設醫院<sup>2</sup>**Introduction**

Arthroscopic repair for TFCC tear is considered a standard procedure with good outcomes owing to quicker recovery and fewer complications than open repair. However, high dissatisfaction rates of up to 16 % are still reported in uncomplicated arthroscopic TFCC repair. This high dissatisfaction rate has raised the question as to whether the effect of TFCC repair is appropriate for each patient. The aim of this study was to investigate the rate of TFCC cut through and residual instability after TFCC foveal repair under arthroscopic monitoring.

**Materials and Methods**

44 patients with Palmer type 1B peripheral TFCC tear were treated with arthroscopic repair were reviewed and analysis. After TFCC suture, the traction was reduced to 8 pounds for TFCC tying. The rate of TFCC cut through and residual instability were recorded and analyzed.

**Results**

Among the treated 44 patients with Palmer type 1B peripheral TFCC tear, the rate of TFCC cut through during tying was 2/44 (4.5 %). The rate of residual instability after tying was :5/44 (11%). The residual TFCC instability after arthroscopic repair can be reinforced by PDS out-side-in suture from 6-R portal.

**Discussion**

Arthroscopic repair for TFCC tear is considered a standard procedure with good outcomes owing to quicker recovery and fewer complications than open repair. Monitored tying under decreased traction is helpful to determine the strength of tie and also avoids cut through of TFCC during tying.

**Conclusions**

Dorsal deep DRUL repair may improve strength of supination. Combined fovea and capsule repair of TFCC significantly improves patients' VAS score postoperatively. Yet intraoperative blunder such as TFCC cut through during tying or residual unstable TFCC after typing sometimes occurs. In our study, arthroscopic monitoring during tying avoids cut through and insufficient node.

**Tension Band Wire - A Novel Fixation Technique in Metacarpal Neck Fractures**

掌骨頸骨折內固定術式之新選擇 - 張力鋼絲

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Metacarpal fractures can be categorized into fractures of head, neck, and shaft. About 50% of metacarpal neck fractures involve 5<sup>th</sup> metacarpal bone. The treatment of metacarpal neck fracture includes closed reduction with casting, closed reduction and percutaneous pinning (CRPP), and open reduction and internal fixation (ORIF) with plate or intramedullary pinning. However, some the aforementioned treatments often lead to stiffness and tendon irritation. Metacarpal neck fractures typically angulate apex dorsal, and tends to supinate when small finger is involved. Such angulation force creates a tension side dorsally and a compression side ventrally about the fracture site, as a result of ligamentotaxis. With respect to the principle of tension band wire technique, the construct converts tensile force into compression force. We have thus come out with the idea of applying tension band wire in metacarpal neck fractures with apex dorsal angulation. This study aims to investigate the feasibility and outcome of treating metacarpal neck fractures with tension band wire.

**Materials and Methods**

3 patients with metacarpal neck fractures were treated with tension band wire construct. When performing ORIF with tension band wire, the incisions were made dorsally over the fracture site. After the fracture site was exposed, proximal and distal fragments were cannulated transversally with the help of 18-gauge syringe needles. 0.035 inches wire was then applied through the cannulated holes in a figure-of-eight construct over the tension side of apex dorsal angulation, and was fastened to optimal tension for solid fixation of the fracture site. The wound was then closed by layers as usual fashion.

**Results**

The application of tension band wire in metacarpal neck fractures extensively stabilizes the preexisting apex dorsal angulation, which provides immediate rigid fixation and does not require immobilization. The 3-month postoperative follow-up radiographs in all 3 patients have revealed bone union without residual angulation. The patients were also presented with pain free, full ROM, and full grip power in their functional outcomes.

**Discussion**

Tension band wire brings several advantages comparing to other surgical modalities, including low profile implant, rigid anti-rotational fixation, and unrequired immobilization. Furthermore, such surgical technique can be performed under wide awake local anesthesia no tourniquet (WALANT) condition, which allows for intra-operative test for stability of fixation. However, there also exist some possible drawbacks such as possible tendon irritation. Last but not least, with respect to principle of tension band wire, it is contraindicated in volar cortex comminution patients.

**Conclusions**

Tension band wire might be a novel fixation technique in the treatment for metacarpal bone fracture. Yet further study with larger number of cases is required.



**Volar Dislocation of the Ulnar Head After Distal Radial Fracture****遠端橈骨骨折後尺骨頭掌側脫位**

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**Introduction**

In cases of distal radio-ulnar joint (DRUJ) instability, the incidence of dorsal deviation of the ulnar head is higher, when volar dislocation of the ulna is relatively rare. We presented a case in whom volar dislocation of the ulnar head occurred after osteosynthesis for the treatment of distal radius fracture. We report and discuss the diagnosis and treatment of volar dislocation of the ulnar head in this case.

**Materials and Methods**

A 52-year-old female suffered from falling accident and right distal radius fracture was impressed. She underwent open reduction with internal fixation (ORIF) with locking plate in 2020/10. However, pain persisted and limited pronation of right wrist was mentioned. Malalignment of the DRUJ was observed on plain radiography and right wrist triangular fibrocartilage complex (TFCC) tear with volar dislocation of ulnar head was noted on MRI. Re-operation was performed 3 months after osteosynthesis in order to stabilize DRUJ.

**Results**

During operation, incision between 5th and 6th compartments was made from dorsal side of right wrist. TFCC tear over dorsal DRU ligament was noted. DRUJ was reduced after releasing of the anterior capsule. TFCC was repaired with suture anchor (JuggerKnot, 1.4mm, Biomet) and reinforcement with 2-O Ethibond was performed. The DRUJ was fixed in neutral position using 1.6mm Kirschner wire.

**Discussion**

Generally, dorsal deviation of the ulnar head is likely to occur when DRUJ instability is noted. Rare cases presented with volar dislocation of ulnar head. Previous literature reveals that not only TFCC but also distal interosseous membrane (DIOM) plays an important role in the control of ulnar head instability toward the volar side. When tension of the DIOM cannot be improved by ORIF of the distal radius fracture, it is necessary to repair the injured TFCC to stabilize DRUJ.

**Conclusions**

We highlighted a rare case of volar dislocation of ulnar head after distal radius fracture. No consensus has been reached with regard to the selection of treatment. When pain and DRUJ instability persisted after osteosynthesis of distal radius fracture, active repair of TFCC should be considered to stabilize residual post-operative DRUJ instability.

## Concomitant Extensor Digitorum Communis and Extensor Digiti Minimi Tendon Rupture After Distal Radius-Ulna Fracture: Case Report

個案報告：遠端橈骨骨折後同時併發指伸肌及伸小指肌肌腱斷裂

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### Introduction

Distal ulnar fractures are uncommon in isolation but most accompanied with distal radius fracture. Tendon ruptures after distal radius-ulna fracture usually occur at flexor tendons and extensor pollicis longus after internal fixation of distal radius fracture. Although partial tear of extensor carpi ulnaris tendon was reported after ulnar styloid non-union, there is no concomitant extensor digitorum communis and extensor digiti minimi tendon rupture after distal radius-ulna reported in current literature. We present one case report of this rare condition.

### Case report

A 63-year-old man with hypertension had a left distal forearm two bone fracture after a traffic accident and his left wrist distal motion were intact before operation. Open reduction and internal fixation (ORIF) with Synthes distal radius locking plate and external fixators were applied for distal radius fracture due to intra-articular comminution. One 1.6 mm percutaneous Kirschner wire was fixed to distal ulnar fragment for displaced ulnar styloid fracture and the distal ulnar alignment was acceptable without fixation. But follow-up roentgenogram showed totally displaced left distal ulnar fracture with apex volar angulation. After removal of the wire, the displacement improved partially and the external fixators were removed 6 weeks following the operation. However, the left wrist painful disability and 3<sup>rd</sup> to 5<sup>th</sup> dropped digit were observed then. Operation was arranged, and complete tear of 3<sup>rd</sup> to 5<sup>th</sup> and partial tear of 2<sup>nd</sup> extensor digitorum communis tendon and complete tear of extensor digiti minimi tendon were noticed. Tendon repair with Kessler and side-to-side technique were performed after identification of stumps. Volar resting splint was applied then.

### Discussion

Treatment for distal ulnar fracture would be discussed after distal radius fracture is treated. In our case, the distal radius fracture is accompanied with ulnar styloid and metaphyseal fracture. The stability of distal radioulnar joint (DRUJ) could be tested only after internal fixation of distal ulnar, and the alignment of distal ulnar fracture was acceptable after fixation of distal radius fracture. As a result, we fixed the displaced ulnar styloid fracture in case of DRUJ instability presented. Distal ulnar metaphyseal fracture malalignment is defined as  $\geq 10$  degrees of angular deformity,  $\geq 3$ mm of ulnar variance change, or  $\geq 1/3$  translation of fracture surface. Although the total displacement of distal ulnar fracture improved partially after removal of the percutaneous wire, the dorsal angulated proximal fragment still impinged the extensor tendons, which may contribute to the tendon ruptures even under gentle ROM.

### Conclusions

Concomitant extensor digitorum communis and extensor digiti minimi tendon rupture is a rare condition after distal radius-ulna fracture. Operation for distal ulnar fracture should be intervened if the malalignment presented to avoid the complication.

**Tortious Ulnar Artery: A Possible Cause for Ulnar Tunnel Syndrome****曲折的尺動脈：造成手腕尺神經隧道症候群的可能原因之一**黃敬凱<sup>1</sup> 胡名賢<sup>2</sup> 李佩淵<sup>2</sup> 陳信銓<sup>\*2</sup>國立成功大學附設醫院骨科部<sup>1</sup> 彰化秀傳紀念醫院骨科部<sup>2</sup>**Introduction**

Ulnar nerve compression neuropathy, also known as ulnar tunnel syndrome, is caused by compression of nerve at Guyon's canal. While ganglion cyst being the most common cause, ulnar artery anomaly or thrombosis can also play a role.

**Case**

A 44 years old man who had no underlying disease before complained a painful mass on right palm ulnar side with progressive 4<sup>th</sup> and 5<sup>th</sup> finger numbness for 2 months. No trauma history or infection symptoms were noticed. Physical examination revealed a mass with tenderness over the top of pisiform and hamate, with distal phalanx circulation intact. No claw hand or muscle weakness was identified. Plain film showed no bony lesion. Magnetic resonance imaging showed palmar side soft tissue nodule. Tumor excision was performed and a tortious vascular structure arising from ulnar artery was found to compress the palmar branch of ulnar nerve intraoperatively. The vascular lesion was removed and ulnar artery was re-anastomosis with 6-0 Nylon. Pathology revealed vascular malformation with thrombosis without any malignant tissue.

**Discussion**

Ulnar tunnel syndrome can be divided into three zone of compression. Zone I locates before the ulnar nerve bifurcation and may presents with mixed motor and sensory deficit, while zone II affects deep branch of ulnar nerve and leads to only motor deficit. Zone III lesion, however, affects palmar branch of ulnar nerve and leads to only sensory deficit. Physical examination can give us a hint on possible lesion area. Plain films and computed tomography help to identify any bony fracture or dislocations. Sonography and Magnetic resonance imaging can provide more details on soft tissue lesion.

Ganglion cyst accounts for the most common cause of compression in Zone I and Zone II, while ulnar artery pathology becomes more predominant in Zone III. Thrombosis is thought to be result from single or repetitive blunt impacts on hypothenar eminence, which may further causes digital ischemia. Long-term use of vibrating tools and sports such as volleyball, mountain biking and golf are risk factors.

Other rare vascular anomalies including ulnar artery aneurysm, tortious ulnar artery, arteriovenous complex and hemangiomas are also been reported. These vascular lesions can be hard to distinguish merely through the Magnetic resonance imaging. Angiography or Doppler ultrasound can reveal blood flow and help diagnosis. Excision of involved segment and reconstruction of ulnar artery may be indicated if symptomatic.

**Conclusions**

We reported a case of tortious ulnar artery with thrombosis causing ulnar tunnel syndrome. Vascular lesion should always be considered and surgical management may be needed.

## Median Nerve Anastomosis to Palmaris Longus: A Trap in Management of Wrist Volar Laceration

正中神經與掌長肌肌腱吻合：處理手腕腹側撕裂傷的陷阱

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### Introduction

Volar wrist laceration can involve multiple structures from tendons, arteries to nerve injuries. Surgical management is complicated and sometimes unsatisfied outcome may result from incorrect operative technique.

### Case

A 50 years old woman, who is a smoker, hepatitis B virus carrier and had right middle lobe bronchiectasis status post lobectomy, suffered from right wrist volar side cutting injury by broken porcelain and receive surgery at other hospital one month ago. However, persistent hand tingling, numbness and progressive wrist stiffness were noticed. While visiting our outpatient clinic, physical examination showed positive Tinel's sign, hypoesthesia over median nerve distribution and thenar muscle weakness. Plain film was generally normal but electromyography and nerve conduction velocity revealing left median neuropathy at wrist with active denervation. Surgical exploration was performed and proximal end of median nerve was found attached to distal end of palmaris longus mistakenly. We extended the surgical wound distally and refreshed both distal and proximal stump of median nerve. Finally, we repaired the median nerve with 6-0 Prolin and apply anti-adhesion agent. A short arm splint was applied and Occupational Therapy was arranged post-operatively.

### Discussion

Median nerve and palmaris longus shares similar anatomical position over volar side of wrist, with palmaris longus on top of the median nerve. It is not common but sometimes misidentification and iatrogenic nerve injury happened. It has been reported that median nerve being harvested as palmaris longus tendon for a free tendon graft. Also in extensive wrist volar injuries, known as "spaghetti wrist", median nerve stump repair to palmaris longus tendon incorrectly has also been mentioned.

Palmaris longus is lacking or poorly developed in approximately 1/10 of people. For non-traumatic cases, these can be distinguished among adequate physical examination. As coming to trauma, nerve or tendon usually retract after severance and extensive exploration from deep to superficial is needed. To identify the correct anatomy, clear the hematoma among surgical field, apply adequate lighting, and both distal and proximal end of the injured structure should be tagged by clips before repair.

Repair the nerve to tendon can lead to complete nerve palsy. The golden time for nerve repair should be within 6 months post-injury, for irreversible muscle atrophy would happen as time passes by. If tension-free repair is not possible, nerve grafting is another treatment of choice.

### Conclusions

Extensive wrist volar laceration is complicated and need expertise for adequate management. Extensive exploration should not be hesitate for any suspicions of mal-treatment to avoid further complications.

**Asymptomatic Ulnar Styloid Triquetral Impaction Case Report****無症候性尺骨莖狀突起三角骨撞擊症 症例報告**周鉅文<sup>1</sup> 寺岡朋子<sup>2</sup> 吉田宏<sup>1</sup> 寺岡暉<sup>2</sup>北川醫院骨科<sup>1</sup> 寺岡記念病院<sup>2</sup>**Introduction**

Lewis stated that primates retain a primitive mammalian wrist joint pattern and indicated that the lower extremity of the ulna participates in the joint, articulating with the triquetral and pisiform bone.

Ulnar styloid impaction against the triquetrum (USTI) has been recently reported as a distinct cause of ulnar-sided wrist pain. When an excessively long ulnar styloid abuts against the triquetrum, for longer period of time, TFCC may be eroded to the extent of full exposure of the tip of the ulnar styloid and results the pain syndrome. The purpose of our presentation is to suggest that long-term existence of an excessive long ulnar styloid process with severe impaction of the triquetrum will not induce a pain syndrome when the TFCC is intact.

**Materials and Methods****Case Presentation:**

An 87-year-old right-hand-dominant surgeon was examined as having excessive long ulnar styloid process with impaction of the triquetrum in left wrist on an incidental X-ray examination for his osteoporosis. Detailed examination by MRI and ultrasonography demonstrated that there was a synovial joint between ulnar styloid end and triquetrum with intact TFCC. There were no history of injury or overuse. No functional impairment or motion disturbance noticed. Dynamic X-rays showed no ulnar variance and a long ulnar styloid process of 12mm in length with joint formation with triquetrum in neutral position and severe impaction into the triquetrum on adduction of the left wrist. Provocative maneuver did not induce the pain.

**Results**

MRI, ultrasonography and dynamic X-rays demonstrated that there was an excessive long ulnar styloid process with joint formation in neutral position and severe impaction into triquetrum in forceful adduction of the left wrist without any discomfort or pain, The TFCC was intact.

**Discussion**

Heijden analyzed the effect of different radiographic views to assess the length of the ulnar styloid and suggested using ulnar styloid-capitate ratio (SCR) in addition to styloid length for defining a long ulnar styloid as having an SCR greater than  $0.18 \pm 0.05$  and /or an overall styloid length greater than 6mm. Our case showed excessive long ulnar styloid process in the left wrist as having 12mm in length with SCR as 0.57 compare to the normal right side as having 5mm in length and with SCR as 0.23.

**Conclusions**

An excessive long ulnar styloid process with impaction of the triquetrum may not produce any symptoms when the TFCC is intact. Asymptomatic USTI may be an inherited anatomic variation like primates as monkeys.

**Concurrent Scaphoid Fracture with Scapholunate Ligament Injury****舟狀骨骨折併舟月韌帶損傷**

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**Introduction**

Scaphoid is the most frequently fractured carpal bone, and often occurring after a fall onto an outstretched hand. The most common treatment for scaphoid fracture is percutaneous reduction and internal fixation. Scapholunate ligament is a key component for carpal stability. However, the incidence of acute scapholunate ligament injury combined with scaphoid fracture is not clear, given this injury is hard to be diagnosed in the acute trauma setting. The aim of this study is to evaluate the incidence and management of such seemingly paradoxical complex injuries.

**Materials and Methods**

From 2016 to 2020, a retrospective study in our institution was performed, including 12 patients, with a mean age of 33.5 years old (minimum 17; maximum 61), who underwent arthroscopic-assisted reduction and internal fixation (ARIF) for scaphoid fracture. Inclusion criteria is acute scaphoid fracture, including transscaphoid perilunate fracture dislocation. Patients unsuitable to receive ARIF or with scaphoid non-union were excluded. Wrist arthroscopy was done to assist the reduction of scaphoid fracture and treat soft tissue injuries in the same time.

**Results**

Half of the patients (6 of 12) had associated scapholunate ligament injury. According to the Geissler classification, there were two type I lesions, three type II lesions and one type III, no type IV lesion was detected. After reduction and fixation for scaphoid fracture, thermal shrinkage for type I and type II lesions was done. Reduction and association of the scaphoid and lunate (RASL) was performed for type III lesions.

**Discussion**

Scapholunate ligament injury is seldom reported in association with an acute scaphoid fracture but is more frequently described in association with a scaphoid fracture nonunion. Although simultaneous occurrence of a scaphoid fracture and a scapholunate ligament injury is thought impossible, there are several case reports of scapholunate ligament injuries combined with acute scaphoid fracture, but the incidence is variable in the literature. In this study, half of 12 cases had scapholunate ligament injury. This paradoxical injury needs to be managed to avoid subsequent carpal instability .

**Conclusions**

Concurrent scapholunate ligament injury with acute scaphoid fracture is not as rare as generally thought. In the scenario of acute scaphoid fracture, associated scapholunate ligament injury is necessary to be diagnosed and treated in the same time.

**Treatment of Rheumatoid Wrist Arthritis with Arthroscopic Assisted Radiolunate Fusion and Sauvé-Kapandji Procedure: A Case Report****以腕部關節鏡輔助橈月關節融合及Sauvé-Kapandji手術治療風濕性腕部關節炎之個案報告**

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**Introduction**

Cartilage degeneration, synovitis, ligamentous laxity, tendon rupture, bone erosion or joint deformity usually accompanied by progression of rheumatoid wrist arthritis. Nonsteroidal anti-inflammatory drugs, steroids and disease-modifying antirheumatic drugs are the cornerstone of current treatment. However, surgical treatment is considered whenever conservative treatment fails or as early as possible to prevent function loss or progressive deformity. Previous studies reported different operative options for varying degrees of wrist radiocarpal and distal radioulnar joint destruction and instability. Here we reported a case of rheumatoid wrist arthritis treated with right wrist arthroscopic assisted radiolunate(RL) fusion and Sauvé-Kapandji(S-K) procedure arthrodesis.

**Materials and Methods**

A 22 year-old female had suffered from progressive right wrist pain and swelling for 6+ months. Physical examination revealed right wrist tenderness which was more prominent over radiolunate and positive Ballottement test over DRUJ joint and accompanied with limited ROM. Lab data revealed normal CRP, negative ANA, but elevated ESR and RF. Radiographic study showed DRUJ widening and cartilage erosion over radiolunate joint. MRI demonstrated severe radiocarpal joint synovitis, scapholunate interosseous ligament partial tear and DRUJ dorsal subluxation. Medication treatment and local injection were attempted initially without prominent effect. Due to failed of conservative treatment, operation was underwent as right wrist arthroscopic debridement, radiolunate fusion and distal radial ulnar joint S-K procedure arthrodesis.

**Results**

Radiography showed bone healing with stable fixation 6 months after operation. Improved pain(VAS 9 to 1-2) and right wrist ROM (flexion:45°; extension:40°, pronation: 85°; supination: 85°) also noted at latest follow up.

**Discussion**

Various surgical treatment for rheumatoid arthritis of wrist had been reported with satisfactory outcomes. Usually, the DRUJ was first involved joint and then the radiocarpal joint with severe synovitis. Few evidences have reported better clinical outcomes with more stable radiocarpal joint in S-K procedure in compared to Darrach procedure, especially in patients with young age and high functional demand. Additional RL fusion was usually performed in company with Darrach procedure for prevention from radiocarpal translation. However, limited radiocarpal fusion can be considered in S-K procedure for young, active patients with cartilage erosion. Although pain relief and functional wrist can be obtained after radiolunate or radioscapulohumeral arthrodesis, RL fusion yield better postoperative ROM which was more suitable for patients with early stage of radiocarpal destruction. Series studies also suggested efficiency of wrist arthroscopic surgery for functional recovery in moderate stages of rheumatoid wrist arthritis, sustained remission and slowed radiological progression of disease when conservative treatment failed.

**Conclusion**

Wrist arthroscopic assisted radiolunate fusion and Sauvé-Kapandji procedure is likely to be a safe and effective intervention to treat rheumatoid wrist arthritis with less complication and remission of disease progression.

## **Distraction Osteogenesis and Ulna Head Hemiresection Arthroplasty in Treating Physeal Arrest After Distal Radius Fracture : Case Report and Literature Review**

牽引骨生成術合併尺骨頭半切除術用於遠端橈骨骨折術後生長板生長停止:個案報告及文獻探討

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### **Introduction**

Growth arrest of distal radius is a relative rare complication followed by pediatric distal radius fracture. There are variety of treatment options for the condition , including distal ulnar epiphysiodesis , physeal bar excision with interposition grafting to more invasive procedure like ulnar shortening osteotomy , radial lengthening or distraction osteogenesis .

### **Materials and Methods**

A 9-year-old child suffered from left distal radial metaphyseal fracture , salter harris type II . He received close reduction and percutaneous pinning plus short arm casting . After loss follow up for 10 years , patient suffered from wrist deformity and stiffness, Xray showed ulna positive variance (2.5cm) with loss radial inclination and radial height.. In order to restore the limb length , we first performed distraction osteogenesis with Radius open osteotomy and monoplanar External fixation . After operation for 2 months , distraction length seemed unideal due to ulna impaction . So we performed ulnar head hemiresection arthroplasty and adjust external fixator . After 1 month of distraction and ideal radial length was achieved , we remove the external fixator and arranged open reduction internal fixation with MIPO technique for distal radius stabilization .

### **Discussion**

Operative treatment of physeal arrest of distal radius includes distal ulnar epiphysiodesis , physeal bar excision with interposition grafting to more invasive procedure like ulnar shortening osteotomy, radial lengthening or distraction osteogenesis. Once ulnar abutment is present or radial shortening too much , invasive procedures like ulnar shortening osteotomy , radial lengthening or distraction osteogenesis was much preferred .

Reviewing literature , in order to correct radial length discrepancy , possible method could be circular external wrist fixator like ilizarov external fixator. Considering the implant size , convenience and patient's request, we performed distraction osteogenesis with monoplanar external wrist fixator. But after surgery for 2 months , we face a new problem of unideal radial length distraction not documented in literature. The condition might be induced by DRUJ limitation and ulna impaction. In order to solve this condition , we arrange another surgery of ulna head hemiresection arthroplasty and adjust external fixator. After the surgery for 6 weeks , we achieve the ideal radial height and radial inclination, so we remove the external fixator and perform open reduction internal fixation of distal radius for further stabilization. Follow up examination showed proper supination/pronation/flexion/extension of wrist function and Xray showed solid bone union.

### **Conclusions**

Distraction osteogenesis is one of the solution in treating growth arrest after distal radius fracture. It may come across rare situation of growth restriction cause by DRUJ limitation and ulna impaction . Ulna head hemiresection arthroplasty is one of the possible solution in treating this problem .



**Cost Effective Analysis of Phalanx Fracture Surgery Using WALANT Technique Compared with General Anesthesia or Local Anesthesia with Tourniquet****比較 WALANT 手術與全身麻醉或局部麻醉合併止血帶方式-探討手部指骨骨折手術的經濟效益分析**

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**Introduction**

WALANT(Wide awake local anesthesia with no tourniquet ) technique is a growing technique and it proven to be cost-effective in orthopedic trauma surgery . We therefore intended to explore the cost-effectiveness in Phalanx fracture surgery using WALANT technique compared with traditional general anesthesia and local anesthesia with tourniquet

**Materials and Methods**

Sixty-two patients with phalanx fracture underwent open reduction and internal fixation with plating from 2015-2018. They were divided into three groups. There are 32 patients in Group I which are local anesthesia with tourniquet. There are 15 patients in Group II which are general anesthesia with tourniquet and 15 patients in Group III using WALANT technique. No significant difference in gender distribution and mean age between these 2 groups. We record and analyze anesthesia time, operation time , length of POR stay , preoperative cost , Anesthesia reimbursement, operation cost , hospitalization total cost...etc . We further calculate the total cost and compare the time consumption between different anesthesia technique

**Results**

The anesthesia time was 20.19±1 min for group I , 21.4±4.91 min for group III and 32.4±6.34 min for group II . Preoperative cost of group II was \$1240 NT dollars higher than group I and III. Anesthesia reimbursement was \$65 NT dollars for group I and III, otherwise \$3582 NT dollars for group II. Furthermore, there is no need for WALANT group patient undergoing PACU monitor. Thus decrease PACU cost about \$130 NT dollars.

Besides, postoperation pain score was 2.93±0.76 for group I , 3.13±0.92 for group II and 1.93±0.96 for group III .

**Discussion**

WALANT technique had proven to be cost-effective in orthopedic surgery. According to the results of our study, statistically significant difference was disclosed regarding the anesthesia preparation time, postoperative pain score and hospitalization total cost. Through our calculation, at least \$4942 NT dollars hospitalization total cost reduction compared the WALANT group and general anesthesia group. It should be attributed to the elimination of the need for preoperative survey, general anesthesia related reimbursement and PACU monitor cost. Thus greatly reduce the total cost of phalanx fracture surgery . Additional benefit include decreasing the anesthesia preparation time, decrease postoperative pain , increase the satisfaction rate toward the phalanx fracture surgery .

**Conclusions**

In this study, phalanx fracture undergoing open reduction with plating fixation with WALANT technique had significant reduction in preoperation examination cost, anesthesia cost and total hospitalization cost compared with general anesthesia and local anesthesia with tourniquet use.

## Isolated Vaughan-Jackson Syndrome Unrelated to Rheumatoid Arthritis: Case Report and Literature Review

### 非風濕性關節炎患者的沃恩傑克森症候群：病例報告與文獻回顧

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#### Introduction

Vaughan-Jackson syndrome 是一種手指伸肌肌腱自恥骨側依次向橈骨側斷裂的症狀，患者通常沒有相關的創傷史，通常也不會有明顯的疼痛。此類症狀多出現於風濕性關節炎的患者，伴隨著遠端橈尺骨關節的脫位，尺骨的背側脫位以及手腕的滑膜炎。於此例中我們報告一例罕見的非風濕性關節炎患者的單側 Vaughan-Jackson syndrome 群以及相關的文獻回顧。

#### Materials and Methods

肌腱轉移手術部分使用手腕背側入路，轉移的肌腱使 pulverta tendon weaving 方式進行，術後使用腹側附木固定六週。文獻回顧部分利用 Pubmed 資料庫。關鍵字包含 type II diabetic mellitus, diabetic ketoacidosis, perioperative period 搜尋近十年文獻。

#### Results

根據患者表示症狀自大約六個月前產生，先從左小指發生無法伸直的狀況，隨後症狀逐漸蔓延至同側無名指以及中指，患者否認任何相關的創傷史，患處無疼痛狀況。身體檢查顯示左側小指至中指均無法自行伸直，被動的活動範圍無明顯的限制，肌腱式抓握現象均消失。遠端橈尺關節呈現尺骨背側脫位，且具有 Piano sign。影像檢查顯示遠端橈尺關節脫位，ulnar plus 的狀況。術中檢查發現患者伸小指肌及總伸指肌肌腱第七區斷裂，術中僅觀察到輕微的滑膜炎而無明顯的類風濕性關節炎的症狀。以患者伸食指肌腱轉位後重建中指至小指的總伸指肌肌腱，術後以石膏固定六周，患者術後雖然依然有約 15 度的伸直肌落後現象，但已能主動伸展左側中指至小指。

#### Discussion

Vaughan-Jackson syndrome 多出現於類風濕性關節炎的患者身上，因為其遠端橈尺關節以及腕關節的退化，造成局部的滑囊炎以及尺骨的背側脫位，一般常見的治療策略遠端尺骨切除，滑膜炎切除及肌腱轉移。介入的時間點通常建議儘早介入以降低手術的複雜度。於類風濕性關節炎以外的案例並不多見，曾有案例報告顯示在月狀骨壞死的患者以及遠端橈骨關節退化性關節炎的換者都有出現過 Vaughan-Jackson syndrome 的情況，於前例中患者因為月狀骨背側脫位，後者則如同風濕性關節炎患者同樣為尺骨脫位所造成的肌腱磨損以及斷裂。於此例中所觀察到在非慣用手且無相關病史的遠端尺橈關節脫位鄉端的案例相當的罕見。在治療策略上，除了患者的功能性重建之外，另外還需要針對患者本身造成肌腱磨損的根本原因進行處理，以避免未來症狀復發。

#### Conclusions

如

## Irreducible Fracture-Dislocation of Index Finger Metacarpal-Phalangeal Joint (Case Report) 食指掌指關節無法復位之骨折脫位(個案報告)

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### Introduction

A 19-year-old right-hand dominant young man presented to our hospital with complaints of pain and deformity of the left index finger. At the time of injury, he fell to forward and the left palm landed on the ground with pronation of the forearm and left index finger suffered an extreme hyperextension position and was stepped by someone. On examination, he had a hyperextended deformity at the MP joint and absence of active and passive movements of this joint. There was no neurovascular damage and plain radiographs demonstrated dorsal complete dislocation of MP joint with 2<sup>nd</sup> metacarpal head fracture. Close reduction under sedation was performed but failed. Dorsally surgical approach was performed for ORIF of 2<sup>nd</sup> metacarpal head fracture and reduction of MPJ. During operation, the inspection of the joints revealed that the volar plate was completely dorsally translocated over the metacarpal head.

### Materials and Methods

MCP dislocations are usually dorsal, caused by a fall and hyperextension of the MCP joint and index finger is most commonly involved. Also, associated fractures of metacarpal head or proximal phalange were seen in up to 50 percents. Recent study reported that complex MP joint dislocations are, by definition, irreducible by closed means and require open reduction, as the volar plate becomes entrapped between the metacarpal head and proximal phalanx. For open reduction - the dorsal & the volar, are the two primary approaches described. Though, the right approach to treat such lesions is still a debate, it is the volar approach which is widely used and described more in literature. Volar approach is precarious to injure the neurovascular structures. Thus, we will present a case with dorsal surgical approach to ORIF and try to perform reduction.

### Results

As follow-up after 6 weeks, he had no pain, almost full range of motion on his left index finger. We needed more long time follow-up and tried to evaluate patient's functional outcome. Neurovascular evaluation was within normal limits. X-rays confirmed maintenance of reduction and bone union

### Discussion

Some reports showed patients with MCPJ fracture-dislocation treated with volar approach had a sensory loss on the radial aspect of the injured finger while those treated with dorsal approach had full recovery with normal function. In our care, fracture fragment is on the dorsal side and ideally addressed by dorsal approach. The main culprit of this lesion is the volar plate. It dislocates dorsally and lies between the joint which prevents the reduction.

### Conclusions

Dorsal and volar both approaches can be used for the complex dislocations of MCP joint. Dorsal approach is better in view of reducing the possibility of neurovascular compromise. Though, extensive follow-up and clinical evaluation should be executed combined so as to thoroughly assess the effectiveness of both methods.

## The Peritrapezoid and Peritrapezium Dislocation with Dislocation of 3rd Carpal-Metacarpal Joint — A Case Report

大小多角周邊脫位合併第三腕掌關節脫位— 病例報告

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### Introduction

The peritrapezoid and peritrapezium dislocation with dislocation of 3rd carpal-metacarpal joint are rare event, especially the dislocation in volar side. This kind of injury is usually caused by high energy trauma. In most cases, the dislocation is volar side and is difficult to reduce because the joint is less mobile. Here we present our experience in the management of a male patient with acute trapezoid metacarpal dislocation treated by closed reduction and multiple pinning with good functional results at 3 months.

### Materials and Methods

A 38-year-old male patient sustained a motorcycle accident. He presented to our emergent department with complaints of pain, swelling, limitation, and deformity of his left hand. Physical examination showed volar deformity of the metacarpal-trapezoid joint without distal neurovascular deficit. Radiographs revealed peritrapezoid/peritrapezium dislocation, dislocation of 3rd carpal-metacarpal joint and 3<sup>rd</sup>-4<sup>th</sup> intermetacarpal joint. CT of his left hand revealed trapezoid and trapezium dislocated to volar side. In the surgery, close reduction was achieved manually and bones were fixed with multiple 1.6mm Kirschner under C-arm fluoroscopy. The hand was supported by short arm split.

### Results

Postoperatively, the pain was improved and his hand deformity reduced. Radiographs showed good position and congruity of carpal-metacarpal joint after closed reduction. After removal of K-pins at 6 weeks postoperatively, rehabilitation program was begun. At 3 months, he could move his fingers and wrist joint freely without remarkable discomfort.

### Discussion

According of Garcia-Elias et classifications, our patient involved both axial ulnar dislocations and axial radial dislocation. At present, it is difficult to know how this injury occurs. The main mechanisms of this traumatic pathology are secondary to direct injury, fall from a height, or a rotational force (high-energy processes); which often result in posterior dislocation. However, this case belongs to “volar dislocation” which is very rare.

### Conclusions

Divergent carpometacarpal joint dislocation to volar side are exceptional; their diagnosis is sometimes difficult and may go unnoticed especially in a patient with polytrauma. The functional prognosis depends on the precocity of diagnosis and the quality of the reduction and rehabilitation.

## Rumpel-Leede Phenomenon, Nightmare of Hand Surgeon: A Case Report and Literature Review

魯氏現象，手外科醫師的夢靨：個案報告及文獻探討

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### Introduction

Rumpel-Leede (R-L) phenomenon is a rare event in which the small dermal capillaries of an extremity rupture in response to application of a compressive device to that extremity, such as when inflating a cuff during noninvasive blood pressure monitoring or when applying a tourniquet to during the surgery. We report a case who experienced R-L phenomenon after releasing the tourniquet after the surgery of finger tenolysis.

### Materials and Methods

A 44-year-old woman with a history of systemic hypertension (HTN) and type 2 diabetes mellitus (DM) presented bilateral middle finger tenosynovitis for one month, so we arranged surgery of bilateral tenolysis for her. All preoperative examination was normal. Noninvasive blood pressure (BP) monitoring revealed a BP of 214/92 mm Hg just before the surgery. During the surgery, the tourniquet was applied for 7 minutes for the left hand and 27 minutes for the right hand, and was well tolerated by the patient.

### Results

Immediately after the right arm tourniquet released, she subsequently developed an erythematous petechial rash spreading on her right upper extremity distal to the site of the tourniquet application. This extended into her hand with a sharply demarcated proximal border in her upper arm. Distal pulses were intact and capillary refill was normal on the fingers, and there was no sensory or motor deficit. BP monitoring revealed a BP of 192/107 mm Hg at the point. A clinical diagnosis of R-L phenomenon was made, and she was discharged after 1 hour of observation. At 1-week follow-up, she was seen in our outpatient department with much improvement of the lesion, and a complete resolution of the rash at 2-weeks follow-up.

### Discussion

R-L phenomenon, also known as acute capillary rupture syndrome, is a rare occurrence where distal dermal capillaries rupture in response to a proximal compressive force. It has since been used as a test for thrombocytopenia and capillary fragility. There have also been reports of the phenomenon occurring in the settings of chronic steroid use and Sjogren's disease. Since there is no treatment for this condition apart from treatment of the underlying vascular disease or thrombocytopenia, prevention is very important. It can be easily prevented by carefully history taking and blood examination before the surgery which needs tourniquet use.

### Conclusions

R-L phenomenon is believed to occur most often in patients with underlying vascular disease, such as DM, HTN or thrombocytopenia. R-L phenomenon is most often benign, though it may rarely be associated with pain and discomfort. So if the patients are going to receive hand surgery under with tourniquet, it is best to relief the pressure gradually to prevent the capillary from rupture causing by sudden blood pressure differences.

**Wrist Pain Caused by Superficial Palmar Branch of the Radial Artery****橈動脈掌側枝造成的手腕疼痛**

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**Introduction**

Radial artery contributes to the superficial palmar arch with its superficial palmar branch. The superficial palmar branch of radial artery (SPBRA) usually pierces through the thenar muscle and supply the thenar region. However, variation of SPBRA in size, branching patterns and course have been reported. Rarely, a subcutaneous course of the SPBRA may cause clinical symptoms.

**Cast Report**

60 years old female complained a painful mass over left wrist for 2 years. The pain exacerbated with powerful grip and subsided with rest. The mass is firm, tender, and is about 0.2 x 0.2 cm in size. Besides, a weak pulsation was noted around the mass.

Radiography showed calcification around scaphoid tubercle. MRI revealed joint space narrowing of scaphotrapezotrapezoid joint without soft tissue tumor or bony lesions. Sonography displayed a subcutaneous course of the SPBRA lying upon a bony prominence. MRA showed plenty of collateral circulation around SPBRA. Allen test of left hand was negative.

The tender portion was marked on the skin before skin incision. The SPBRA was partial excised over the tender region, about 0.5 cm in size. Patient was pain free the next day after the surgery. The symptoms did not recur 1 year after the operation.'

**Discussion**

There were variations of the branching course, size and pattern of the SPBRA in the literature. The subcutaneous course of the SPBRA may be externally compressed during grasping and caused pain in patients. Though transposition of the artery into thenar muscle was reported in one study, we decided to excise the compressed segment of the SPBRA due to good collateral circulation of the thenar muscle and contusion bruise of the artery.

**Conclusion**

SPBRA has different kinds of variation and subcutaneous course of the artery may be symptomatic. Simple excision after vascularity evaluation offered satisfactory results for our patient.

## **Pulmonary Tuberculosis with Wrist Involvement: An Uncommon Differential Diagnosis of Swelling Wrist**

**腕關節結核菌感染：罕見的手腕腫脹之鑑別診斷**

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### **Introduction**

Extrapulmonary tuberculosis (EPTB) is known to have many and varied presentations. The clinical features of such infections are known to mimic chronic pyogenic osteomyelitis. This case underlines the importance of making EPTB an important differential diagnosis even in cases with clinical features that are completely inconsistent with tubercular infections.

### **Materials and Methods**

A 57-year-old male, without history of tuberculosis (TB), had complained of pain and swelling of right wrist for 1 month. Patient came to our hospital on 2nd Dec 2020. X-ray just showed soft tissue swelling in right wrist. Magnetic resonance imaging (MRI) showed synovitis around radiocarpal joint, distal radioulnar joint. Notably, it also implied bulging infected synovial recess or abscess is more prominent over volar aspect of right wrist. Laboratory tests revealed C-reactive protein (CRP): 6.78mg/L, erythrocyte sedimentation rate (ESR): 55mm/h. Therefore, we had arranged the admission for surgical intervention with debridement.

### **Results**

Due to chest radiography showed numerous tiny nodules with patches in bilateral lungs more in upper lungs. Therefore, tuberculosis was highly suspected. Laboratory tests for tuberculosis survey disclosed that Acid Fast Stain: 4+, PCR: positive. Sputum TB Culture showed Mycobacteria tuberculosis complex growth. Therefore, we hold the operation. Anti-tuberculous treatment with Rifampin, Isoniazide, Pyrazinamide and Ethambutol were prescribed since 18th Dec 2020.

### **Discussion**

Radiography of the joint has poor sensitivity to detect early joint damage, but changes may be evident early on magnetic resonance imaging.

### **Conclusions**

Pulmonary tuberculosis with wrist involvement is uncommon. However, in developing countries where tuberculosis is prevalent, it should be part of the differential diagnosis in order to prevent delayed diagnosis and treatment.

## The Two-stage Total Hip Replacement in Systemic Sclerosis and Dermatomyositis Patient Under Immunosuppressive Drug Treatment with Active Tuberculosis Hip: A Case Report

兩階段全髖關節置換術治療結核菌性髖關節病在長期免疫抑制治療系統性硬化症和皮肌炎患者：個案報告

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### Introduction

Atypical infection was sometimes found in patients with immunosuppressive drug treatment. Tuberculosis arthritis was one of atypical infection in septic hip. There were some articles discussed about total hip replacement for tuberculosis arthritis. However, no standard treatment was prescribed for active tuberculosis arthritis. We prescribed a success case of immunosuppressive patient with tuberculosis arthritis with two stage surgery and preoperative and postoperative used of the antitubercular agent.

### Materials and Methods

39-year-old female with systemic sclerosis and dermatomyositis for 8 years under long-term Immunosuppressive drug treatment referred to our OPD due to right hip pain. After infection survey in OPD, septic arthritis of right hip or AVNFB with synovitis was highly suspected. Therefore, patient was admitted to our ward. Direct anterior approach for arthrotomy was arranged and accidentally reported TB arthritis. antitubercular agent was prescribed and treatment first. After 2 months Antitubercular agent treatment, we arranged Two-stage Total hip replacement : 1st Girdlestone procedure with resect right femoral head and set cement femoral head with cannulated screws fixation and total hip replacement after at least 3 months antitubercular agent treatment with TB Culture from last operation revealed negative finding. After total hip replacement, at least 8 months antitubercular agent treatment in OPD follow up.

### Results

In this case, we kept Anti-TB treatment total 15 months (aim of therapy 12-18 months). The function score of hip was well and the infection index of serum significantly declined by regular following in OPD. There were no recurrent tuberculosis arthritis or infection after 36 years follow up.

### Discussion

After reviewing articles about total hip replacement for TB arthritis. Current evidence showed a high success rate and low complication rate after treatment. The experienced surgeons suggest adequate joint debridement and perioperative prophylactic Antitubercular agent was key point for success operation. Cement with Antitubercular agent had no obvious benefit for treatment. One-stage procedure was report with success treatment of active tuberculosis arthritis without sinus discharging pus whereas two-stage procedure was highly suggested for active tuberculosis arthritis with sinus discharging pus.

### Conclusions

Active tuberculosis arthritis can apply total hip replacement after review articles 2.The important for success treatment is complete debridement, perioperative prophylactic antitubercular agent (1-3 months) and postoperative antitubercular agent treatment(at least 12 months) 3. two-stage procedure was highly suggested for active tuberculosis arthritis with sinus discharging pus 4. Cement with Antitubercular agent had no obvious benefit for treatment



**Dose Patient with History of Hepatitis B Infection Can be a Safe Bony Graft Donor?****具 B 行肝炎病史者，是否適合捐贈骨組織？**

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**Introduction**

Studies around 1975, showed an extremely high prevalence of chronic hepatitis B infection in the general population (15~20%) in Taiwan. As a blood transmitted disease, active hepatitis B is prohibited from donation of bone graft. When the virus may become silent / cured, these people are candidates for bone donation. However, as hepatitis B is potentially re-activated after chemotherapy or immunosuppression, whether the virus has the possibility to hide in bone graft is a concern. There is evidence that HBV virus infects bone marrow mesenchymal stem cells but still lacks evaluation of hepatitis B transmission risk. We retrospectively analyze the past 10 years of lab data in our hospital to assess the possibility of HBV transmission.

**Materials and Methods**

From 2010/01 to 2020/11, 568 patients had received bone graft implantation during surgery. 25 patients have examined hepatitis B associated lab data during the following years due to liver cirrhosis, screen, ill internal medicine associate problem, ...etc.

**Results**

3 donor with Hx of hepatitis B infection but HBsAg and anit-HBc-IgM were negative on time of harvest bone graft. However, all of them have positive Anti-HBc-IgG. On the long term follow up of paired recipients, 1 recipient has positive anit-HBc-IgG and HBsAb. Another one has a record of Negative HBsAg but positive HBsAb 3 years later; still another one has negative HBsAg and positive anti-HBc-IgG but HBsAg becomes positive 2 years later. On Anti-HBc-IgM: Non-reactive and HBsAg: Nonreactive donor, paired 16 recipients have either anti-HBc-IgG, HBsAg or anti-HBe positive. Still 3 recipients' record appears HBsAb positive but cannot justify this is caused by HBV exposure or post vaccination.

**Discussion**

Chronic hepatitis B can lead to liver cirrhosis or even liver cancer. However, limited resources of allograft bone sometimes affects surgeons evaluating the necessity of each transplantation. Graft from donors with a history of HBV infection shall be of great concern. According to current record, recipients have hepatitis B still cannot complete attributed to the bone graft.

**Conclusions**

Only exam anti-HBc-IgM and HBsAg of donor may not be enough. Anit-HBc-IgG of both donor and recipient are suggest. The risk of hepatitis B transmission on bone graft requires more comprehensive serum examination on more patients.

## The Absorption Process of Artificial Bone is Similar to Osteomyelitis in Nuclear Medical Image 人工骨於體內吸收過程於核醫影像中類似骨髓炎

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### Introduction

Bone defect may arise from bone fracture. Artificial bone substitute in the loci of bone defect can help to stabilize bone structure in the early stage. In middle-late stage (bone healing stage), artificial bone substitute will gradually be absorbed and hence replaced with bone neogenesis. During this stage, cells are highly activated and the cellular metabolic rates are also high, which confers the particular region the hot spot in nuclear medicine image study. Nuclear medicine images of bone neogenesis, osteomyelitis, and heterotopic ossification are very similar and thus easily misinterpreted. A case study in this report provides an example demonstrating the aforementioned phenomenon.

### Materials and Methods

An 84-year-old male patient was hospitalized due to sepsis. After receiving antibiotic treatment for 1 week, high fever was still observed. Based on the transesophageal echocardiogram (TEE), the patient was diagnosed as highly suspected infectious endocarditis by the cardiologist from other hospital and thus was transferred to other hospital. The past history of the patient included recurrent stroke with left side paralyses, and fracture of intertrochanteric of right femur s/p ORIF seven months ago.

Routine blood examination with blood culture was applied in the emergency room of our hospital. Meanwhile, the echocardiogram was again applied by our cardiologist, but the result did not show apparent cardiac valve abnormalities. Two days later, the result of blood culture showed *Enterococcus* positive. Lacking the source of infection, nuclear medicine images of Tc-99m MDP Whole body bone scan and Ga-67 inflammation scan were assigned to the patient. Afterwards, except for a focal intense uptake at lesser trochanter of right femur, which was suspected to be osteomyelitis, there were no other active inflammatory process areas. No fever was detected after 1 week of antibiotics treatment, and the CRP value also returned to the normal. However, after discussing with the patient's families, the patient was transferred to orthopedics to receive debridement treatment to search for the source of infection. In surgical operation, we realized the hot spot of the particular patient's nuclear images was actually the location of the artificial bone substitution solidified. During operation, tissues for bacterial culture and biopsies were also collected. The bacterial culture turned out to be negative, and the tissue biopsies showed that both lamellar bone and woven bone were surrounded by fibrous tissue, demonstrating bone neogenesis.

### Results

Although the source of infection that caused this patient's sepsis is still unclear, it is unlikely due to the infection of the right hip internal fixation. Because the inflammation index in all laboratory tests had returned to normal and there were no clinical signs of sepsis, this patient was discharged 10 days after the operation and requested to come back in clinic department to follow the status.

### Discussion

In the process of artificial bone resorption, new bone will be formed which contributes to a high metabolism area, and in turn become hot spots in nuclear medicine imaging. Depending on only one imaging examination could be misleading. For example, heterotopic ossification also displays hot spots in whole body bone scan images. It is necessary to include additional reference such as patient's symptoms and hematology tests.

### Conclusions

Filling the bone defect with artificial bone substitution can reinforce the stability in initial phase after fracture fixation. However, if the artificial bone is placed outside of cortical bone, the time for resorption and new bone proliferation may be prolonged. Just like this case report, it has been over seven months after the operation, and the patient still shows characteristics of bone neogenesis. Therefore, more attention should be paid to the location of applying artificial bone substitution.

**A Rare Case of Aeromonas Periprosthetic Infection of Total Hip Arthroplasty****嗜水氣單胞菌人工髖關節感染的罕見病例報告**

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**Introduction and Results**

A 53 year old man, with past history of bilateral hip avascular necrosis status post bilateral total hip arthroplasty on and left hip peri-prosthetic infection status post girdle stone procedure on 2016.04.20, revision total hip arthroplasty on 2016.08.17, recurrent peri-prosthetic infection status post girdle stone procedure on 2018.03.16, revision total hip arthroplasty on 2018.07.25, presented to our emergency department with chief complaint of left hip pain with fever for 3 days. Due to left hip periprosthetic infection, we performed arthrotomy and girdle stone procedure on 2020.08.26. Pus culture at emergent department and operation room both showed aeromonas hydrophila. He also had history of sashimi intake. We prescribed ciprofloxacin as antibiotics treatment and arrange revision total hip replacement three months after girdle stone procedure.

**Discussion and Conclusions**

Periprosthetic joint infection is infection of tissues surrounding an artificial joint. Periprosthetic joint infections are the third-most common complication of joint replacement surgery, after aseptic loosening and prosthesis dislocation. Periprosthetic joint infection is one of the most common reasons for revision surgery on an artificial joint. Management of infection in arthroplasty is challenging. The two-stage revision is the most common approach to PJI. *Aeromonas hydrophila* is a low-virulence gram-negative bacillus, found in ambient water, primarily causes gastroenteritis. *Aeromonas* is a significant foodborne pathogen, as it is ubiquitous in marine environments and could be transmitted through minimally processed seafood products. *Aeromonas* could also cause extraintestinal infections, such as ocular, respiratory, urinary tract infections, however, the extraintestinal infections are usually rare. When we conduct the literature research, we only found one case report of aeromonas periprosthetic infection of total knee arthroplasty. There is no other case of aeromonas periprosthetic infection of total hip arthroplasty been reported. In conclusion, in addition to microorganism such as staphylococcus aureus which was the most common causative organism of periprosthetic joint infections, rare pathogen such as aeromonas should also be considered.

**Risk Factors and Mortality of Synchronous Multifocal Necrotizing Fasciitis: A Case Control Study in Comparison with Monofocal Necrotizing Fasciitis in Taiwan****同時多發處的壞死性筋膜炎與單處的壞死性筋膜炎的危險因素與死亡率比較**

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**Introduction**

Synchronous multifocal necrotizing fasciitis (SMNF), the simultaneous development of NF in multiple noncontiguous sites, is rarely reported. This study aimed to compare the clinical characteristics and outcomes between patients with SMNF and Monofocal necrotizing fasciitis (MONF), and to determine the risk factors of SMNF.

**Materials and Methods**

Our retrospective case-control study compared the clinical characteristics and outcomes, between January 2006 and January 2013, of patients with SMNF and of patients with MONF of the extremities.

**Results**

We enrolled 144 patients with NF of the extremities: 19 with SMNF and 125 with MONF. The duration of symptoms before admission was significantly shorter for the SMNF than for the MONF (1.7 days vs. 3.3 days,  $p = 0.001$ ); the prevalence of shock at the initial visit significantly higher (73.7% vs. 36%,  $p = 0.002$ ); and the total-case postoperative mortality rate significantly higher (68.4% vs. 14.4%,  $p < 0.001$ ). SMNF was significantly more likely to involve bacteremia (89.5% vs. 36%,  $p < 0.001$ ). Independent risk factors for SMNF were liver cirrhosis (LC) (odds ratio [OR] 6.0,  $p = 0.001$ ) and end-stage renal disease (ESRD) (OR 7.1,  $p = 0.035$ ). Gram-negative bacteria were most common in SMNF, and Gram-positive bacteria in MONF (83.3% vs. 53.3%,  $p = 0.005$ ). *Vibrio* species were the most common single microbial cause (35.4%) of all NF patients and were the overwhelming cause (73.7%) of SMNF.

**Discussion**

Immunocompromise increases the risk of bacteremia and the current study found that SMNF patients (89%) had a much higher prevalence of bacteremia than MONF patients (36%).

**Conclusions**

SMNF was more fulminant than was MONF. SMNF was attributable primarily to marine Gram-negative bacteria. Physicians should be aware of SMNF because of its extremely high mortality rate

## Monomicrobial Necrotizing Fasciitis and Sepsis Caused by *Pseudomonas fluorescens*: First Case Report and Literature Review

單株螢光假單胞菌引起之壞死性筋膜炎：第一個病例報告及文獻研究

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### Introduction

Monomicrobial necrotizing fasciitis caused by *Pseudomonas fluorescens* is an extremely rare infection. The purpose of this study was to describe the specific characteristics and clinical outcomes of *Pseudomonas fluorescens* necrotizing fasciitis.

### Materials and Methods

The 71-year-old female denied any underlying chronic illness and visited emergency department due to left lower leg pain, erythema and hemorrhage bullae for 3 days. Her blood pressure was 126/62 mmHg and body temperature was 36.8°C. Laboratory values included hemoglobin 10.5 g/dL, platelet count 201000/uL, ESR 80 umol/L, CRP 149 mg/L, and albumin level 3.8 g/dL. The leukocyte count was 14900 cells/mm<sup>3</sup> with 88% segmented neutrophils, and 8% lymphocytes. Emergent fasciotomy was performed 4 hours after necrotizing fasciitis diagnosis confirmation.

### Results

*Pseudomonas fluorescens* was confirmed by wound culture 3 days after emergent fasciotomy. Repeated debridement was performed on the 7<sup>th</sup> day to control infection. She had received skin graft on the 16<sup>th</sup> day and discharged on the 26<sup>th</sup> day after fasciotomy.

### Discussion

*Pseudomonas fluorescens* is usually regarded much lower virulent than *Pseudomonas aeruginosa*, and it was reported to cause bloodstream infections in patients with cancer and immunocompromise, such as blood transfusion-related septicemia, catheter-related bacteremia, and peritonitis in peritoneal dialysis patients. However, this case was a farmer and did not have any underlying chronic illness.

### Conclusions

To our best knowledge, we reported the first case of monomicrobial necrotizing fasciitis with *Pseudomonas fluorescens*.

## Fluctuation of Muscle Power in a Patient with Pott Disease: A Case Report and Literature Review

波特氏病患者之肌力變化表現：案例報告與文獻回顧

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### Introduction

Pott disease is a rare infectious condition of the spine, which is typically originated from an extraspinal infection. Pott disease is also known as tuberculosis spondylitis, refers to vertebral body osteomyelitis and intervertebral diskitis from tuberculosis. The typical site of involvement is the anterior aspect of the vertebral body. A possible effect of this disease is vertebral collapse and when this occurs anteriorly, anterior wedging results, leading to kyphotic deformity, compression fractures, spinal deformities and paraplegia.

### Materials and Methods

A 49-year-old man has history of autoimmune obstructive pneumonitis, anti-phospholipid syndrome, extrapulmonary tuberculosis status post treatment. He suffered from low back pain for 2-3 years, with aggravation in 6 months. The patient denied recent trauma history, without sensory or motor deficit. The plain films revealed T8 compression fracture with kyphotic deformity. MRI revealed infectious spondylodiskitis T7/8. CT-guided biopsy showed chronic inflammation; bacterial, fungal, and Mycobacterium culture showed negative. During the next two months, body weight loss, bilateral lower limbs loss of sensation and weakness were noted. The plain films showed progressed kyphosis, and the MRI revealed spondylodiskitis over T7/8/9 with spinal cord compression, contiguous osteomyelitis of T6-10.

### Results

Posterior decompression of T7-9 and instrumentation of T6/7/11/12 were done. His neurological status improved obviously. The pathologic report showed positive acid-fast test, and the pathologic report revealed caseating granulomatous inflammation. However, lower limb muscle power decreased from 4 to 3 was noted 12 days later. Revision decompression was performed, found mild hematoma accumulation, and his motor function improved afterwards. Progressive muscle weakness was noted after 10 days. CT showed no spinal cord compression. Corticosteroid was administrated, and his muscle gradually improved, being able to walk.

### Discussion

The tubercle bacillus begins its destruction in cancellous bone and eventually extends to the cortex. The infection gradually spreads to adjacent vertebra via the disc space. In advanced stages of the disease, progressive vertebral collapse occurs, resulting in kyphosis and gibbus formation, associated paraplegia therefore developed. When roentgenogram of the spine shows vertebral collapse, it may be mistaken for compression fractures, delaying the true diagnosis of Pott disease.

### Conclusions

Back pain is an important symptom of Pott disease. MRI scan is a supreme tool for diagnosis, microbiologic diagnosis is essential. Biopsy of the spine lesion should be done, for pathologic diagnosis, culture and stain for M. tuberculosis. Clinicians should consider Pott's disease in the differential diagnosis of patients with back pain and destructive vertebral lesions.

## Novel Minimal Invasive Technique: Arthroscopic Repair of Medial Patellofemoral Ligament on Recurrent Patella Dislocation with Suture Anchor

微創術式:關節鏡縫合錨釘修補內側髌股韌帶治療反復髌骨脫位

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### Introduction

Acute patella dislocation is contributed to 2~3% of knee injury, usually seen in adolescent and young adults, with overall frequency of injury greatest between 10 and 20 years of age. The patella dislocation is typically lateralization, with the literature reporting rupture of the medial patellofemoral ligament (MPFL) in approximately 90% of cases. MPFL acts as an important knee stabilizer to prevent lateralized force on the patellofemoral joint. Currently, surgical management includes various open procedures to repair or reconstruct ligament. The purpose of this article is to introduce a minimal invasive procedure treating patella dislocation with arthroscopic aided suture anchors to repair MPFL.

### Materials and Methods

Twenty years-old young girl hurt her left knee while dancing. Radiography revealed left patella lateral dislocation at that time. She received knee reduction initially at a local clinic. However, she felt persistent left knee pain and motion limitation with instability sensation for a month. MRI was arranged one month later and revealed tear of medial patellofemoral ligament with partial healing in the top side of medial patella. Under arthroscopic aid, we fixed a suture anchor on medial patella and passed through suture out of the skin by guidance of polydioxanone loops, which were prepared with a syringe needle under arthroscopy. Then, mini skin incision made along the patella medial border to grip out suture at level just on top of medial patellar retinaculum. Suture was securely tied and MPFL was repaired.

### Results

Left patella tracking was checked under the dynamic arthroscopic examination, the result showed stable patella tracking under passive ROM examination. After 3 months follow-up, the radiography revealed acceptable patella-femoral groove alignment and patient restore full range of motion and daily activity.

### Discussion

Various open surgical management of MPFL repair were well published and proved. However, few articles discussed arthroscopic repair with suture anchors in MPFL injury. Our arthroscopic technique can be clearly examined the lesion, check the post-fixation stability, and preserved the uninjured part of medial retinaculum with less soft tissue damage.

### Conclusions

Our procedure provided a novel method to repair MPFL and restore patella stability by minimal invasive technique. To date, the postoperative result was well satisfactory.

## Synovial Chondromatosis May Mimic a Neoplastic Disease in Differential Diagnosis:A Case Report with Literature Review

滑膜性軟骨瘤可能會模仿其他增生性骨腫瘤：病例報告及文獻回顧

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### Introduction

Synovial chondromatosis is an uncommon benign neoplastic process featured by loose cartilaginous bodies in the subsynovial tissue of a joint, tendon sheath, or bursa. Previous studies had focused on differential diagnosing with chondrocalcinosis, osteochondroma, and chondrosarcoma by radiographic and pathologic characteristics. Even though it is widely accepted that the malignant transformation of synovial chondromatosis is unusual, pathologic diagnosis remained to be challenging in arriving at a correct early diagnosis, which may lead to misdiagnosis and result in over- or undertreatment. Therefore, the purpose of this study is to investigate the variety of clinical presentation of synovial chondromatosis through literature review.

### Materials and Methods

A 46-year-old Taiwanese female without any underlying disease has suffered from left knee discomfort with mild pain sometimes when squatting for more than 20 years. She complained about left knee weakness and easily sprain in the recent half year. The physical examination showed palpable nodule-like lesion over medial and posterior aspect of distal femur and knee joint. She denied tenderness or limited range of motion over left knee. No muscle power decrease or sensory disturbance was noted. She was able to ambulate with stable gait pattern. The radiographs of knee showed minimal OA change with spur formation and bilateral patellar lateral tilting. Multiple calcific joint bodies with rings and arcs calcification patterns were noted. MRI series presented extensive diffused synovial process involving the knee joint with multiple high signal intensity of osteochondral bodies, impressed as synovial osteochondromatosis. Arthroscopic removal of loose bodies was performed and the excisional biopsy was proved to be osteochondroid stroma by pathologic report.

### Discussion

The malignant transformation of synovial chondromatosis is rare but this diagnosis must be established to perform appropriate treatment. Bertoni et al believes that all cases of malignant transformation of synovial chondromatosis are initially low-grade chondrosarcoma. According to the previous studies, synovial chondromatosis secondary to trauma, osteoarthritis and neuropathic arthropathy, may developed into chondrosarcoma. These two diagnoses are extremely rare and their coexistence are unlikely. Adequate treatments need to be applied once the patient was impressed as suspicion of synovial osteochondromatosis. Further advanced imaging study such as MRI may be needed for suspicion of medullar invasion.

### Conclusions

Malignant degeneration of synovial chondromatosis is rare but can necessitate morbid surgery or result in death. The clinical presentation varies from patients to patients. Imaging examination provides sufficient information in differential diagnosis, which may be proven by pathologic studies for support of diagnosis. However, biopsy and partial resection are prone to diagnostic error. Surgical decisions are frequently based on size and clinical appearance and may be in conflict with pathologic diagnosis. Therefore, physician should be aware of the patients' presentation combining examination proves for adequate treatment plan.



## Arthroscopic Treatment for Knee Tophaceous Gouty Arthritis 關節鏡手術治療痛風性關節炎

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### Introduction

Gout is caused by elevated uric acid in the blood, which likely occurs secondary to diet and genetic factors. Tophaceous gout can present with pain, locking of joints, subcutaneous nodule formation, joint destruction, and soft tissue contracture. Medical management of acute gouty arthritis is primarily with NSAIDs as a first-line agent and colchicine and corticosteroids used as alternative therapies. In general, arthroscopy for tophaceous lesions resulting in mechanical symptoms can result in relief of symptoms. However, arthroscopic intervention for tophaceous deposits of the knee was mostly presented through case reports. We present a case of intra-articular tophaceous gout causing mechanical symptoms managed by arthroscopy.

### Materials and Methods

Retrograde review of the history, symptoms, physical examination and radiographs of a case.

### Results

A 34-year-old man presented to our outpatient department complaining of right knee pain when walking for 2 years. He also noticed right knee stiffness in recent 6 months. He denied any trauma history. He had received medical treatment and physical therapy in other hospital, but the symptoms persisted. On physical examination, right knee tenderness over joint line and ROM limitation were noted. MRI revealed ACL rupture and patellar tendon partial tear. Due to persisted symptoms, arthroscopic intervention surgery was arranged for him. During the surgery, white crystal like coating was noted on joint cartilage and ACL and crystal like loose body was scattered in the joint. Pathologic report showed tophi. We remove the intraarticular loose bodies and the cartilage coating. Near full ROM was achieved before wound closing. A dose of platelet-rich plasma was then injected into the joint cavity. CPM rehabilitation was conducted since 1st post-op day. The joint pain subsided on the 3rd post-op day and he returned to work without knee pain and since a month after surgery.

### Discussion

Gout is a common condition in the population today. Tophi are radiolucent and are unable to be visualized with radiographs. Ko et al. showed that MRI findings of gouty tophi can be non-specific but can have low intermediate signal intensities on both T1-weighted images and T2-weighted images. On review of our patient's MRI by both the surgeon and radiologists, there were no signs consistent with gouty tophi. Treatment of intraarticular gouty tophi within the knee joint has been reviewed in the literature. These patients can be managed non-operatively with allopurinol alone for 3 months. Aoki et al. performed a partial meniscectomy and synovectomy for intrameniscal gouty tophi with a presentation similar to our patient. In the case of our patient, the diagnosis of significant intra-articular gouty tophi covering the articular cartilage was made intraoperatively. Successful clinical results were obtained by arthroscopic debridement of the tophi overlying the articular cartilage.

### Conclusions

Arthroscopic management is a useful treatment for tophaceous gouty arthritis.

## Take Lower Extremity Alignment into Consideration When Performing Arthroscopic Surgeries: A Case Report and Literature Review

案例分享與文獻回顧：行關節鏡手術需考慮下肢肢體中軸

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### Introduction

Patients associated with symptomatic lateral compartment OA or posttraumatic arthritis may be treated with distal femoral varus osteotomy as the primary procedure without concomitant soft tissue or ligamentous repair, reconstruction, or replacement. Arthroscopy should be performed to confirm the diagnosis and to address intra-articular pathology before osteotomy.

### Case report

A 55-year-old woman presented right knee lateral joint line weight bearing pain and intermittent swelling after a traffic accident one year ago. Progressive valgus deformity was noted as well. Joint aspiration of right knee was ever showed bloody fluid. Prior nonsurgical treatment were all in vain. On examinations, full range of motion of right knee but antalgic gait was noted. The mechanical axis by inspection of the standing showed right knee valgus deformity. Patella apprehension test, anterior/posterior drawer test, Lachman test, posterior sag, valgus/varus stress test and flexion contracture were all negative, but positive lateral joint line tenderness with joint effusion and positive McMurray test. Radiographs demonstrated right knee valgus alignment (around 12 degree) with preserved lateral joint space. MRI revealed right knee joint effusion and lateral meniscus tear without cruciate ligament nor collateral ligament injury.

The patient underwent arthroscopic examinations firstly, which found right knee lateral meniscus tear (Bucket-handle type, lateral-posterior horn), and lateral femorotibial compartment OA (grade II) were found; others (ACL/PCL/MM/popliteal tendon) were unremarkable. We then performed arthroscopic partial lateral meniscectomy, meniscus repair. After that, we did corrective distal femoral varus osteotomy by lateral open wedge methods (allogeneous bone grafting) and internal fixation with locking plate. No peri-/post-operative complications were incurred. Postoperative day 2, we changed long leg splint to hinged knee brace (fixed 0-30 degrees) with non-weight bearing ambulation under physical therapist's assistance. The range of motion of hinged knee brace increased 30 degrees every two weeks, till 120 degrees (total six weeks). After three months follow-up, bony callus formation with stable implant was visible by radiographs. Her right knee range of motion was 5-135 degree, five months later. The patient remains symptom-free and without radiologic evidence of malalignment and progressive osteoarthritis 12 months after surgery.

### Discussion

As a clinical consequence, lower limb alignment should be considered in the treatment of patients undergoing arthroscopic surgery with concomitant mal-alignment. Arthroscopy should be performed firstly to confirm the diagnosis and to address intra-articular pathology. Meanwhile, always take realignment osteotomy into consideration if there is concomitant lower extremity mal-alignment.

### Conclusions

Arthroscopy should be performed to confirm the diagnosis and to address intra-articular pathology before osteotomy.

## A Valuable Treatment Experience of Hyperextension Varus Bicondylar Tibial Plateau Fracture

過度伸展合併內翻型脛骨平台骨折治療經驗分享

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### Introduction

Hyperextension Varus bicondylar tibial plateau fracture pattern (HEVBTP) is a special group of bicondylar tibia plateau fractures with following radiographic marks in the meantime: (1) loss of the normal posterior slope of tibia plateau (2) posterior cortex tension failure (3) compression of the anterior cortex and varus deformity in the coronal plan. Previous studies showed HEVBTP is a unique fracture pattern having high risk of some associated injury as peroneal nerve injury, vascular injury, and compartment syndrome. In the manuscript, we present a case who suffered from hyperextension varus bicondylar tibial plateau fracture complicated with compartment syndrome, popliteal artery injury, and partial common peroneal nerve palsy and was successfully treated by fasciotomy, popliteal artery reconstruction with vein graft and ORIF with anteriomedial and posterior plating. Two year follow up showed union of fracture and good ROM.

### Materials and methods

A 50 yo male suffered from left knee painful deformity due to motorcycle bump into car accident. Initial physical examination showed extremely swelling, loss of distal pulsation, drop foot and cyanotic change of left lower limb. Compartment syndrome was diagnosed with transection of left popliteal artery reported by CTA survey. X ray showed left fibular head avulsion fracture and tibia plateau fracture with loss of the normal posterior slope of tibia plateau, posterior cortex tension failure, compression of the anterior cortex and varus deformity in the coronal plan. Hyperextension Varus bicondylar tibial plateau fracture pattern (HEVBTP) was favored. Fasiotomy was performed with popliteal artery reconstruction by saphenous vein graft. ORIF was performed 2 weeks based on stable skin condition and patent vascular status. The patient was put in supine position with hip pad elevation. Incision was made on previous fasiotomy wound. Anteriomedial fragment was disimpacted by laminar spreader and filled with allograft bone and posterior medial side was compressed to reduced normal tibia slope. The fracture was fixed with anteriomedial and posterior plating. Another incision on fibular head and approach to the fracture site. The fibular head avulsion fracture was fixed with revo screw and ticon transosseous suture.

### Results

After operation, we applied knee brace to prevent varus stress and avoid full extension. Two year follow up showed union with ROM about 0-100 degree. Weakness of dorsiflexion improved but mild post traumatic OA change was observed in series xray follow up.

### Discussion

Now a days we commonly use Schatzker classification for tibia plateau fracture. However, there's a small group of hyperextension varus bicondylar tibial plateau fracture pattern observed with high risk of associated neurovascular injury.

### Conclusion

Early distinguish this fracture pattern can help beware of neurovascular condition and the evaluation of posterolateral corner injury.

## Concomitant Hoffa and PCL Avulsion Fracture: A Rare Case Report and Literature Review Hoffa 骨折合併脛骨端後十字韌帶撕裂性骨折

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### Introduction

Hoffa fracture, a rare fracture pattern, is defined as coronal plane partial articular distal femur fracture, which may involve either medial or lateral femoral condyle of distal femur. According to our best knowledge, there is no literature presented Hoffa fracture and PCL avulsion fracture. The aim of this study is to report our experience on concomitant ipsilateral Hoffa fracture and PCL tibia-sided avulsion fracture and try to figure out the possible mechanism of injury and reliable management methods

### Case report

A 56-year-old female visited our clinic for persisted left knee pain after falling from stairs at home for two days. She cannot stand up or walk due to pain exaggeration with knee movement. Physical examination showed left knee swelling, posterior tenderness and limited range of motion. Image unveiled left knee concomitant Hoffa fracture (AO/OTA 33B3.2, Letenneur type I, CT classification type Ib) and PCL avulsion fracture, thus surgical management was indicated. A curved 11-cm incision was made over middle to medial posterior aspect of left knee. We fixed the PCL avulsion fracture with two compression screws. We fixed the medial condyle fracture with 2 headless cannulated screws and a four-hole dynamic compression plate as antiglide plate. (figure 6-9).

### Discussion

In our case, the patient had left distal femur medial condyle Hoffa fracture with metaphyseal extension and PCL tibial-sided avulsion fracture at the same time. Surgical treatment is rational to prevent subsequent complications, such as nonunion or arthrofibrosis after long-time immobilization.

Arthroscopic approach to treat two around-joint lesions simultaneously could be an option. However, the stability with simple screws fixation for Hoffa fracture with metaphyseal extension is questionable. An additional anti-gliding plate via open approach is more reliable for condylar fragment. To sum it up, the final surgical plan is cannulated screw(s) for tibial fragment and cannulated screws plus anti-gliding plate for femur fragment via posterior approach. The single incision may reduce the damage to soft tissue.

### Conclusions

We reported a rare case of medial Hoffa fracture associated with PCL avulsion fracture. After comprehensive consideration, we treated two lesions with posterior open approach in single incision. Operation was finished smoothly, and post-operative result is satisfactory. Orthopaedic surgeons who treat patients with high energy trauma should be aware of associated injuries and make management plan comprehensively.

## **Surgical Treatment for Hoffa Fracture Combined with Post-Traumatic Osteoarthritis: A Case Report and Review of Literature**

### **Hoffa 骨折合併創傷後關節炎之手術治療：病例報告及文獻研究**

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#### **Introduction**

Coronal-plane fractures of the femoral condyle, also known as Hoffa fractures, are extremely rare intra-articular injuries and are easily misdiagnosed and missed in anteroposterior X-rays since the unfractured condylar part of femur obscures the fractured condyle. Open reduction and internal fixation is the mainstay of treatment.

#### **Materials and Methods**

This is a 76-year-old female suffered from left knee injury due to traffic accident, and had sustained left knee pain ever since. The knee pain progressed and she gradually developed limping gait, poor exercise tolerance, difficulty in climbing stairs, and easy fatigue. She ever visited local medical department for help, where conservative treatment was given, but in vain. Therefore, she visited our orthopedic out-patient department for second opinion. Physical examination showed left knee tenderness with valgus deformity. Radiography of left knee revealed osteoarthritis change and lateral condylar Hoffa fracture. Considering her clinical conditions of Hoffa fracture combined with osteoarthritis, she received primary total knee arthroplasty as surgical intervention.

#### **Results**

Left total knee replacement with United PS cemented, F/T/I: 3.5/2/9 mm and open reduction and internal fixation of left knee lateral condylar Hoffa fracture with interfragmentary screws were performed. After surgery treatment, radiography revealed left total knee replacement in good alignment.

#### **Discussion**

Patients who suffered from Hoffa fracture with healthy joint surface and good bone density, the treatment of choice is open reduction and internal fixation; whereas in those with joint degeneration and low bone stock, arthroplasty maybe a better option.

#### **Conclusions**

To our best knowledge, we reported the first case of surgical treatment with primary total knee arthroplasty for Hoffa fracture combined with post-traumatic osteoarthritis.

## Treatments of PCL Avulsion: Arthroscopic Pull-Out Suture Versus Open Suture Bridge Fixation

### 關節鏡縫合及開放式雙排縫合於後十字韌帶撕裂性骨折之治療成果比較

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#### Introduction

Posterior cruciate ligament avulsion fracture is uncommon in either trauma or sport injury, Thus the treatment strategy and methods are still controversial. Traditional open reduction techniques were using screw, Kirschner wire fixation, however the risk of neurovascular injury due to popliteal fossa dissection is always exist. In recent years, arthroscopic surgery is widely used in sport medicine, resulting less soft tissue dissection but requiring different implant for fixation. Besides, suture anchor can tolerate more pull-out strength and are introduced in PCL avulsion fixation. The study retrospectively evaluates the clinical and radiographic outcome of PCL avulsion, treated with open suture bridge fixation or arthroscopic pull-out suture fixation in order to identify the optimal treatment.

#### Materials and Methods

The study retrospectively enrolled the patients with PCL avulsion fracture surgically treated from 2009 to 2019 at NTUH by single surgent. Patient data including age, gender, associated fracture, surgical method, functional recovery, complication, pre and post-operative radiographs, and final stress radiographs are collected from EMR. The tibial translation under stress views are compared with contralateral knee and analysis using Mann- Whitney U test for comparisons of two groups. Other categorical variables are examined using Chi square test.

#### Results

Total 23 patients were included and 12 received arthroscopic pull-out suture while 11 received open suture bridge fixation. There were 14 male and 9 females. 7 of 23 patients had combine femur or lower leg fracture. Knee stress views were available for 8 of 23 patients and mean tibial translation difference were 0.98mm for pull-out suture and 1.67mm for suture bridge. Each group has 2 fibrous union (no callus formation) and still stable knee joint. 22 of 23 patients recovered to daily and sport activity while 34% of them had certain degrees of residual knee pain or soreness. 1 patient in suture bridge group had giving way sensation despite normal stress test. There was no revision, infection or neurovascular injury in this cohort.

#### Discussion

Cruciate ligament avulsion fractures, the mechanism of injury is close to that of cruciate ligament injuries without fractures; posterior cruciate ligament avulsion fractures are mostly caused by high-energy injuries. The surgical indications have not yet been determined, and as its low incidence, various surgical methods cannot be studied on a large scale. There have been many systematic reviews or comparative studies to explore different surgical methods. However, due to the heterogeneity of the surgical details and postoperative rehabilitation plans in each study, and the surgical methods and implants are changing times.

#### Conclusions

Both arthroscopic pull-out suture fixation and open suture bridge fixation provide high successful rate with excellent functional outcome, low complication rate. Further larger study might needed for analysis in detail.

**An Educative Case: *Extra-Octave* Fracture in 8-Year Old Basketball Player**  
**具教育意義的個案報告:一名小指近端指骨 *Extra-octave* 骨折的兒童籃球員**

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**Introduction**

Hand fractures are common in children. Of those fractures, Salter Harris type II fractures are commonly seen in the proximal phalanx. Extra-octave (Salter Harris type II) fractures consist of a transverse metaphyseal fracture line with involvement of a metaphyseal fragment at the ulnar or radial corner of the metaphysis of the fifth proximal phalanx. Extra-octave is the most common fracture of the proximal phalanx of fingers in children.

**Materials and Methods**

We presented one 8-year-old boy who had an injury to the fifth digit of his left hand. The patient described an axial loading of the phalanx with the basketball as the possible cause and had limited pain at rest but significant pain of fifth digit with any movement. On physical examination, the digit was held in flexion at the distal interphalangeal joint and proximal interphalangeal joint. It was abducted and angulated at the metacarpophalangeal (MCP) joint. Range of motion was limited because of pain. Soft tissue swelling was present around the MCP joint. No ecchymosis was present. The neurovascular examination was normal. Radiographs showed a fracture involving the metaphysis of the proximal phalanx of the fifth finger (extra-octave) with no definite involvement of the physis.

**Results**

Our patient underwent closed reduction under adequate anesthesia and was placed in a splint with buddy tape. After closed reduction, the patient had regained full range of motion of the digit and had no tenderness, numbness, or tingling at his OPD visit.

**Discussion**

Forcible abduction of the fifth finger as a result of sport activities is usually the mechanism of injury. Some authors categorize it as a Salter-Harris type II fracture. Closed reduction is recommended. This can be achieved with placement of a pencil in the fourth web space and adduction of the fifth finger with flexed MCP joint. An ulnar gutter splint should be used for immobilization. In rare cases, an open reduction and internal fixation may be necessary, particularly in cases with flexor tendon entrapment or collateral ligaments disruptions. Growth disruption is rare.

**Conclusions**

Non-displaced fractures of the small finger proximal phalanx can be treated without reduction using buddy tape. There is no difference in time to recovery between the buddy tape and reduction groups, and the displaced fracture can be reduced by either the pencil or 90/90 method. Surgery is rarely needed. According to previous literatures review, the outcomes of these fractures are good to excellent. The pencil method or the 90/90 method can be applied with equal success and outcomes.

**Open Reduction, Triple Innominate Osteotomy and Femoral Corrective Osteotomy for Congenital Hip Dislocation with Avascular Necrosis in A 7-Year-Old Female: A Case Report**  
以開放性復位髖白股骨矯正截骨術治療先天性髖脫臼合併股骨頭壞死的九歲女性-案例報告

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### **Introduction**

This is a 7-year-old female without systemic diseases. Development milestones were normal. She had a limping gait for 3 years. Physical examinations showed limited ROM in abduction of right hip, positive Galeazzi sign, positive Trendelenburg sign and shorter right limb length. Plain films showed dislocated right hip (Tonnis grade 4) with dysplasia. She underwent open reduction, triple innominate osteotomy and femoral corrective osteotomy. She was allowed to have partial weight bearing progressively 2 months after operation. She had ROM exercise 80 days after operation. During follow-up clinic, ROM of right hip was close to the left hip. After 5 months, she can tolerate full weight bearing. Serial plain films showed good bone healing and femoral head remodeling. Some residual limping gait related to leg discrepancy was noted but the patient can run and was able to return to other sport activity after 2 years.

### **Materials and Methods**

We searched “congenital dislocation of the hip”, “osteonecrosis”, “acetabular dysplasia” at Pubmed.

### **Results and Discussion**

Developmental Dysplasia of the Hip is a silent disease with subtle or even no abnormalities in physical examinations. For late-diagnosed hip dislocations (age more than 8 years), osteonecrosis of the femoral head is one of the main complications. Among all the pelvic osteotomies, triple innominate osteotomy is indicated for older children with acetabular dysplasia because their symphysis pubis does not rotate well. Whether to perform a reduction is highly debatable. Several studies suggest open reduction combined with femoral shortening provides protection to ON. Pospichill et al retrospectively reviewed 78 hips with developmental dislocation of the hip. They suggested that open reduction with concomitant osteotomies predicts the development of ON. However, Zhang et al retrospectively reviewed 107 DDH patients who underwent closed reduction. These patients were divided into 3 groups according to the age. They concluded that patients older than 18 months may result in a high risk of residual acetabular dysplasia. Re-dislocation is significantly associated with IHDI grade IV. There are no other case reports of open reduction, pelvic and femoral osteotomy for congenital hip dislocation with avascular necrosis in children. So we presented this rare case.

### **Conclusions**

For late-diagnosed DDH patients, osteonecrosis is a severe complication. Whether to do open reduction and osteotomies is still controversial. Our patient has a satisfactory outcome after open reduction and osteotomies.



## Safety and Efficacy of Treatment for Flaccid Neuromuscular Scoliosis with Posterior Instrumented Fusion to Lumbar 5 Level or Above

癱瘓性神經肌肉型脊椎側彎以第五腰椎以上後側入路固定融合手術之治療安全性及療效探討

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### Introduction

Flaccid neuromuscular scoliosis (NMS) is a non-congenital spinal deformity that occurs in patients with pre-existing neuromuscular diagnosis. Of the causes of NMS, Duchenne muscular dystrophy (DMD) and spinal muscular atrophy (SMA) are flaccid neuromuscular disorders (NMDs) which usually resulted in gradual deterioration of spinal deformity. Previous studies have shown that non-operative treatment resulted in rapid irreversible deterioration of scoliotic curves in these patients. Operative treatment mainly involves posterior correction and instrumentation. Earlier studies recommended the caudal level of fusion till sacral and even ileum level. However, the more recent studies have embraced the concept of instrumented fusion to L5 level only that seems to produce similar correction ability with less operative time and complications.

### Materials and Methods

A total of 21 consecutive patients diagnosed as flaccid neuromuscular disorders because of DMD or SMA receiving posterior correction surgery was collected from 02/2012 to 07/2020. 11 patients received posterior correction with lowest instrumentation level at or above L5. 10 patient received posterior correction and instrumentation involving sacrum or ileum. Cobb angle, L5 tilt and pelvic obliquity along with intra-operative blood loss was measured. The parameters were recorded pre-operatively, post-operatively and during last follow-up. Difference was compared in the two groups.

### Results

Most patients had good correction of L5 tilt and coronal curve after the surgery. The pelvic obliquity also improved after the procedure. Physiologic sagittal plane alignment was recreated after surgery and maintained in mid-term observation. There was no significant loss of correction of coronal curve and pelvic obliquity. At time of the last follow-up, there was no major complication.

### Discussion

Spinal deformity such as scoliosis is very common in patients diagnosed with DMD and SMA. The deformity presented in this group of patient is usually progressive and hard to manage. Instrumentation and fusion to the sacrum/pelvis has been the main method to treat flaccid neuromuscular spinal deformity before for correction of pelvic obliquity. However, there is still debate concerning the necessity of extending the implant constructs and fusion to sacrum / pelvis. In addition, pelvic fixation has certain disadvantages, including increased blood loss, longer operative time and technical difficulty.

### Conclusion

In the current study, an above-L5 posterior instrumentation technique improved pelvic obliquity significantly and showed comparable mid-term result to instrumentation including sacrum / pelvis. The degree of improvement was also comparable with similar studies conducted before in other literature. We may infer that a good pelvic balance can be achieved and maintained despite fusion only to L5 or above.

## Extra Osseous Subtalar Arthroereisis Improve More Alignment in Sagittal Plane Than in Axial Plane

距下制動術對於扁平足在矢狀面矯正優於軸向面

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### Introduction

Subtalar arthroereisis with Vulpius procedure is a common operation for flexible flatfoot treatment while the amount of improvement remains to be discovered. We aim to conduct a retrospective study to discover the improvement and the best effectiveness of correction angles to symptomatic flexible flatfoot status being undergone subtalar arthroereisis (SA) or SA with Vulpius procedure after the implant was removed.

### Materials and Methods

We retrospectively reviewed children with flexible flatfoot who underwent subtalar arthroereisis combined with Vulpius procedure from 2010 to 2017. We collected 63 cases with 126 feet. The indication of surgery is symptomatic flexible flatfoot with heel cord tightness, and children were with mean of 9.9 (range, 4-15) years. We measured radiographic data on both preoperative and implant removal plain films. We adopted inter-observer values coefficient to examine inter-observer reliability. Weight bearing plain film on foot during the OPD follow-up was taken and we measured the radiographic data. We compared the radiographic data between the implant in situ group and extrusion group. We used Kolmogorov-Smirnov test to examine the normality distribution. Paired t test and Wilcoxon signed rank test were used to compare the data according to normality distribution. Medcalc® v17.9.7 was applied for statistic calculation and  $p < 0.05$  was defined as significant.

### Results

Interobserver correlation showed excellent reliability. After implant removal, foot alignment improved in a variety kind of aspect. AP Meary angle improved from  $10.0^\circ$  to  $5.6^\circ$  with variance of  $4.4^\circ$  for 43.2% effectiveness; Lateral Meary angle improved from  $10.2^\circ$  to  $4.5^\circ$  with variance of  $5.7^\circ$  for 55.2% effectiveness; Calcaneal pitch improved from  $14.3^\circ$  to  $16.5^\circ$  with variance of  $2.2^\circ$  for 15.4% effectiveness. All the above showed significant improved statistically ( $p < 0.05$ ).

### Discussion and Conclusions

Subtalar arthroereisis with Vulpius procedure is an effective operation for pediatric flexible flatfoot to correct foot alignment. There is more improvement in lateral Meary angle than AP Meary angle.

**A Rare Type of Postaxial Polydactyly of Toe Accompanying with Congenital Curly 4<sup>th</sup> Toe –  
A Case Report**

一個罕見型態小趾多趾症合併第四趾蜷曲-病例報告

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**Introduction**

Polydactyly of foot occurs in about 1 in 500 births, with postaxial being the most common type. Traditionally it can be classified according to Venn-Watson Classification. This time, we described a rare type of postaxial polydactyly of toe accompanying with congenital curly 4<sup>th</sup> toe which cannot be classified according to current classification system.

**Materials and Methods**

This is a six y/o boy presented with postaxial polydactyly with painful erosion and congenital curly 4<sup>th</sup> toe. X-ray showed a duplicated middle phalanx, but only one distal phalanx was seen; which cannot be classified according to current Venn-Watson Classification. We performed 4<sup>th</sup> toe flexor tendon tenotomy, ablation of the extra lateral sided middle phalanx and realignment of the 5<sup>th</sup> toe.

**Results**

The 4<sup>th</sup> and 5<sup>th</sup> toe deformity was corrected, the skin flap healed uneventfully. The patient is currently under regular OPD follow up.

**Discussion**

The Venn-Watson Classification of Polydactyly can classify polydactyly of toes into post-axial (lateral side of the foot), central (not part of the original classification), and pre-axial (medial side of the foot); and then divide each form into different subgroups. Surgical ablation of extra digit can be performed in malaligned toe, at 9-12 months of age if possible.

**Conclusions**

Here we described a rare form of postaxial polydactyly of toe accompanying with congenital curly 4<sup>th</sup> toe and its treatment.

**Bardet–Biedl Syndrome- A Case Report****巴德-畢德氏症候群- 案例分享**蔡宗育<sup>1</sup> 秦凌霄<sup>1</sup>奇美醫療財團法人奇美醫院骨科部<sup>1</sup>**Introduction**

Bardet in 1920 described a patient with retinopathy, polydactyly, and congenital obesity. Biedl in 1922 added the fourth and fifth cardinal features, mental retardation and hypogenitalism. The incidence of Bardet–Biedl Syndrome is 1:140000 to 1: 160000 live births in European and North American. This case report showed a rare case of Bardet–Biedl Syndrome.

**Materials and Methods**

This 3 years old male with growth history of mental retardation and progressing vision decreased with pigmentary retinopathy. He came to our OPD due to post-axial polydactyly of bilateral hands and feet. X-ray showed Stelling and Turek type II polydactyly over bilateral hands and Venn-Watson Classification of Y shape metatarsal over left foot and complete metatarsal duplication over right foot. The diagnosis of Bardet–Biedl Syndrome because the patient met the criteria. Due to cosmetic reason, the patient's families asked for surgical intervention to resection of extra digit in hands and feet.

**Results**

During operation, we performed resection of polydactyly in hands and feet with tendon tenodesis. We checked the alignment under fluoroscopy and sutured the wound layer by layer. After operation, the prophylactic antibiotic was use for one day and the medication of pain control was also given. The patient was discharged in the following days and the wound condition was stable at that time. He had regularly followed up at our OPD and finally the wound healed with well appearance and shoe fit.

**Discussion**

Stigglebout W et al. developed the criteria for the diagnosis of Bardet–Biedl Syndrome: 4 main, or 3 main + 2 secondary characteristics. Primary features are Rod-cone dystrophy, Polydactyly, obesity, learning disabilities, hypogonadism in males and renal anomalies. Secondary features are speech disorder/delay, strabismus/ cataracts/ astigmatism, brachydactyly/syndactyly, developmental delay, polyuria/polydipsia (nephrogenic diabetes insipidus), ataxia/poor coordination/imbalance, mild spasticity (especially lower limbs), Diabetes mellitus, dental crowding/ hypodontia/small roots/high arched palate, left ventricular hypertrophy/congenital heart disease and hepatic fibrosis. Our patient met the criteria of Bardet–Biedl Syndrome. We performed the operation of resection of polydactyly in hands and feet and the patient would followed up at Pediatric OPD.

**Conclusions**

We should always keep in mind the other problems in one patient. Our patient came to our OPD because of polydactyly but through taking history we found the disease of Bardet–Biedl Syndrome.

## Parosteal Osteosarcoma- A Case Report

### 骨膜外骨肉瘤- 案例分享

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#### Introduction

There are many types of osteosarcoma including conventional osteosarcoma(75~80%), juxtacortical osteosarcoma(1~6%), Telangiectatic/ small cell sarcoma, low-grade central sarcoma, high grade surface osteosarcoma and secondary osteosarcoma. Parosteal osteosarcoma is one of the juxtacortical osteosarcoma. This case report showed a rare case of parosteal osteosarcoma.

#### Materials and Methods

This 44 years old female came to our OPD due to a non-painful mass over left lower leg for 6 months. She denied night pain, body weight loss and fever. Physical examination showed 5 cm solid mass over left lower leg and left calf local tenderness with local heat. X-ray showed osteoblastic lesion extend from metaphaseal to diaphaseal with cortex thicken around left lower leg. CT and MRI showed differential diagnosis include a huge irregular "parosteal osteosarcoma (low grade osteosarcoma)" or mature phase of myositis ossificans wrapping around tibia and fibular shaft with cortical erosion at antero-lateral cortex of upper tibia and a focal intramedullary invasion(1.4 cm in diameter) at postero-medial aspect of medial tibial condyle and this dense ossified mass occupying in anterior compartment and interosseous space and also partial encasement of anterior and posterior tibial neurovascular bundle. Biopsy was suggested to confirm the pathology of the tumor.

#### Results

Biopsy showed highly consistent with parosteal osteosarcoma. Then the operation of wide resection of tumor was performed, but non-complete resection due to nerve entrapment of tumor. After the operation, the adjuvant radial therapy and chemotherapy were performed. However, tumor progression after the operation was noted in the following 9 months and the operation of above knee amputation was performed after discussing with the patient. Now she has regularly followed up at our OPD and no tumor recurrence was noted.

#### Discussion

Parosteal osteosarcoma is a low-grade osteosarcoma which is quite different from conventional osteosarcoma. Parosteal osteosarcoma usually occurs on surface of metaphysis of long bones and the most common sites include posterior distal femur, proximal tibia, and proximal humerus. Parosteal osteosarcoma is more common in females and during the age 30 to 40 years old. The standard treatment of parosteal osteosarcoma is wide local surgical excision and chemotherapy is not indicated unless there is a high grade component. Our case report showed an unusual case of parosteal osteosarcoma which may be the dedifferentiated parosteal osteosarcoma.

#### Conclusions

Although parosteal osteosarcoma is a low-grade osteosarcoma, we should always keep in mind the differential diagnosis of dedifferentiated parosteal osteosarcoma which is a high grade tumor and poor prognostic factor with significant potential for life- threatening.

## Management and Diagnosis of Septic Arthritis of Hip in Neonatal with Miss Diagnosed as Developmental Dysplasia of Hip: A Case Report

案例分析：新生兒化膿性髖關節炎之治療與診斷及髖關節發育不全之鑑別診斷

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### Introduction

Septic arthritis of the hip in neonates is rare but can cause devastating consequences. The signs and symptoms may differ from those older children, which may result in diagnostic challenge or delay. Bacterial infection of the joint occurs via hematogenous invasion, extension from an adjacent site, or direct inoculation. Developmental dysplasia of hip (DDH) was often miss diagnosed in these cases due to the similar presentation. Many parents and local medical doctors may therefore miss diagnose and delay the treatment time.

We present a case with 2-month-old female infant who was miss-diagnosed as DDH at first and was turned out to be septic hip. We would further discuss the diagnosis and management of the case.

### Materials and Methods

A 2-month-old female infant without underlying and was a full-term baby came to our out-patient apartment for survey of DDH. The baby had crying with anxiety during changing diaper and limited range of motion of right hip was noted. Tracing back her birth history, she had jaundice at birth time and she also had once RSV infection with supportive treatment in another medical center a month ago. The septic hip was suspected and she was admission to ICU.

We would further evaluate the diagnostic of septic hip and the result of operation and antibiotics treatment. And we would monitor the lab data level, radiology, and infant's activity. Furthermore, we would discuss the pathogen and pathophysiology of the septic hip.

### Results

During hospitalization, sonography revealed intra-capsular effusion and radiology revealed proximal femur focal osteolytic lesion. Lab data showed elevated CRP and leukocytosis. Septic hip was impressed. Emergent surgical treatment and antibiotics (Ceftriaxone + Vancomycin) were done. Intra-operatively, we noticed pus and abscess in right hip. After the operation, her lab data showed significant improved and there were no sepsis condition. However, culture and pathogen showed no growth. Only inflammation tissue was noted in pathology report. The patient was then discharged smoothly due to stable condition.

### Discussion

Septic arthritis is considered a surgical emergency in pediatric due to the risk of destruction of bone and joint. Neonates had higher risk due to the transphyseal vessels which lead pathogen directly invade into joint. In our case, the clinical course of progression was in only one months. Besides lab data, surgical treatment and antibiotics are good methods for both diagnosis and treatment. Moreover, staphylococcus aureus is common pathogen, while kingella kingae is rare but with increasing prevalence in the population less than 4 years old. However, due to the negative finding of culture report, we suspected that the pathogen might be the kingella kingae or the initial antibiotics treatment which had killed these pathogens.

### Conclusions

Septic hip in the neonatal population is difficult to diagnose. However, the most significant prognostic factor for a favorable outcome in patients with neonatal SA is early diagnosis and treatment. Therefore, we should pay more attention of the diagnosis with the use of sonogram, radiology, and surgical treatment.

**Volkman's Contracture as a Complication Of supracondylar Fracture of Humerus in Children: A Case Report and Review of Literature**

小兒遠端肱骨髁上骨折造成福爾克曼氏攣縮的併發症：病歷報告及文獻探討

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**Introduction**

A supracondylar fracture of the distal humerus is one of the most common fractures in children with up to 60% of paediatric elbow fractures and it is often associated with the development of serious complications including: compartment syndrome, Volkman's ischemia, non-union or malunion (cubitus varus / cubitus valgus). We introduced a case that suffered from left forearm acute compartment syndrome and progressive to Volkman's contracture after receiving percutaneous pin fixation and long arm casting for supracondylar fracture.

**Materials and Methods**

The 5 years old boy suffered from left supracondylar fracture and received percutaneous pin fixation and long arm casting. However acute compartment syndrome was observed after the next day of operation. After serial rehabilitation for 6 months, left hand and forearm contracture was still observed. Due to above problem, the patient was transferred to our hospital. The physical examination revealed all fingers of left hand are bent (flexed) and the wrist was slight bent stuck, and loss of the sensation of the left hand. The nerve conduction examination demonstrated that no motor and sensory response over left ulnar and median nerve. Left forearm computed tomography angiography revealed total occlusion of left distal brachial artery, radial collateral artery, radial recurrent artery and proximal radial artery. Under the impression of left forearm Volkman contracture, severe type in Tsuge classification, Holden type I, the patient was admitted for further management.

**Results**

Several surgical procedures were done including 1. ulna and median nerve neurolysis, 2. pronator teres, palmaris longus and wrist flexors (flexor digitorum superficialis, flexor digitorum profundus, flexor carpi radialis and flexor carpi ulnaris ) tenolysis 3. Muscle sliding.

**Discussion**

At postoperative 6 month, the patients reported flexion-extension arc of the left elbow ranged from 0-130 degree, left wrist 0-20 degree, left hand 2nd-4th metacarpal-phalangeal joint flexion contracture about 30 degree, left hand 2nd-4th proximal interphalangeal joint full passive extension and flexion about 90 degree, left forearm supination and pronation were still limited, finger active abduction was observed but no finger active flexion was observed. The nerve conduction velocity showed detectable left ulna and median nerve.

**Conclusions**

The development of Volkman's contracture can be successfully prevented for patients with the displaced supracondylar fracture of the humerus. Minimal elbow flexion, careful manipulation during closed reduction, stabilisation of fragments by percutaneous pinning and careful clinical follow-up are the crucial factors in the prevention of compartment syndrome in this context.

## **Tardy Ulnar Nerve Palsy after Conservative Treatment of Humeral Supracondylar Fracture: A Case Report**

肱骨髁上骨折保守治療後產生延遲性尺神經麻痺。病例報告

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### **Introduction**

Supracondylar fractures of the humerus are the most frequent fractures affecting the pediatrics elbow. Neural injury can occur in 6.5% to 19% of cases of displaced fracture. It can be caused by primary lesion or secondary lesion. Primary lesions are caused by fracture displacement, which can stretch, entrap or disrupt the nerve. Secondary lesions are caused by excessive manipulation, immobilization in hyperflexion or iatrogenic injury by fixation. Ulnar nerve injury is frequently associated with flexion-type supracondylar fracture, cubital valgus deformity and medial pin iatrogenic injury. We reported a girl who had tardy ulnar nerve palsy after humeral supracondylar fracture treated with long arm casting immobilization.

### **Materials and Methods**

This healthy 11-year-old girl had right elbow swelling and limited range of motion after fell down at school. X-ray showed right humeral supracondylar fracture, Gartland type II, flexion type. She received nonoperative treatment with long arm casting. Unfortunately, fracture malunion with cubital valgus and tardy ulnar palsy were noted 6 weeks after injury. Physical examination showed right cubital valgus deformity and right claw hand. Right elbow range of motion was: flexion: 135 degree, extension loss: -30 degree, pronation: 90 degree, supination: 90 degree. Right Froment sign was positive. Severe right ulnar nerve lesion was confirmed by NCV (nerve conduction velocity) study.

### **Results**

We performed right proximal humeral correction osteotomy and internal fixation with K-wire and ulnar nerve neurolysis for her. Severe adhesion over cubital tunnel and ulnar nerve entrapment within scar tissue were found during neurolysis. Ulnar nerve palsy and right claw hand resolved 3 months after neurolysis. Right elbow range of motion improved after correction osteotomy: flexion: 135 degree, no extension loss, pronation: 90, supination: 90. There was no cubital valgus deformity any more.

### **Discussion**

Flexion-type supracondylar fractures are relatively uncommon in children, accounting for only 2-10% of all distal humerus supracondylar fractures. They are usually caused by a direct fall on the posterior aspect of elbow. A greater need for open reduction internal fixation of these fracture has been noted as well as a higher incidence of ulnar nerve injury. The ulnar nerve injury can either appear in patient, who received conservative treatment or operation. In the non-operative group, ulnar nerve injury is thought to be the result of the nerve being stretch over the posterior spike, entrapment within fracture callus or scar tissue.

### **Conclusions**

Flexion type supracondylar fracture represent an uncommon but often difficult-to-treat group of fractures. Ulnar nerve injury must be considered with any flexion-type supracondylar fracture, even if patient received conservative treatment.



## Femoral Head Fracture in Children

### 兒童股骨頭骨折

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#### Introduction

Femoral head fracture in children is an uncommon condition encountered almost always associated trauma. The lesion may be mistaken as, or mimicking, a slipped capital femoral epiphysis(SCFE). We report the experience in treatment of 5 such cases.

#### Materials and Methods

Five children were operated on for hip pain after obvious trauma since 2006. There were 4 boys and 1 girl, their average age was 10.8 years-old (9.6~13.7). All five patients had sustained hip joint pain after sport injury in 4 and one after a violent seizure attack. There were 4 patients with Delbet type 1A proximal femoral head trans-epiphyseal fracture and one Delbet 2 femoral head comminuted fracture. Two of the Delbet 1A patients and the one Delbet type 2 patient presented for more than 2~10 days. Three of the four Delbet 1A patients received open reduction and internal fixation with cannulated screws and one treated as SCFE with closed reduction and pinning in situ. One Delbet 2 femoral head fracture received open reduction aided by trochanteric osteotomy and internal fixation with cannulated screws.

#### Results

Three of 4 patients of Delbet type 1A and one patient of Delbet type 2 received open reduction and achieved union of femoral head fracture with minor phenomenon of femoral head avascular necrosis and in one patient who developed coxa breva, coxa vara and leg length discrepancy later received greater trochanter fusion and contralateral knee temporary epiphyseal guide growth. The one case treated as SCFE with gentle closed reduction and pinning developed severe avascular necrosis of proximal epiphysis with deformity and lateral need valgus osteotomy of proximal femur.

#### Discussion

Femoral head fracture in children is an uncommon but severe trauma in our daily clinics. Most cases linked to high level sports activity or violent seizure force as presented in all of our patients. Surgical management with open reduction should be implemented as early as possible. A procedure similar to modified Dunn procedure may be utilized in delayed cases if needed to minimize osteonecrosis of femoral epiphysis.

#### Conclusions

Careful evaluation of these patients sustaining femoral head fracture may be needed to avoid or minimize complication inherent of these fractures and the same principle utilized in dealing with severe grade SCFE may be applied.

**Neonatal Monteggia Injury: A Case Report and Literature Review**  
**新生兒孟氏骨折: 案例報告與文獻回顧**

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Neglected Monteggia fracture is a rare injury. However, up to 25%-50% of these fractures may be initially missed in children and left untreated because of the inability to visualize the unossified skeleton on radiograph. The lack of a standard treatment for these missed injuries is evident by the large number of surgical procedures described for correction. As far as we know, our 12-month-old case was the youngest case while diagnosed. Different from the mainstream surgical treatment, we performed closed reduction of radial head under the assist of arthrogram and ulnar osteotomy with plate fixation and bone grafting. Joint congruity was maintained after 6 months follow-up.

**Materials and Methods**

Case present: This 12 month-old girl brought to our clinic due to an accidentally found palpable mass over medial side of right elbow by her parents for nearly 2 months on while she was 10-month-old. The mass was more prominent especially while supination. Physical examination revealed dislocation of radial head. It was reducible with gentle manipulation but easily dislocatable in elbow motion. Range of motion was limited in full flexion. Elbow radiograph found ulnar deformity with radial head dislocation due to discontinuous radio-capitaller line, Bado type I. During the process of 10 months follow up, unstable radial head with limited range of motion remained. Then, after discussing with her parents, she had underwent arthrogram-assisted closed reduction of radial head and ulnar lengthening with plate fixation and artificial bone applied on osteotomy site when she was 26 month-old. The clinical and radiological outcomes were both excellent after routine follow up.

**Results**

The clinical and radiological outcomes were both excellent after routine follow up.

**Discussion**

1. Neonatal Monteggia Fracture: 4 to 10 years old have the peak incidence. Our case was diagnosed at only 12 months old.
2. Trauma-related radial head dislocation: Our case had a smooth delivery process but several times of falling episode. Besides, the concave appearance of the radial head was demonstrated in arthrogram
3. Bone graft applied on osteotomy site
4. Arthrogram assisted closed reduction of radial head: most of the literature review and case reports applied open reduction and majority of surgeons take open reduction of radial head reduction for granted. However, open reduction indeed causes some problems.

**Conclusions**

It seems our case had good results in both clinical and radiological outcomes by performing these procedures.

## Acute Peripheral Nerve Injury in Pediatric Elbow Fractures and the Role of Ultrasound – Case Series and Literature Review

小兒手肘骨折造成急性周邊神經損傷及超音波之角色-病例報告及文獻回顧

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### Introduction

Elbow fractures are common in pediatric populations. Among them, distal humerus supracondylar fracture is the most commonly seen, followed by lateral condyle fracture. Nerve injury is one important complication that could be seen. The specific injured nerve depends on fracture location and types of treatment. In this case series, we presented the clinical symptoms, evaluation technique, type of nerve injury, treatment and the final outcome in ChiMei medical center.

### Materials and Methods

We performed retrospective review of pediatric patients with elbow fractures between 2015 and 2020. Nine patients with acute peripheral nerve injury were identified and their electric medical records were thoroughly reviewed. Clinical evaluation, radiographs and specific studies like nerve conduction velocity and ultrasound were all recorded if they existed.

### Results

The trauma mechanism was mostly accidental falling down injury. The most common diagnosis was distal humerus supracondylar fracture. The most injured nerve was radial nerve. Fracture treatment included close reduction percutaneous pinning or open reduction internal fixation with K-wire plus neurolysis. All the pinning construct was crossed pinning. Ultrasound was used both pre-operatively and post-operatively to define the cause, the location of nerve injury and the recovery. Neurolysis, physical therapy and hydrodissection were used as treatment. All patients have full recovery of nerve function and recovery time was from 1 to 6 month.

### Discussion

Risk factors associated with acute nerve injury after pediatric elbow fracture have been studied in several literature. Fracture location and treatment both affect the nerve injured. For instance, cross-pinning construct has higher possibility of injuring ulnar nerve than lateral pinning only in supracondylar fracture. To confirm the suspicious nerve injury pre-operatively and to better evaluate the cause of nerve injury, ultrasound is a useful tool to detect, for example, entrapment of nerve by bony spike, stretching injury, nerve injury due to pinning, or post-operative nerve entrapment in callus. The treatment can then be directed by the result of ultrasound.

### Conclusions

Nerve injury is one of the most common acute complication after pediatric elbow fractures. Early detection of possible nerve injury could lead to better treatment choice and better functional recovery. Ultrasound study could provide an easy way to evaluate the suspicious nerve injury, the cause and the location of definite nerve injury pre-operatively and the recovery pattern post-operatively.

## Timosaponin AIII Impairs Metastasis of Human Osteosarcoma Cells *in Vitro*

### Timosaponin AIII 減弱人類骨肉瘤細胞的轉移能力

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#### Introduction

Timosaponin AIII (TSAIII) is a steroidal saponin and demonstrates antitumor activities. However, the effect of TSAIII on human osteosarcoma remains largely unknown. In this study, we demonstrated that TSAIII exerted a significant inhibitory effect on the distribution of cytoskeletal F-actin and cytoskeletal-related proteins, which contributed to the suppression of cell migration and invasion without inhibiting cell growth or apoptosis.

#### Materials and Methods

To determine the cytotoxicity of TSAIII in 143-B, HOS, and MC3T3-E1 cells, the cells ( $8 \times 10^3/100 \mu\text{L}$ ) were treated with various concentrations (0, 2, 4, 6, 8, 10  $\mu\text{M}$ ) of TSAIII for 24 and 48 hours. The cell cycle was determined by flow cytometry after PI stain. Flow cytometric analysis was performed on cells co-stained with annexin V and PI to detect apoptosis. The levels of related protein were examined by Western blot analysis. The migration and invasion abilities were determined using a Boyden chamber assay.

#### Results

High concentrations of TSAIII (8 and 10  $\mu\text{M}$ ) exerted a cytotoxic effect on the growth of human osteosarcoma and normal osteoblast cells and has no effect on the induction of cell cycle arrest nor apoptosis in human osteosarcoma cells. TSAIII significantly suppressed the cell migration and invasion of both human 143-B and HOS cells. The expression and distribution of F-actin in the 143-B and HOS cells were significantly reduced related with treated doses.

#### Discussion

The present study results represented that TSAIII did not decrease the cell growth and colony formation in human osteosarcoma cells, and significantly inhibited cell migration and invasion by downregulating the expression and distribution of cytoskeletal F-actin.

#### Conclusions

These data provide few evidences that TSAIII has the potential to be an antimetastatic agent, but we need more studies to investigate the possible mechanism.

**Epidemiology of Fatal/Non-Fatal Suicide Among Patients with Chronic Osteomyelitis (COM): A Nationwide Population Based Study**

慢性骨髓炎患者致命/非致命自殺的流行病學：單一個國家國民研究

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Osteomyelitis(COM) is a bone infection frequently becomes a chronic infection and last for weeks, months, years or even be permanent. Patients are usually male, older and lead to chronic systemic inflammation. Suicide is the 10th leading cause of death in the United States. In one prospective study, higher levels of serum C-reactive protein had a higher risk of suicide death and no studies have examined the correlation between COM and suicide tendency. We performed a nationwide population-based study to determine the epidemiology of health care service use for suicide among COM patients.

**Materials and Methods**

Data source: The Longitudinal Health Insurance Database (LHID), which randomly selects 1 million subjects from the NHIRD by using ICD-9-CM system. Study population: Subjects with at least two outpatient visits or one course of inpatient care diagnosed with COM (ICD-9-CM: 730.1 730.9, 909.3) from January 2000 to December 2012 were recruited into a COM cohort. Statistical analysis: SAS 9.4 software (SAS Institute Inc., Cary, NC, USA) was used for data analysis and R software was used to plot the incidence curves

**Results**

5,762 in the COM cohort and 23,039 in the control cohort. COM patients had 1.93 times the risk of fatal/non-fatal suicide than control Subjects. COM patients had 1.76 times the risk of fatal/non-fatal suicide than control subjects in the competing risks regression model. The effect of COM on the increased risk of fatal/non-fatal suicide was more prominent among diabetic patients. Compared with the control cohort, we observed a severity-dependent risk of fatal/non-fatal suicide associated with COM after controlling for age, sex, urbanization level and medical comorbidities.

**Discussion**

In this study, we demonstrated that COM patients had 1.93 times the risk of fatal/non-fatal suicide than control subjects. Considering death as the competing event, COM patients had 1.76 times the risk of fatal/non-fatal suicide than control subjects using a competing risk regression model. The effect of COM on fatal/ non-fatal suicide was more prominent among diabetic patients. COM patients receiving both outpatient and inpatient care had 4.79 times the risk of fatal/non-fatal suicide than control subjects.

**Conclusions**

These findings demonstrate that COM is a risk factor for fatal/non-fatal suicide, including suicide attempts and suicide death. The relative importance of COM as a risk factor for fatal/non-fatal suicide was greater among diabetic patients. These data indicate that COM is not merely a local musculoskeletal disease and its association with suicide tendency justifies preventive measures for suicide attempts or suicide deaths among COM patients.

**Monitoring of Suspended Particulation in Orthopedic Surgery -A Preliminary Report****骨科手術中懸浮顆粒的監測-初步報告**

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**Introduction**

There is no research and discussion on suspended particulates in operating rooms so far. This research uses the orthopedic surgery room as the research environment for monitoring suspended particulate during different types of operations. Data was collected through a particles collection system conducted by ITRI team. Comparison between different surgical procedures was performed. Observation of threshold value of aerosols produced in different operating procedures. Preliminary results were analyzed and further proposed improvements will be suggested.

**Materials and Methods**

The orthopedic operating room is equipped with continuous suspended particulate monitoring system. Data collection of aerosols continuously in one operating room. According to the daily surgical schedule, the values of suspended particles produced during the operation are analyzed.

**Results**

Data collection in 56 consecutive orthopedic surgeries from November 1 to November 30 2020. Threshold value 5,000( $\mu\text{m}$ ) was documented in infectious guideline, In the initial implementation process, the maximum value of "Total Knee Replacement" is about 23,000 ( $\mu\text{m}$ ), the maximum value of Rotator Cuff Repair-Severe is about 35,000 ( $\mu\text{m}$ ), and the value of "Arthroscopic Cruciate Ligament Reconstruction" is about 11,000 ( $\mu\text{m}$ ). The aerosols produced during the operation in different operating rooms are different. Patients entering the operating room and performing anesthesia have similar aerosol values. It was found that the aerosols produced by cauterization during the operation were extremely high. It may cause harmful effect to surgeons, nurses, patients, etc. Suspended particles enter the human respiratory system through respiration. Therefore, how to protect doctors and nurses is the direction for future improvement. For example: the degree of protection of surgical masks, gas extraction with electric knives, etc.

**Discussion**

Through the suspended particle monitoring equipment, the data of suspended particles in the operating room is continuously recorded and transferring with WiFi linkage. It has been analyzed that high levels of suspended particles will be generated when performing cauterization coagulation. Including: total knee arthroplasty, severe rotator cuff repair, artificial arthroscopic cruciate ligament reconstruction, etc., the number of suspended particles is high, 5 to 7 times higher than the threshold. It may cause harm to doctors, nurses, etc. Such as: respiratory tract, asthma, cardiovascular and other diseases.

**Conclusions**

Since it is a preliminary report, in further study, we will continue to collect suspended particulate data, analyze the results generated in different operating rooms, and improve collection protocol, such as suction equipment, protective equipment and data transfer, etc. Improve the quality of the surgical environment and reduce the hazardous substances will be mandatory for all surgeries.

## Be Aware of Sodium-Glucose Transporter-2 Inhibitors (SGLT2i) Related Euglycemic Diabetic Ketoacidosis in Patient Who Receiving Orthopaedic Emergent Surgery. A Case Report with Literature Review

小心鈉-葡萄糖轉運蛋白 2 抑制劑造成的正常血糖酮酸中毒併發症在病人接受緊急骨科手術之後：一篇病例報告併文獻回顧

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### Introduction

Sodium-glucose transporter-2 inhibitors (SGLT2i) are the newest class of antihyperglycemic agents, lowering blood sugar by causing the kidneys to remove sugar from the body through the urine. Increasing these drugs usage is noticed due to its effect on weight benefits, reductions in heart failure and renal benefit. However, common side effects were mentioned after taking these drugs, such as urinary tract infection, dyslipidemia, nausea and thirst. Rare complication such as ketoacidosis was also mentioned, which significant increasing the mortality rate. The purpose of this topic is to share an experience of SGLT2i related life-threatening euglycemic diabetic ketoacidosis after receiving orthopaedic emergent surgery.

### Case presentation

A 57-year-old female suffered from left thigh pain after falling down. She had type II DM under oral antidiabetic agents dapagliflozin, which was a SGLT2i drug. At our emergency department, x-ray showed left distal femur fracture. She received ORIF one day later and surgery was performed without any complications. However, poor intake, dehydration were noticed in ward. She still took dapagliflozin due to relative normal blood sugar level around 120 mg/dL. Sudden onset of dyspnea with desaturation was noticed two days after surgery. Lab data showed severe ketoacidosis. She was transferred to intensive care unit for intubation and hemodialysis with impression of euglycemic diabetic ketoacidosis. After adequate fluid resuscitation, insulin pump and inotropic agents use, she finally transferred to ordinary ward two months later.

### Discussion

Euglycemic diabetic ketoacidosis was a rare life-threatening complication, characterized by euglycemia (blood sugar less than 250 mg/dL), presence of severe metabolic acidosis and ketonemia. After reviewing current literature, common precipitation factors were mentioned, such as fasting, SGLT2i drug use, infection, and pregnancy. Major surgery would also increase risk due to stress response, resulting in increasing catecholamine release, cortisol production and reduced insulin utilization. It was hard to early detection. Post operation poor intake was common. DM related serious complications, diabetic ketoacidosis and hyperglycemic hyperosmolar state was not likely due to euglycemia. The average half life of SGLT2i drugs was about 12 hours. It was suggested to hold longer period of 48 hours prior to surgery to ensure near-complete elimination.

### Conclusion

It was suggested to hold SGLT2i drug prior to major surgery due to life-threatening euglycemic diabetic ketoacidosis and further studies were needed for true incidence rate and relationship to orthopaedic surgery.

**Severe Urinary Tract Infection is an Important Complication After Surgical Treatment of Hip Fracture in the Elderly.****嚴重泌尿道感染是年長者髖關節骨折術後一項重要的併發症**鍾和肯<sup>1</sup> 陳顥文<sup>1</sup> 葉光庭<sup>1</sup> 吳文田<sup>1</sup> 于載九<sup>1</sup> 陳英和<sup>1</sup> 王仁宏<sup>2</sup>  
花蓮慈濟醫院骨科部<sup>1</sup> 花蓮慈濟醫院研究部<sup>2</sup>**Introduction**

Although urinary tract infection (UTI) is a common perioperative complication among elderly patients with hip fracture, its incidence and effects are often underestimated. Elderly patients with multiple comorbidities are even more susceptible to UTI, which may lead to further admission or other complications. This study investigated the effects of severe UTI on elderly patients with hip fracture and the risk factors for this condition.

**Materials and Methods**

In this retrospective nationwide cohort study, we searched Taiwan's National Health Insurance Research Database from 2000 to 2012 for data on patients aged  $\geq 50$  years with hip fracture who underwent open reduction and internal fixation or hemiarthroplasty for comparison with healthy controls (i.e. individuals without hip fracture). Patients who were further admitted for treating UTI was defined as "severe UTI". The study and comparison cohorts were matched for age, sex, and index year at a 1:4 ratio. The incidence and hazard ratios of age, sex, and multiple comorbidities associated with severe UTI were calculated using Cox proportional hazard regression models.

**Results**

Among the 5774 and 23,096 patients in the study and comparison cohorts, the overall incidence of severe UTI per 100 person-years was 8.5 and 5.3, respectively. The risk of severe UTI was cumulative over time and higher in the study cohort than in the comparison cohort, particularly in those who were older, were female, or had comorbidities of cerebrovascular accident or chronic renal failure.

**Discussion**

This study discovered an increased risk of severe UTI after surgery for hip fracture compared with the risk in individuals without hip fracture. UTIs, which are among the most common bacterial infections in older patients with hip fracture, can be symptomatic or asymptomatic.

**Conclusions**

The severe UTI incidence in the study cohort was higher than that in the comparison cohort, particularly in patients who were older, female, or had comorbid CVA or CRF. To increase patients' postoperative quality of life, further prevention or protection protocols for these patients at high risk of severe UTI should be enacted earlier during the recovery period after hip fracture.



**Characterization of Role of Aquaporin 5 in Mediating the Interplay Between Oxidative Stress and Osteoblastogenesis**

探討水通道蛋白 Aquaporin 5 調控氧化壓力來影響成骨細胞分化之分子機制

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The aquaporin 5(AQP5) is a water channel that regulates water secretion and controls the transportation of free radicals to mitigate the cellular integrity and tissue homeostasis. Previous in vitro studies indicated that aquaporins are critical in regulating the differentiation of mesenchymal stem cells and potentially participate in transporting free radicals, indicating AQP5 might play an important role in connecting oxidative stress and cell differentiation. However, the exact function of AQP5 and its role in mediating the interplay between oxidative stress and osteoblastogenesis in the bone cell remain unclear.

**Materials and Methods**

To better understand the role of AQP5 in vitro, we use MC3T3-E1-derived osteoblast cells to study the role of AQP5 during osteoblast differentiation under oxidative stress (e.g. hydrogen peroxide)

MC3T3-E1 stem cells were treated with 50ug/mL ascorbic acid and 10mM BGP to induce osteoblast differentiation for 7 days. The percentage of differentiation was determined using alkaline phosphatase staining (ALP) to quantify the population of osteoblast cells. During differentiation, various concentrations of hydrogen peroxide (0-250 uM) were added to the cell culture for 24 hr. AQP5, inflammatory factors and bone-differentiation profiles were measured by quantitative PCR.

**Results**

After hydrogen peroxide induction, we observed a significant reduction of AQP5, sod2 and ALP in osteoblasts with increased oxidative stress. In contrast, we observed a significant increase of bglap2, cox-1 and apoe under oxidative stress.

**Discussion**

Our data suggested that the expression of AQP5 is affected by oxidative stress during osteoblastogenesis. Interestingly, we found that bglap2 was significantly upregulated with increased hydrogen peroxide, which has never been observed in previous studies.

**Conclusions**

Although the RNA expression level of AQP5 seems connected to oxidative stress in osteoblast, its protein level and function still need further characterization. Future studies will be focused on applying siRNA to knock down the function of AQP5, and to determine whether it directly involves in the regulation of bglap2 expression.

## Effects of Commonly Used Chinese Medicinal Herbs on Mesenchymal Stem Cell-Induced Chondrogenesis and its Mechanistic Studies

### 常用中藥對骨髓幹細胞誘導軟骨形成的影響與其機轉探討

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#### Introduction

Osteoarthritis (OA) is a degenerative joint disease resulted from damage of joint cartilage and underlying bone. The results of present OA treatment modalities are beyond our expectation. How Chinese herbal medicine modulates mesenchymal stem cell (MSC)-induced chondrogenesis remains to be elucidated. The aim of this study was to screen Chinese medicinal herbs on chondrogenesis *in vitro* and elucidate the mechanisms of herb-induced chondrogenesis.

#### Materials and Methods

Human MSC line was used in this study. *In vitro* chondrogenesis was established by administration of chondrogenic induction medium (CIM) on MSC culture. The six commonly used Chinese herbal preparations in treatment of OA clinically, including Chuan Qiong (CX, *Ligusticum striatum* DC, 川芎), Hu-Qian-Wan (HW, 虎潛丸), You-Guei-Wan (YGW, 右歸丸), Gui-Lu-Er-Xian-Jiao (GLESJ, 龜鹿二仙膠), and Du-Huo-Ji-Sheng-Tang (DHJST, 獨活寄生湯) and Zi-He-Che (ZHC, 紫河車), were treated on MSC cultured with CIM for 1-, 2-, and 3-wks, followed by observation the chondrogenic sphere, Alcian blue stain, and the screened results were verified by Western blot and real-time PCR for gene expression such as collagen type II or type X, and TGF- $\beta$  1

#### Results

Six different herbal remedies were treated on MSC during CIM induction condition. The results showed that there were no significant differences on chondrogenesis between CIM alone group and Chinese herbal preparations (CHP) + CIM groups. To elucidate the possible mechanisms of herbal effects on *in vitro* chondrogenesis, another inducing medium, namely, de-TGF $\beta$ 1 CIM was designed. De-TGF $\beta$ 1 CIM (DTCIM) included all components of CIM except that TGF $\beta$ 1 was depleted. When herbal treatments in DTCIM on MSCs cultures, the area size of chondrosphere seemed increased, although no statistical significance, on chondrogenic formation. The QPCR result also demonstrated an increasing trend after herbal treatment in both collagen type II and collagen type X but not sox9 gene expression.

#### Discussion

Chondrogenesis is the process of cartilage formation initiated from mesenchymal stem cells (MSCs) and is strictly controlled by many factors such as extracellular matrix (collagen families, aggrecan, etc) that promote chondrogenesis and fibroblast growth factor (FGF). Besides, bone morphogenetic proteins (BMPs) play important roles for MSCs to condensation and mineralization and transforming growth factor beta (TGF- $\beta$ ) induces chondrocyte proliferation or enhances the differentiation from stem cell to pre-chondrocytes. However, how Chinese herbal medicine modulates the chondrogenesis process remains to be elucidated. Our results demonstrated the enhancement of chondro-sphere size under the treatment of ZHC and GLEXJ. The quantification data showed the increase of area size compared to negative control (NC, growth medium alone) however, did not larger than positive control (PC, CIM). The alcian blue stain showed no significant difference chondrogenesis compared to CIM group. The QPCR result showed the increasing trend after herbal treatment in both collagen type II (Col2) and sox9 gene expression, but not significant different compared to CIM group. These data suggested that there were no significant differences on chondrogenesis between CIM and Chinese herbal preparations (CHP).

#### Conclusions

We conclude that GLESJ and ZHC might have potential on MSC-induced chondrogenesis and the results of this study will provide important information for clinical application in treatment of OA deterioration.

**Comparison of the Efficacy and Adverse Effects of Zoledronic Acid and Denosumab for the Treatment of Male Osteoporosis****比較 zoledronic acid 和 denosumab 在治療男性骨質疏鬆症的功效及副作用**

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**Introduction**

Injectable osteoporosis drugs are widely acceptable for the osteoporotic patients because of their convenient administration. Treatment efficacy of osteoporosis in men is significantly understudied compared with women and often not included in the osteoporosis clinical studies to date. In this retrospective comparison of the two available treatments, denosumab and zoledronic acid, we aimed to determine and compare the efficacy and tolerability of denosumab and zoledronic acid in men with osteoporosis.

**Materials and Methods**

The charts of male patients who received denosumab and zoledronic acid at single medical center were reviewed, and adverse events were noted. Of primary interest were myalgias, flu-like symptoms, back pain, and fractures. A questionnaire regarding the efficacy, tolerability, and treatment cost supplemented this chart review in a subset of study participants. Bone mineral density (BMD) changes, bone turnover markers, and questionnaire results were also compared.

**Results**

The study cohort consisted of 124 male patients (76 denosumab, 48 zoledronic acid). The denosumab group had a greater mean increase in spine BMD than the zoledronic acid group at 1 year follow-up. The change in femur and spine BMD at one year were not significantly different between both groups. The zoledronic acid group had a greater incidence of mild flu-like symptoms, while the denosumab group had a greater incidence of dermatitis.

**Discussion**

The BMD results are similar to what was reported in the previous large RCTs that have evaluated denosumab and zoledronic acid individually. The tolerability of the patients are similar but different side effects were noticed.

**Conclusions**

The denosumab group seemed to have a higher mean increase in spine BMD, and both groups had different but tolerable adverse effect. The study groups were statistically similar in terms of satisfaction of the male patients.

**Comparison Between the Effects of Full-Course of Teriparatide Followed by Denosumab and Persistent Administration of Denosumab on Clinical Outcomes in Patients with Severe Osteoporosis****完整骨穩療程後續使用保髒麗與持續使用保髒麗在治療嚴重骨質疏鬆症的功效比較**

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**Introduction**

Teriparatide is the most widely used anabolic agent in the treatment of patients with osteoporosis although its use is restricted in many countries. A recent randomized trial confirmed that teriparatide was superior to risedronate at preventing vertebral fractures over a 2-year period. There is limited information on the relative effectiveness of teriparatide compared with standard care in routine clinical practice.

**Materials and Methods**

We collected the data of 84 women with severe osteoporosis who were considered for teriparatide therapy. Of these patients, 52 (61.9 %) were treated with teriparatide, whereas the remaining 32 (38.1%) received denosumab. This was either because they were unwilling or unable to self-inject (62.6%) or because they had already been established on half-year subcutaneous injection (37.4%).

**Results**

The teriparatide group were younger than the standard care group and had a lower 10-year fracture risk. Those treated with teriparatide had a greater increase in BMD at the lumbar spine compared with standard care after approximately 2 years and had a lower incidence of vertebral fractures over the course of our observation.

**Discussion**

There was no difference between groups with respect to either BMD change at the femoral neck or incidence of non-vertebral fractures.

**Conclusions**

This study confirms that teriparatide is superior to standard care at reducing the risk of vertebral fracture in patients with severe osteoporosis.

**The Impact of Elastic Band Training on Functional Improvement in Patients with Sarcopenia:  
A Meta-Analysis****彈力帶訓練對於肌少症患者生理功能的助益：統合分析**

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**Introduction**

Sarcopenia is a syndrome characterized by pathological loss of skeletal muscle mass and strength, significantly correlated with physical disability, poor quality of life and death. Resistance exercise has been reported to be an effective treatment for sarcopenia. However, clinical evidence is lacking. This meta-analysis aimed to investigate the effectiveness of elastic band resistance exercise in facilitating physical performance in individuals with sarcopenia.

**Materials and Methods**

Well-controlled prospective clinical trials investigating the treatment effect of elastic band training for sarcopenia were searched from PubMed, Embase, Cochrane Library, and Google scholar databases up to October, 2020, using “Sarcopenia” and “Elastic band” as our searching terms.

**Results**

Four studies including three randomized controlled trials and one quasi-experimental study met our criteria. A total number of 297 patients with sarcopenia were included. After 12 weeks of training, there were significant improvements on maximal grip strength, gait speed, time up and go test in the elastic band training group than in the control group (95% CI 1.18-5.16, 95% CI 0.02-0.07, 95% CI -2.97- -1.35, respectively). However, there were no significant differences on the performance of 6-minute-walk test in the elastic band training group than in the control group at 12 weeks of follow-up( 95% CI -12.34- 26.51)

**Discussion**

Elastic band resistance training provided a significant improvement on muscle strength in upper and lower extremity for patients with sarcopenia after 12 weeks of training. However, no significant difference on the 6-minute-walk test between groups implicates that elastic band resistance training may have no advantage on strengthening of muscular endurance, since the 6-minute-walk test relies on the performance of muscular endurance and cardiovascular function rather than on muscle strength.

**Conclusions**

Elastic band resistance training may be benefit for patients with sarcopenia. Further randomized controlled studies with larger sample size and longer follow-up time are warranted to strengthen the clinical evidence of the effectiveness of elastic band training for sarcopenia.

## Compression Testing of the Acellular Porcine Annulus Fibrosus Grafts

### 去細胞豬纖維環植體的壓縮測試

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#### Introduction

Degeneration of the intervertebral disc (IVD) represents a significant musculoskeletal disease burden. The prevalent treatments for damaged IVDs seem to have limited success due to short of effective means to the annulus fibrosus (AF). Tissue engineering would be an ideal candidate for repair or substitution of the resulting degenerated discs with appropriate analogs. The development of new therapeutic strategies to repair or reinforce damaged AF may offer new hope. In the previous study, we have demonstrated that decellularization of AF was achieved through decellularization protocols. Thus the aim of this study was to assess the biomechanical properties of acellular AF grafts by compression tests .

#### Materials and Methods

The mechanical properties of the AF scaffolds were determined by compression tests. We exam the differences in the mechanical properties before and after decellularization by compression tests. Fresh porcine lumbar spines were obtained en bloc from a local abattoir, specimens from the same disc, one was washed and stored at -20°C until test, and the another one was underwent decellularization procedure using freeze-thaw cycles followed by decellularization. Compression tests were conducted using a Universal Testing Machine. Uni-axial compression tests were performed at room temperature (26°C) and 60% relative humidity. The constant deformation rate was set at 0.1 mm/sec for all materials examined (n = 6). Force and deformation (changes in length) were recorded electronically, and the resulting stress–strain compression curves were constructed.

#### Results

Using force and deformation results, stress–strain compression curves were constructed and Young's modulus was obtained. Compression testing showed no difference between native and decellularized AF scaffolds ( $p > 0.05$ , Student's t test).

#### Discussion

To develop a tissue engineering solution to degenerative or injured AF, the engineered construct must exhibit characteristics of structural support and discrete tissue architecture that mimics that of the native AF. Devising a successful strategy for AF repair requires a clear understanding of the functional biomechanics of the intervertebral disc. Intervertebral discs serve to support large spinal loads involving combinations of tension, torsion, compression, and bending. Therefore, AF repair materials must withstand the high stresses generated by spinal motion. Biomechanical testing of the decellularized AF demonstrated no significant difference in Young's modulus, further indicating satisfactory preservation of the biomechanical properties of the native tissue.

#### Conclusions

In this work, we demonstrate an effective methods of decellularizing porcine AF tissue while retaining the biomechanical properties. These resultant demonstrated that the acellular AF would be a potential scaffold for clinical utility.

## Program of the Advocacy for Using Taiwan's Orthopedic Devices 推動醫師使用國產品專案計畫成果報告

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### Introduction

In order to promote domestic orthopedic devices, the program was set up by Taiwan Joint Commission on Hospital Accreditation to enhance the understanding of Taiwan's brands. Combining educational trainings and clinical usage, identity for using domestic products were aimed to increase. On the other hand, feedbacks and suggestions were also collected for further improvement and adjustment. The purpose of this study is to illustrate the outcome of usage, satisfactory and understanding rates after above program.

### Materials and Methods

The program was a project extension from the one in 2019. In this program, companies aiming on spine and trauma materials were included. It was designed into 3 stages. In stage 1, involved physicians were randomly selected from Taiwan Orthopedic Association. The prevalence and satisfaction rate of using domestic orthopedic devices in 2019 was investigated with pre-program questionnaires. In stage 2, education training and product illustration were done. In stage 3, application of aforementioned device into clinical usage were advocated. Screws' and plates' were also evaluated for their design whether they were specific for Taiwanese population.

### Results

The questionnaire showed that most physicians (48%) used less than 25% of domestic trauma devices. However, majority of physicians (27%) used 50-75% of domestic spine implants. The cognition for functional, safety, service, and price characteristics with consumer preferences were all significantly increased. However, the understanding for domestic company to provide customized products were decreased. This misunderstanding was clarified by further bi-directional communication. Domestic products also shown to be satisfactory to physicians need but still lack of variability.

### Discussion

The study revealed that maintaining the usage rate of domestic products after this program was most challenging. However, the usage of precision devices, such as tools for revision arthroplasty, remained high despite program ends. It implicated that research and advocacy on optimization for precision products were key factor for promotion of domestic products.

### Conclusions

The quantity of using domestic orthopedic products increased after policy and promotion. The quality of domestic orthopedic devices improved after bidirectional communication between physicians and companies. However, the key to maintain using Taiwanese products still rely on official supervision over quality assurance.

## Cross-Team Promotion of Patient-Controlled-Analgesic (PCA) for Postoperative Pain Management in Orthopedic Patients

### 跨團隊合作推廣 PCA 以減少術後疼痛——桃醫骨科經驗

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#### Introduction

Pain was defined as the fifth vital sign. Cross-team promotion of Patient-Controlled-Analgesic (PCA) for postoperative pain management for orthopedic patients was introduced.

#### Materials and Methods

The promotion of PCA was listed as one of the key performance indicators (KPI) for our balanced scorecard (BSC). A case manager was appointed in charge of the marketing promotion and education of nursing staff. The two departments, Orthopedics and Anesthesiology, held joint meetings to discuss the pros and cons and clinical problems, to reduce the repellent of the surgeons. Educational posters were posted at the outpatient clinics, pre-anesthetic assessing room, family resting lounge of operating theater and the aisles of the wards. Cataloging brochures were also offered. The effectiveness and adverse reactions after PCA were evaluated promptly, including insufficient analgesic effect, dizziness, nausea, and allergies. The Department of Pharmacy also helped to introduce newer drugs and to adjust the more appropriate regimen for each individual patient.

#### Results

PCA cases of orthopedic patients accounted for more than 40% of the total number of the hospital, and it increased from 300 cases to 500 cases annually. The average length of stay (ALOS) dropped from 4.3 days to 4.0 days. The medical expense was also reduced at the same time, with the Tw-DRGs payment ratio increased from 1.16 to 1.25.

#### Discussion

PCA reduced postoperative pain, thus the patients got out-of-bed earlier and performed physical therapy better. Besides, good appetite, good bowel movements and good mood could accelerate recovery, reducing the post-operative complications. Moreover, the reduction of concomitant usage of NSAIDs led to lower risks of peptic ulcers and kidney damages.

#### Conclusion

Cross team promotion of PCA leads to various advantages. It may play an important role in ERAS (Enhanced recovery after surgery) which is very popular nowadays.



## Simultaneous Bilateral Hip Fractures in a Sarcopenic Elderly with End Stage Diabetic Nephropathy: A Case Report and Literature Review

案例報告：診斷雙側髖關節骨折、肌少症與糖尿病腎病變的年長洗腎病患

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### Introduction

Simultaneous bilateral hip fractures (SBHF) are uncommon, usually related to high-energy trauma, and those caused by low-intensity falls are even rarer, most of which are elderly with underlying osteoporosis or other metabolic diseases. We present a case of an 82-year-old man suffered from SBHF after a minor fall at home, with underlying inadequately controlled type 2 diabetes mellitus (DM), uremia under regular hemodialysis, arrhythmia with pacemaker, and possible sarcopenia, and relevant issues are also reviewed.

### Materials and Methods

After uneventful bilateral hip hemiarthroplasty, various examination including serum laboratory data and dual-energy X-ray absorptiometry (DXA) were performed. At sixth-month follow-up, sarcopenia evaluation such as Short Physical Performance Battery (SPPB), 6-meter walk test (6MWT), five-times sit to stand test (5XSST), Strength, Assistance in walking, Rise from chair, Climb stairs, Falls test (SARC-F), calf and mid-arm circumference, and handgrip strength test through Jamar<sup>®</sup> Hydraulic Hand Dynamometer were also performed. However, Bio-impedance analysis (BIA) was not performed due to the contraindication of pacemaker implantation, and DXA body composition analysis for appendicular skeletal muscle mass (ASM) was also unavailable in our institute.

### Results

DXA report revealed high BMD and Singh index indicated normal bone density, together with the findings of thick bone cortex found on plain X-ray and operative finding. The result of serum laboratory data with X-ray radiography all ruled out hyperthyroidism, secondary hyperparathyroidism, renal osteodystrophy, osteomalacia, and Paget's disease. Various examination confirmed the diagnosis of sarcopenia, according to Asian Working Group for Sarcopenia (AWGS) 2019 Consensus.

### Discussion

In recent years, some researchers have discovered that patients with type 2 DM may have higher fracture risk but with elevated BMD and thicker cortices. The fragility of such supposedly "strong" bones can result from microcrack accumulation. Therefore, BMD should not be solely used to represent the quality of bone, as the structure of trabecula also affect the bone quality, and trabecular bone score (TBS) might be a more precise index to evaluate fracture risk especially in patients with type 2 DM.

### Conclusions

SBHF after low-energy trauma are rather uncommon, and most of the cases are elderly with severe osteoporosis and have many comorbidities. Sarcopenia should be taken into consideration. BMD may not be equal to bony strength or bony quality, and type 2 DM may reveal high BMD but low bony strength as seen in DM osteopathy.

## The Correlation Between Neutrophil-to-Lymphocyte Ratio and Postoperative Mortality in Elderly Patients with Hip Fracture: A Meta-Analysis

嗜中性白血球與淋巴球比值高低與高齡患者髖部骨折術後的死亡率相關：統合分析研究

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### Introduction

Neutrophil-to-lymphocyte ratio (NLR) has been proven as an important predictor for the prognosis following several major operations, but the association between NLR and the outcome after hip fracture surgery is still in lack of evidence. This meta-analysis aimed to investigate the prognostic value of NLR to predict postoperative mortality among geriatric patients following hip surgery.

### Materials and Methods

PubMed, Embase, Cochrane library and Google scholar databases were searched up to January 2021 for the studies reporting the association of NLR with postoperative mortality in elderly patients undergoing repair for hip fracture. Data from studies reporting the mean of NLR and its 95% confidence interval (CI) were pooled in a meta-analysis. Both long-term ( $\geq 1$  year) and short-term ( $\leq 30$  days) mortality rate were included.

### Results

Eight retrospective studies comprising a total of 1558 patients were included. Both preoperative and postoperative NLR (mean difference(MD)= 2.75, 95% CI= 0.23, 5.27; P=0.03), (MD= 2.36, 95% CI = 0.51, 4.21; P= 0.01), respectively) in the long-term mortality group was significantly higher than that in the long-term survival group. However, there was no significant difference on NLR between short-term mortality and survival group (MD= -1.02, 95% CI = -3.98, 1.93; P = 0.5).

### Discussion

NLR was reported as an indicator not only for inflammatory status but also for nutrition status. A patient with poor nutrition and under high inflammatory status may be presented with high NLR, and therefore reflect on high risk of mortality following repair of hip fracture.

### Conclusions

Higher preoperative and postoperative NLR was correlated with higher risk of long-term mortality following hip fracture surgery in geriatric population, implicating the prognostic value of NLR as a predictor for long-term survival. Further studies with well-controlled confounders are warranted to clarify the predictive value of NLR in clinical practice for geriatric patients with hip fracture.

## Prevalence and Related Risk Factors of T-score Discordance Between Hip and Spine Among the Elderly Taiwanese

探討台灣老年人發生髖部及脊椎骨質密度(T-score) 不一致性的盛行率及危險因子

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### Introduction

T-score discordance between hip and spine is a common problem in the assessment of bone mineral density. The fracture rate may be underestimated and the anti-osteoporosis treatment may be delayed. This study is aimed to determine the prevalence and risk factors of the hip and spine T-score discordance in a population aged  $\geq 65$  years.

### Materials and Methods

In this cross-sectional study, we prospectively collected the demographic, comorbidities, the lumbar alignment parameters, and bone mineral density data of the participants. A difference smaller than 1 standard deviation is considered as the minor discordance, while a difference more than one diagnostic class is considered as the major ones. Chi-square and binary logistic regression analysis were used to assess the prevalence of the discordance between hip and spine.

### Results

A total of 623 people (211 men, 412 women) subjects were recruited. The incident rates of the minor and major discordance were about 30 % and 3 %, respectively. Overall, the risk factors related to T-score discordance were older age, height decrease, marked clawed spur formation, marked disc space narrowing, and more active physical status.

### Discussion

Lumbar spine and hip BMD measurements are routinely performed in clinical practice both for baseline risk assessment and for monitoring purposes. When confronted with highly discordant measurements (lumbar spine worse than femoral neck), clinicians are in a quandary about how this should be integrated into the decision-making process

### Conclusions

T-score discordance between hip and spine seemed to be common among Taiwanese elderly population. For the patients who have marked degenerative lumbar spine disease the physicians should considered evaluate the bone mineral density of the other anatomic regions other than spine and hip.

**Risk Factor Analysis of Low Hand-Grip Strength Among Postmenopausal Women**  
停經後婦女低握力風險分析

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**Introduction**

Hand-grip strength is a convenient and practical tool for initial evaluation of the physical status of elderly individuals, and low hand-grip strength has been associated with poor life quality in the elderly. This study revealed that lower hand-grip strength was significantly correlated with a higher FRAX 10-year predicted risk of major osteoporotic fracture rather than a lower bone mineral density in the postmenopausal women group, so do hypertension and the unemployed status.

**Materials and Methods**

This prospective cross-sectional study involved Taiwanese postmenopausal women older than 50 years from September 2019 to September 2020. Data for participant age, bone mineral density status, Fracture Risk Assessment Tool (FRAX) 10-year risk of major and hip osteoporotic fractures, body weight index, diabetes mellitus, hypertension (HTN), coronary artery disease, chronic renal failure, and recent employment status were collected for analysis.

**Results**

A total of 300 postmenopausal women were included in this study (mean age,  $67.7 \pm 8.2$  years; mean BMI,  $24.5 \pm 4.6$  kg/cm<sup>2</sup>). Multivariate logistic regression analysis showed that poor grip strength was significantly correlated with a high FRAX risk of major osteoporotic fracture, HTN, and unemployed status.

**Discussion**

Bone and muscle connect with each other and comprise motor units for exercise and daily activity. Muscle strength and BMD in postmenopausal women decrease with age. However, reference value of Taiwanese grip strength was not established. Relationship between grip strength and global muscle strength still remained controversial in older patients.

**Conclusions**

Lower hand-grip strength was significantly correlated with a higher FRAX 10-year risk of major osteoporotic fracture, HTN, and unemployed status. Future studies should focus on the efficiency of using this practical assessment for prediction and follow-up of the improvement or progression of chronic disease, especially musculoskeletal status.

## Should the Upper Extremity Fracture Caused by Low Energy Trauma Be Used as the Indicator for Early Osteoporosis Screening and Treatment in the Elderly Patients?

使用低能量上肢骨折於年長族群初期骨質疏鬆篩檢與治療之指標

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### Introduction

According to literature and osteoporosis treatment guidelines, both men and women with distal radius fractures (DRFx) and proximal humerus fractures (PHFx) caused by low-energy trauma may have undetected osteoporosis. Although upper limb fracture is a known predictor of subsequent osteoporotic fracture, the rates of prompt bone mineral density (BMD) evaluation and antiosteoporotic management in these patients remains much lower than those in patients with hip or spine fractures. : To evaluate the awareness of the physician for survey osteoporosis and to identify the association of the aforementioned fractures after falls with osteoporosis on the basis of BMD estimated through dual-energy x-ray absorptiometry

### Materials and Methods

We collected the parameters, including ethnicity, comorbidities, age, sex, and BMD data of the patients aged  $\geq 55$  years who sustained DRFx or PHFx and their BMD examination rates as physician awareness rate of possible osteoporosis. The incidence of osteoporosis among patients with these fractures were compared and associated risk factors were identified.

### Results

The physician awareness rates were 65.1% in DRFx and 66.0% in PHFx. 421 patients with DRFx and 219 patients with PHFx were included. Of the patients, 239 were male and 401 were female, and their mean age was  $67.1 \pm 6.5$  years. The osteoporosis rate were 38.0% and 46.6% in DRFx and PHFx. No patient aged more than 70 years had normal BMD in our study group. Most female patients had osteoporosis, whereas most male patients had osteopenia. 7.7% of the patients had normal T scores and only 24.6% of the patients with osteoporosis were undergoing regular antiosteoporotic treatment and follow-up. Those with PHFx had a significantly higher osteoporosis risk than did those with DRFx.

### Discussion

As current practice, bone mineral density (BMD) evaluation was mostly indicated after hip fracture and lumbar spine compression fracture. From our studies, the prevalence of osteoporosis in patient with upper extremities fracture such as DRFx and PHFx were quite substantial. Thus, physician awareness of early osteoporosis screening and treatment in this group of patients was paramount to prevent future fracture and improve quality of life.

### Conclusions

Osteoporosis awareness and treatment are crucial after distal radius or proximal humerus fractures in addition to hip fractures, particularly for female and older patients.

## Biceps Rerouting Technique for Large Irreparable Rotator Cuff Tears 二頭肌改道治療大範圍旋轉袖破裂

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### Introduction

Large to massive rotator cuff tears(LMRCT) is a common clinical condition. Many methods of transfer of the long head of the biceps (LHB) have been developed to augment the shoulder superiorly, with the best method using the LHB still being pursued. In this article, we introduce a special method using the LHB to address LMRCT: arthroscopic dynamic LHB rerouting. The main steps of this technique include opening the native bicipital groove, creating a new bicipital groove through the greater tuberosity, rerouting the LHB into the new bicipital groove with LHB fixation, and side-to-side rotator cuff repair over the LHB.

### Materials and Methods

A prospective evaluation of patients treated with arthroscopic biceps rerouting (ABR) for the repair of LMRCT was performed with 12-month minimum follow-up period. Range of motion (ROM) and functional outcomes were assessed preoperatively and at final follow-up according to visual analog scale (VAS) pain score, and American Shoulder and Elbow Surgeons (ASES) score. Magnetic resonance imaging (MRI) was performed 6 and 12 months postoperatively to examine the integrity of repaired rotator cuff tendons.

### Results

Ten patients who met the study criteria have undergone ABR from March 2018 to January 2020 in our hospital. Six of these patients could be evaluated at least 18-months after surgery. The average age of the enrolled patients was 63.4 years. Compared with preoperative values, VAS score decreased from 4.1 to 1.8, and ASES score improved from 58.1 to 83.5. ROM of forward flexion (FF), external rotation at 90° abduction (ERabd and internal rotation (IR) showed significant improvement between preoperative and last follow-up (FF, 135° to 145°; ERabd, 75° to 85° ; IR, 9 to 10 spinal level. 2 patients (20%) exhibited a re-tear of the repaired rotator cuff on the postoperative 12 months MRI.

### Discussion

Static biceps rerouting can be considered an advanced superior capsular reconstruction, with more tension within the reconstructed structure compared with routine superior capsular reconstruction. The nature of dynamic LHB rerouting is neither rotator cuff reconstruction nor superior capsular reconstruction. This special procedure may take effect through the establishment of a dynamic humeral head–depressing structure.

Compared with other manners of using the LHB tendon in irreparable rotator cuff repair, dynamic LHB rerouting may be the simplest way. Apart from routine manipulation of rotator cuff repair, all we need for dynamic LHB rerouting is to open the native LHB groove, create a new groove, and relocate the LHB in the new groove.

### Conclusions

Arthroscopic biceps rerouting improved the functional and radiological outcomes of patients with Large to massive rotator cuff tears. The ABR technique can be a useful treatment option for LMRCTs.

## Type I Capitellar Fracture with Inverted Fragment Treated with Headless Compression Screw

骨折塊翻轉之第一型肱骨小頭骨折使用埋頭加壓式骨釘治療

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### Introduction

The capitellum forms the anterior and inferior surface of the distal humerus of the elbow joint. Capitellar fractures are very rare, which constituting 1% of all elbow injuries. Capitellar fractures are caused by shearing forces anterior to the center of the capitellum. Bryan and Morrey classified this type of injury with a further modification by McKee et al. Type 1 fractures that consist of 2 part coronal plane injuries.

### Materials and Methods

A 63-year-old female complained about left elbow pain after a falling onto a outstretched from standing height. She was brought to our ER for help where, physical examination showed local tenderness with limited ROM of left elbow. Elbow plain film and CT revealed capitellum fracture with a single inverted fragment which displaced anteriorly. Under the impression of Bryan- Morrey type 1 capitellum fracture fractures, surgery of open reduction internal fixation was therefore performed.

### Results

During operation, a lateral Kocher approach was performed. The fracture site was visualized, with an inverted anteriorly displaced fragment of capitellum. Reduction was performed and temporary fixation with two K-wire was done. After confirmation of reduction under fluoroscopy. Two 2.8mm headless compression screw was then inserted from anterior to posterior through articular surface. The wound was then closed by layers. After operation a ROM brace was applied with 0-90 degree movement to prevent excessive extension of elbow.

### Discussion

The literature reveals a number of differing reports on the preferred treatment of capitellar fractures including internal fixation, excision of the capitellum, and closed reduction. Type I capitellum fracture can be treated by closed reduction or internal fixation. A few case series revealed successful closed reduction for this pattern of fracture. However, previous study did not mention about unique type found in this patient, with a inverted fracture fragment which displaced anteriorly. Therefore open reduction is more feasible for this kind of fracture to achieve anatomic reduction of articular surface.

### Conclusions

Type I capitellar fracture with an inverted fragment is a unique type which was not mentioned in previous study. Due to the fracture pattern of this kind of fracture, open reduction is necessary. Internal fixation with headless screw may be a biologically stable for the purpose to achieve anatomic reduction of the articular surface.

**Shoulder Instability in Young Athlete: A Case Report****青少年運動員肩關節不穩定之案例經驗**熊天翔<sup>1</sup> 林彥伯<sup>2</sup> 張宗訓<sup>1</sup>國立臺灣大學附屬醫院骨科部<sup>1</sup> 國立臺灣大學附屬醫院新竹分院骨科部<sup>2</sup>**Introduction**

Shoulder instability is a common condition in sports, especially in contact-sport players. Adolescent as a unique entity within such diagnosis is challenging in management. There has been debate about when surgical intervention is suitable for such patient groups. Too early intervention might shorten their professional life as athlete, but too late treatment might cause repeated dislocation and worse performance.

Here, we present a case of adolescent contact-sport player with shoulder instability and our approach of treatments/ responses.

**Case and Clinical Course**

This is a 16-year-old boy as a football player in school. He first came to our clinic due to anterior shoulder dislocation (twice, self-reduced) in sports. PE showed bilateral shoulder full ROM without impingement and positive apprehension test. MRI showed left shoulder Bankart lesion/Hill-Sachs lesion. After discussion, he received arthroscopic Bankart repair smoothly. Postoperative shoulder dynamic examination showed stable shoulder. He resumed his sports training a few months afterward.

8 months later, another episode of shoulder dislocation happened during sports. He noted obvious instability during daily activity, like napping on a desk. In our clinic, MRI arthrogram showed left shoulder ALPSA lesion with bony Bankart lesion. Open Latarjet procedure was suggested and performed smoothly. Postoperative shoulder dynamic examination confirmed stable shoulder. Later follow-up showed good bony union. He recovered well in follow-up clinics. He resumed his sports training and his pursuit as a professional athlete.

**Discussion**

Different approaches and classifications have been proposed for shoulder instability. Fundamental progress had been made since Dr. E. Itoi (2017)'s review articles: Based on the size of glenoid fossa/ Hill-Sachs lesions, shoulder instability can be classified into "on-track" vs. "off-track" type. Different treatments suggested accordingly. To evaluate such defect, he suggested non-contrast CT with 3D reconstruction. In our case, MRI was done for better evaluation of soft tissue with on-track lesion assumed. Arthroscopic Bankart repair was provided as Dr. Itoi algorithm. Recurred instability might be the result of athlete training. For routine contact-sport player, more definite surgery might be required. Meanwhile, one might consider provide both MRI and non-contrast CT preoperatively for evaluation.

**Conclusions**

Shoulder instability in adolescent patient is a challenging case. Dr. Itoi proposed algorithms for mechanism/ treatments gave us good insights. But in contact sport athlete, more definite operation might be needed with MRI / non-contrast CT 3D reconstruction provided preoperatively. With complete examinations and right treatment, we may have stable shoulder without early recur.



## Revision Surgery to Rescue the Failed Treatment of Terrible Triad: A Case Report

### 關於治療失敗之肘部嚴重損傷三聯症的手術成功經驗：案例分析

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#### Introduction

The terrible triad of the elbow was characterized by elbow dislocation, coronoid and radial head fractures. A change in treatment paradigms to early surgical treatment for the majority of such injuries has resulted in improved functional outcomes. For elbow stability, both osseous and soft tissue structures contributed. Primary stabilization is provided by the ulno-humeral joint (specifically the coronoid process which provides an important buttress to the elbow joint, resisting varus stress and preventing posterior dislocation), anterior bundle of the medial collateral ligament, and the lateral collateral ligament complex. Here we present a case with failed surgical treatment for terrible triad of elbow, which has loss of coronoid process, loosening of Acumed radial head prosthesis, end up with elbow OA, and we revised with cemented radial head prosthesis and tri-cortical bone graft for coronoid process reconstruction.

#### Case Report

A 40-year-old man received operation for right elbow fracture dislocation on 2019/11 at other hospital. He came to our clinic with complains of right elbow pain and limited range of motion (ROM) 1 year after the operation. He had adhered to rehabilitation but the symptoms were persistent with deterioration. Physical examination shows limited ROM about 30 to 90 degrees, accompanying with occasional mid-range pain. X-ray and CT scan revealed loosening of stem of radial head prosthesis, subluxation of ulno-humeral joint with OA, and loss of coronoid process. Under the diagnosis of Right elbow terrible triad status post Radial head replacement with implant loosening and PTOA, we had arranged revision arthroplasty of right elbow joint with cemented radial head prosthesis, autogenous tri-cortical bone graft reconstruction of coronoid process, contracture release and LUCL repair with Arthrex bio-anchor. During the operation, we found previous prosthesis loosening with elbow posterior subluxation, fibrosis incarceration at olecranon fossa and anterior capsule side. The tri-cortical bone from right ASIS was used to reconstruct coronoid process, and Acumed radial head prosthesis was fixed with cement. The elbow was stable after reduction and ROM increased to 0 to 130 degrees under anesthesia. After surgery, long arm splint was used for 2 weeks' protection, then shifted to custom-made progressive stretching elbow splint. One month after, the ROM of right elbow achieved 0 to 100 degrees without discomfort or instability.

#### Discussion

There are two mistakes in this terrible triad of elbow case, first surgeon performed only radial head arthroplasty with too thin prosthesis stem, without any repair of coronoid process and LUCL, so the result was unacceptable. Later the patient was told to perform aggressive rehabilitation, which end up with elbow PTOA. In revision surgery, we created a new "coronoid process" to rebuild anterior buttress function. LUCL was repaired with anchor and suture of the remanent. Because in Taiwan, the Acumed company did not offer long stem radial head prosthesis for revision use, we need to clean up the radial canal and cemented a new radial head prosthesis to fill up the gap. The elbow stability was rechecked at full extension and full flexion by varus and valgus stress test. The serial procedures successfully re-establish the bony and soft tissue stability. Long term result of cemented radial head prosthesis should be closely observed.

## Symptomatic Coracoclavicular Joint Dynamic Analysis by X-rays, MRI and Ultrasonography Case Report

症候性烏口鎖骨關節以 X 光、MRI 及超音波作動態解析症例報告

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### Introduction

Coracoclavicular joint (CCJ), first described by Gruber in 1861, is a rare but well-established cause of shoulder pain. Most CCJ are asymptomatic and diagnosed by incidental radiological findings. The purpose of this case presentation is to verify the pathological findings by dynamic X-rays, MRI, and ultrasonography.

### Materials and Methods

Case Presentation:

A 72-year-old female injured her left elbow on practicing golf in June 2020 and diagnosed as having avulsion of the triceps insertion portion and cured by a split treatment. Ten days later, she visited our clinic with complaint of left shoulder pain. Dynamic shoulder X-rays showed left scapula anomalous position and CCJ formation. Dynamic MRI and ultrasonography were investigated and proved that her CCJ was a synovial joint and had impingement on full elevation of the left shoulder.

### Results

Treatment with intra-articular hyaluronate injection improved her shoulder movement but corticosteroid injection into CCJ definitely relieve the shoulder pain.

### Discussion

The origin of CCJ is still debated, but many theories have been postulated. From dissecting subjects examined, Lewis stated there was a gradual transition seen between a bursa and the presence of a well-developed articulation in coracoclavicular space. Pillay stated that it is an inherited variant. Lane postulated it to be acquired because of occupational stress. Our case of CCJ developed well-defined CCJ with OA changes indicated occupational influences due to over-use by playing golf.

Treatment of symptomatic CCJ divided into surgical excision of the joint and non-surgical anti-inflammatories, physiotherapy, lifestyle modification or local corticosteroid injection. Our case showed dramatic improvement after local anesthetic and corticosteroid mixture injection proved the pathological location.

### Conclusions

1. Special occasion of over-use like golf play may produce symptomatic CCJ.
2. Symptomatic CCJ can be proved by dynamic X-rays, MRI and ultrasonography especially proving the impingement.
3. Treatment of the shoulder pain from symptomatic CCJ was effective by local corticosteroid injection into CCJ in addition to hyaluronate intra-articular injection into shoulder joint.

## Treatment for Non-Union of Shoulder Periprosthetic Fracture After Open Reduction and Internal Fixation – A Case Report

半肩關節置換術後人工關節周圍骨折開放性復位及內固定手術後骨頭未癒合治療之個案報告

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### Introduction

Shoulder arthroplasty procedures have increased by four-fold over the past years. Shoulder hemiarthroplasty (HA) and total shoulder arthroplasty (TSA) are reliable treatment options for end-stage glenohumeral joint arthritis. However, in the aging society with the increasing population of osteoporosis, the management of periprosthetic humerus fracture has been a challenge. We present a case of non-union periprosthetic humerus fracture after shoulder hemiarthroplasty.

### Materials and Methods

A 71-year-old female patient was admitted to the hospital due to painful left shoulder with limited range of motion for a year. She had no left shoulder trauma history. She was unable to elevate her left due to the progressive pain. Radiographic assessment revealed left shoulder joint end-stage arthritis. After thorough pre-operation assessment, shoulder HA was determined to perform. Intraoperatively the severe osteoporosis condition yielded the prosthetic tip long spiral fracture, Wright Type C fixed with cerclage wires. 5 days after the hemiarthroplasty, there was obvious ecchymosis over left upper arm with severe pain. X-ray revealed loss fixation of fracture. The periprosthetic fracture was reduced and fixed with 3.5mm dynamic-compression plate (DCP) with wires. In a year follow-up, she still had left upper arm pain with severe numbness. Radiographic study showed previous DCP displaced with non-union. The surgical solution consisted of plate osteosynthesis, cerclage and allograft bone struts and neurolysis.

### Results

After 2 years of operation, she had less left upper arm pain though there was still mild numbness over it. The radiographic evaluation of her left humerus showed good bone union with solid plate and wire fixation.

### Discussion

Increasing incidence of osteoporosis in elderly population has been a great concern while orthopedic surgeon applies shoulder arthroplasty on them. Humerus shaft fracture needs surgical treatment. Though systematic condition may be one of reasons of fracture non-union, it's still indispensable that we value the principle of biomechanics to decreased failure rate. The use of bone allo/auto-graft is another opportunity to treat non-union. Plasma-rich plate, scaffold and bone substitute are also effective supplementary treatments. We combined mechanical stability (plate, wires, autograft) and a supportive treatment (allogeneic bone graft) to achieve the best of the osteogenesis process.

### Conclusions

Mechanical and biology are both indispensable for a successful treatment for fracture. In the presented case, combination of well reduction and supportive method show good clinical outcomes.

## Rapid Progressive Collapse of the Humeral Head after Arthroscopic Rotator Cuff Repair: A Case Report

關節鏡旋轉肌袖縫合後肱骨頭快速崩塌壞死。病例報告

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### Introduction

Arthroscopic rotator cuff repair (ARCR) has advanced remarkable in recent years with very rare complication such as the stiffness, humeral head chondrolysis, or glenoid osteonecrosis. The pathogenesis of osteonecrosis of the humeral head is thought to be multifactorial and it is ultimately characterized by vascular disruption of the affected bone. Recently, osteonecrosis of the humeral head after ARCR were reported as a potential complication. We described one case with humeral head osteonecrosis after receiving ARCR.

### Materials and Methods

A 63-year-old right-handed lady had the past history of major depression disorder and hypertension under medication control. Right shoulder pain was complained for weeks with swelling and spontaneous ecchymosis. She denied any trauma history. Active and passive range of motion (ROM) was full but weakness. Hawkins, Empty cam, and Drop arm test were all positive. Radiographies showed upper migration of humeral head without obvious bony lesion. MRI revealed right Os acromiale, biceps tear and massive tear of supraspinatus and infraspinatus. Conservative treatment was experienced but limited effect. Then, she received the surgery of ARCR by suture bridge technique.

### Results

After operation, short period of improvement post-operatively was noted. Active ROM was improved pre-operation to post-operation: Flexion: 90°→180°, Abduction: 90°→150°, External rotation: 45°→90°. However, 2 months later, the patient noticed a sudden increasing pain and limitation of motion of right shoulder. Radiographs showed the progressive resorption of the humeral head. MRI found Cruess type V osteonecrosis and rotator cuff small size re-tear. No infection, tumor, nor immune disease were found after series studies. Because of persistent severe pain and dysfunction, the patient finally received total shoulder arthroplasty and rotator cuff open repair 8 months later after the first operation. The shoulder pain is improved and she exhibits good range of motion of right shoulder after the second operation.

### Discussion

The complications reported after ARCR include stiffness, delayed wound healing, infection, reflex sympathetic dystrophy, and deep venous thrombosis. However, it is very rare to find the complication of humeral head osteonecrosis. Several theories have been established, including high pump pressure, long operative time, massive rotator cuff tear or disruption of humeral head blood supply by anchor screws. For our case, multiple anchors were used for the surgery which may interrupt the blood supply and eventually led to post-operative humeral head collapse. We suggest being careful in anchor localization and number during arthroscopic procedure in order to decrease the risk of humeral head osteonecrosis.

### Conclusions

As the demand for ARCR is expected to increase in the future, we recommend that surgeons become aware of the potential of complications and respect the humeral head vascularization.

## Elbow Joint Hemiarticular Allograft Reconstruction in Patient with Neglected Unreduced Complex Elbow Dislocation: A Case Report

肘部半關節異體移植骨重建手術針對複雜性未復位肘關節脫位：病例報告

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### Introduction

Neglected elbow dislocation is defined as unreduced dislocation for more than 3 weeks. When the dislocations come with fractures of the coronoid process, radial head/neck, distal humerus, or olecranon, they are termed as “complex dislocations”. Various treatment methods have been described. Here we present a case with neglected unreduced elbow dislocation with comminuted fracture treated with elbow joint hemiarticular allograft reconstruction, a rare procedure performed.

### Materials and Methods

A 66-year-old bed-ridden female patient with leptomeningeal carcinomatosis, complicated with hydrocephalus and status epilepticus presented with left elbow painful swelling. Serial CT scan and X-ray showed left distal humerus intraarticular comminuted fracture. ORIF with orthogonal locking plates was performed. Dynamic splinting method was used post-operatively. However, 2 weeks after the surgery, follow-up X-ray showed left elbow dislocation. Closed reduction failed and surgery was performed with comminuted displaced capitellum, trochlea and olecranon fracture noted intra-operatively. We then used a cadaveric allograft of distal humerus and proximal ulna with the patient’s proximal radioulnar joint and lateral side ligaments preserved for reconstruction. A medial cutting of ulna and transverse cutting of distal humerus was performed. A figure of 7 allograft was prepared and fit into the bony defect of the patient. Post-operative outcome was measured and documented.

### Results

Post-operatively the alignment was good and articular surface was congruent. However, left elbow follow-up X-ray 10 days after the surgery revealed elbow joint posterior dislocation. Closed reduction was performed but failed. Due to limited need of range of the motion and the patient had limited consciousness, we applied splint and kept the elbow in flexion to prevent further contracture.

### Discussion

Compare with other joints, the literature of allograft elbow reconstruction is scarce. Previous studies mainly described the use of osteoarticular allograft reconstruction as an option for patients with massive periarticular elbow bone loss due to tumor surgery or trauma. Little was described about elbow joint allograft reconstruction in patient with neglected complex elbow dislocation. In several large series, complications included nonunion, infection, fracture, allograft resorption, and instability. Some literature stated that the hemiarticular allograft reconstructions having a much lower failure rate than the total elbow allograft reconstructions.

### Conclusion

Our case showed early instability of the elbow and dislocation was noted 10 days after the surgery. Reviewing literature, there were similar complications reported before. Though there is still improvement for the outcome of this patient, hemiarticular allograft reconstructions remains a option for neglected unreduced complex elbow dislocation.

## A Complex Shoulder Injury Including Medial Clavicle Fracture, Acromion Fracture, Coracoid Process Fracture, and Acromioclavicular Dislocation: A Case Report and Literature Reviews

複雜性肩傷害包含內側鎖骨、肩峰、喙突骨折及肩峰鎖骨關節脫臼：個案報告及文獻回顧

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### Introduction

Medial clavicle fracture, acromion fracture, and coracoid process fractures are all uncommon injuries to the shoulder. There are literatures discussing surgical indications and outcomes for individual injury. A combination injury to these structures and acromioclavicular dislocation is much rarer, and there is no consensus of treatment for such combined injury. We report a case encountered a complex shoulder injury including medial clavicle, acromion, and coracoid process fractures and acromioclavicular dislocation.

### Case History and Surgical Technique

A 65-year-old man with hypertension presented to Emergency Department with right shoulder, chest, and wrist pain after falling down into a ditch after drinking. Plain radiographs and computer tomography examinations revealed right medial clavicle fracture, acromion fracture, coracoid process fracture, acromioclavicular dislocation, distal radius fracture, and 1<sup>st</sup> to 7<sup>th</sup> ribs fracture. His consciousness was clear and vital signs were stable. There was no open wound. Distal circulation, motor function, and sensory function were intact. For double disruption of superior shoulder suspensory complex and multiple displaced fractures, open reduction and internal fixation was indicated. After rib fixation and stabilization of the patient condition, plate and screw fixation for acromion, transosseous suture and capsular repair for acromioclavicular dislocation, intramedullary screws fixation for medial clavicle fracture, suture anchor fixation for coracoid fracture, and plate and screws fixation for distal radius were done. The post-operative course was uneventful, and the patient was discharged 11 days after the injury. Follow-up clinic recorded no complaint of the patient.

### Discussion

Currently, there is no literature report of such combined injury of this patient. Multiple impacts in one trauma event of falling down into a ditch may explain his complex fractures. The fracture patterns include double disruption of superior shoulder suspensory complex and a floating clavicle-equivalent injury. Open reduction and internal fixation for these displaced fractures was done and the patient tolerated the procedure well.

### Conclusion

We report a case of a rare complex shoulder injury including medial clavicle fracture, acromion fracture, coracoid process fracture, and acromioclavicular dislocation treated by open reduction and internal fixation, which satisfied outcome is achieved. The timing of surgery, surgical indication and technique, and postoperative rehabilitation should be individualized according to patient condition, associated injuries, availability of implants, and surgeon experience.

## Severe Injury of Bilateral Elbow Joints: Left Elbow Terrible Triad Combined with Distal Humeral Supracondylar Fracture and Right Elbow Fracture Dislocation with Radial Head Comminuted Fracture: A Case Report and Review of Literature

雙側肘關節嚴重受傷:左肘關節恐怖三聯征合併遠端肱骨髁上骨折右肘骨折脫位合併橈骨骨頭粉碎性骨折的嚴重病例: 病歷報告及文獻探討

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### Introduction

Terrible triad of the elbow is characterized as posterior dislocation of the elbow joint accompanied by the fractures of the radial head and coronoid process of the ulna. In this study, we reported one case of severe injury of bilateral elbow joints with left elbow terrible triad combined with distal humeral supracondylar fracture and right elbow fracture dislocation with radial head comminuted fracture. Clinical experience was obtained during the diagnosis and surgical procedures.

### Materials and Methods

This 25-year-old man injured the both elbow after falling from 5 meters height scaffolding resulting in severe pain and swelling. The patient was sent to Kaohsiung Medical University Chung-Ho Memorial Hospital. Image examination in the emergency department revealed left elbow terrible triad combined with distal humeral supracondylar fracture and right elbow fracture dislocation with radial head comminuted fracture. After general survey, the patient received urgent operation.

### Results

Stage 1 operation for left elbow, we performed several surgical procedure including: 1. Open reduction and internal fixation for humeral supracondylar fracture 2. Ulnar nerve neurolysis and anterior transposition. 3. Olecranon Chevron osteotomy and tension band fixation. 4. Screw fixation and pull out suture for coronoid fracture 5. Radial head excision and open reduction with cement spacer for elbow dislocation.

Stage 2 operation was done 10 days later, the operation procedure including: 1. Bilateral radial head replacement, bone graft (auto + allo graft for left distal humeral fracture) 2. Open reduction for right elbow dislocation combined with repair for right medial and lateral collateral ligaments.

### Discussion

At postoperative 10 months, fracture healing was seen in bilateral elbow joints. The patients reported no severe pain in bilateral elbow joint, had a flexion-extension arc of the left elbow ranged from 20° to 120°, 75° pronation and 75° supination in the left forearm rotation (160° in total), 10°-130° for the flexion-extension arc of the right elbow, and 80° pronation and 70° supination for the right forearm rotation

### Conclusions

The few available data suggest that bilateral elbow injury involving a terrible triad occurs mainly in male young patient as a result of a high energy trauma. Bilateral radial head fracture with unilateral terrible triad injury is unprecedented. Well adapted surgical indication followed by optimal rehabilitation program are the two keys to obtain good results.

## Anterior Interosseous Nerve Palsy After Plate Fixation of Olecranon Fracture. A Case Report 骨板固定鷹嘴突骨折導致骨間前神經麻痺。病例報告

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### Introduction

Olecranon fractures are intra-articular fractures treated with either by tension-band wire technique or plating fixation. Although the surgical approach was relatively simple but there were complications of neurovascular damage including ulnar artery, ulnar nerve, or anterior interosseous nerve (AIN). The AIN was a branch of median nerve which innervated radial half of flexor digitorum profundus (FDP) and flexor pollicis longus (FPL). It arises from antecubital fossa and pass through the surface of FDP. Hard ware penetrated through the volar cortex of proximal ulnar shaft will put AIN in danger. We described a case with AIN temporal palsy after plating fixation for olecranon comminuted fracture.

### Materials and Methods

A 28-year-old female patient encountered a traffic accident and revealed left elbow swelling with normal sensation and motion of left fingers. Plain film confirmed the diagnosis of left olecranon fracture, OTA 2U1B. She was treated with open reduction and internal fixation with Synthes VA-LCP olecranon plates in concern of multi-fragmentary articular side fracture. During the surgery, crossed bicortical Kirschner-wires were placed for temporary fixation. Compression screws over the ulnar shaft were inserted for plate sliding and fracture site approximation. Malposition of plate over the shaft area was noted during fluoroscopy checkup. We manually adjust the plate and reapply the compression screws. However, too deeply penetrated drill bit over the volar cortex of proximal ulnar shaft was sensed during screw adjustment. It was immediately drew back without soft tissue pulled out. The surgery was completed with anatomical reduction and stable fixation. Back to ward, the patient complaint about difficulty flexing her thumb and index finger, prohibiting her to making an OK sign.

### Results

The patient reported no other weakness nor sensory symptoms. Tendon ruptures were ruled out by Squeeze test. AIN injury was suspected due to the classical symptoms and signs. The proximal ulnar shaft locking screws were not too long in postoperative images. The speculated trauma mechanism might be due to deeply penetrated drill bit from the volar cortex. NCV/EMG studies proved AIN injury at one month later after surgery. Fortunately, the patient regained her thumb and index finger muscle power after conservative treatment. At 3 months follow up, the patient could perform an OK sign easily.

### Discussion

The AIN was close to the proximal ulnar shaft. It could be injured by a blinded advanced, sharp angled and deeply penetrated K-wire. In this case, the drill bit penetrated due to second drilling attempt may be the reason of AIN injury. Traumatic AIN injury may require immediate exploration and repair, in this case, observation was enough because the injury could be transient.

### Conclusions

AIN injury was a devastating complication during olecranon fracture surgery. An orthopedic surgeon should aware of the local anatomy and pay attention to the K-wire or screws close to the proximal ulnar shaft.



## Elbow Open Dislocation with Ipsilateral Radio-Ulnar Open Fracture and Bilateral Distal Radius Fracture - Case Report

開放性肘關節脫位合併同側橈尺骨骨幹開放性骨折及遠端橈骨骨折內固定治療之案例分析

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### Introduction

Elbow dislocation associated with both ipsilateral radial and ulnar shaft fractures is a rare pattern of injury. There was only few case report published. We presented a case of posterior elbow open dislocation with ipsilateral both radius and ulnar shaft open fracture, bilateral distal radius fracture and left proximal hip fracture in a 49-year-old male.

Ulnar shaft and distal radius ORIF with locking plate and screws. Elbow dislocation was first reduced and bi-column elbow joint fixation with 3 provisional trans-articular intramedullary K pin. Elbow arthroscopic debridement to release elbow joint contracture is successful restore his elbow function including supination and pronation and ROM up to 80 degree 2 months after removing 3 temporary K pin fixation without repair his MCL and ULCL.

### Materials and Methods

This 49-year-old male presented to our emergency department due to falling from height. Image studies showed left elbow dislocation with open fracture of ipsilateral radio-ulnar shaft, bilateral distal radius and left proximal hip fracture. Left forearm is severely deformed with MCL and ULCL of elbow joint completely rupture, but there was no distal neurovascular deficit. Emergent ORIF with intramedullary nail for left proximal femoral fracture was performed immediately, followed by reduction of elbow dislocation and fixation with 3 provisional trans-articular intramedullary K pin to achieve elbow joint bi-column stability in 90 degree flexion.

Bilateral distal radius fracture and ulnar shaft comminuted fracture were stabilized with locking plate and screws in next 2 weeks until soft tissue condition improved. Long arm splinting was applied for 8 weeks until radius shaft fracture union and elbow MCL and ULCL healed spontaneously. Elbow arthroscopic release contracture was performed to restore left joint range of motion after 4 months of trauma.

### Results

At 6 months follow-up, patient has regained almost 80% elbow joint function. All the fractures had healed well. He has resumed his occupation as a laborer.

### Discussion

Elbow dislocation concomitant with ipsilateral radio-ulnar shaft open fractures and distal radius fracture is very rare and no such report in literature. External skeletal fixation(ESF) has been mainly used to treat teose kinds of contaminated open fractures. However, it is difficult to apply ESF in this case due to limited space for ESF device. Limited ROM of elbow was noted after immobilization for 8 weeks, but function of left elbow joint had dramatically improved after Arthroscopic debridement.

### Conclusions

Three provisional trans-articular intramedullary K pin to achieve bi-column fixation in 90 degree flexion may have a role in treatment for acute elbow dislocation in difficult cases.

## Endoscopic Surgical Technique for Treating Sacral Radiculopathy Secondary to S1 Nerve Compression After Sacroplasty of S1-A Case Report

內視鏡手術治療因薦椎椎體成形術後繼發 S1 神經根壓迫的神經根病變一案例報告

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### Introduction

Percutaneous sacroplasty is an image guided procedure that is safe and potentially effective for treating the pain and disability related to these fractures. Several cohort studies reviewed here report successful outcomes using this procedure, with patients experiencing nearly full pain relief immediately and longitudinally.

### Case report

A 84-year-old female underwent Percutaneous sacroplasty of S1 due to compression fracture. The patient complained of left S1 radicular pain and was found to have trace plantar flexion weakness on ex-amination. A computed tomography scan was performed and indicated that narrowing of both L5/S1 neuroforamen and left side was likely compressing the S1 nerve by leaked cement. Magnetic Resonance Imaging was also compatible of the left side S1 root compression. The patient underwent an endoscopic procedure that included a 1) laminectomy, and 2) removal of a cement fragment that was pressing on the S1 nerve. The patient's radicular symptoms improved immediately, and she remained asymptomatic at the 3-month follow-up.

### Discussion

One interesting feature of the literature on endoscopic spinesurgery is how it is used as a rescue procedure for complications associated with minimally invasive spine (MIS) procedures: kyphoplasty, MIS surgery-transforaminal lumbar interbody fusion, and lateral fusion. If the surgery were performed with a smaller endoscope and beveled tubular retractor, the beveled edge of the tubular retractor could have been used to retract the S1 nerve safely. The larger endoscope used here made it possible to use a larger drill and made drilling out the fusion bone more expeditious. There are several drawbacks to consider before embracing endoscopic surgery as the salvage procedure for complications secondary to instrumented spine surgeries. First, there is a learning curve to endoscopic spine surgery. Today, it is uncommon for spine surgeons to be trained in residency or fellowship in endoscopic spine surgery techniques.

### Conclusions

Minimally invasive endoscopic spine surgery offers many benefits that are attractive to patients: shorter recovery times, small incisions, and less pain. The authors present this technical note for others to consider as a possible minimally invasive solution for the treatment of a radiculopathy caused by a cement fragment.

## Can Prophylactic Vertebroplasty Reduce the Risk of Adjacent Compression Fractures: The Experience in TSGH

探討預防性脊椎成型術於鄰近節之成效：三軍總醫院之五年成效分析

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### Introduction

Adjacent vertebral fractures are common condition in osteoporotic vertebral compression fractures, which can theoretically be prevented with prophylactic vertebroplasty. The efficacy of prophylactic vertebroplasty into adjacent vertebral body of fractured vertebra in order to prevent new fractures are investigated.

### Materials and Methods

Materials and methods: Between 2012 to 2017, vertebroplasty was performed for osteoporotic compression fractures in 347 patients. The patients were divided into two groups: 169 patients with vertebroplasty for only fractured vertebrae; the other 178 patients received prophylactic cement injection immediately above and below the fractured vertebra in the same procedure. We evaluated the frequency of new vertebral fractures and the efficacy of prophylactic therapy.

### Results

In the non-prophylactic group, 31 of 169 patients (18.3%) developed new fractures within 3 months, and 41 of 169 patients (24.2%) developed new compression fractures within one year after first PV, particularly in the vertebra immediately superior to the treated one and occurred in the lower thoracic and upper lumbar spine. In the prophylactic group, 17 of 178 (9.6%) patients developed new compression fractures within 3 months and 24 of 178 (13.4%) patients developed new compression fractures within 1 year. Statistical analysis showed that fewer new fractures developed in the prophylactic group than in the non-prophylactic group at both 3 months ( $P = .0020$ ) and 1 year ( $P = .0079$ ).

### Discussion

As shown in the Results section, the prophylactic therapy on the adjacent vertebrae of fractured vertebrae significantly lowered the frequency of subsequent compression fractures in our patients. The incidence of upper adjacent fractures is higher than lower one; therefore, prophylactic therapy for these vertebrae may be unnecessary. However, prophylactic therapy for lower adjacent vertebra may be justified if the disc space immediately below the fractured vertebra is narrowed and the two vertebrae are closely related.

### Conclusions

Prophylactic cement injection into non-fractured vertebrae adjacent to fractured vertebrae may prevent new compression fractures after vertebroplasty for osteoporotic patients.

## Comparison of Clinical Outcome of Balloon Kyphoplasty and Confidence Spinal Cement System in the Treatment of Vertebral Compression Fractures

比較經皮氣球式椎體成形術與高黏稠度脊椎骨水泥在治療壓迫性骨折之成效

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### Introduction

In patients with osteoporotic vertebral compression fractures, both Confidence Spinal Cement System and balloon kyphoplasty led to a rapid and marked improvement in clinical signs. The aim of the current study is to evaluate two different procedures used for percutaneous augmentation of vertebral compression fractures with respect to height restoration: balloon kyphoplasty and Confidence Spinal Cement System

### Materials and Methods

44 patients were involved to the study to receive Confidence Spinal Cement System (n =23) or balloon kyphoplasty (n = 21). Preoperative, postoperative and three-month-follow-up radiographs including anterior vertebral height recovery and correction degree of kyphotic Cobb angle were calculated, on which pain visual analogue scale (VAS) of the patients were evaluated. Complications containing cement leakage was recorded.

### Results

Postoperative VAS of the patients in both groups were lower than those before operation. The anterior vertebral height and kyphosis can be restored after operation and maintained at three-month follow-up in both groups. Confidence Spinal Cement System was more effective in three-month-follow-up anterior vertebral height maintenance than balloon kyphoplasty. There were no difference in postoperative anterior vertebral body height restoration, kyphotic Cobb angle correction and three-month-follow-up kyphotic Cobb angle correction between two groups. The incidence of cement leakage in the balloon kyphoplasty group was higher than that of Confidence Spinal Cement System group.

### Discussion

Even the benefits of Confidence Spinal Cement System were fully discussed in articles published in recent years. Complications were less mentioned and compared with vertebroplasty and balloon kyphoplasty. Further studies evaluated the complications and surgical side effects should be conducted.

### Conclusions

Compared with balloon kyphoplasty, Confidence Spinal Cement System can effectively maintain the anterior vertebral body height at three month follow up. It is recommended for routine clinical use.

## Brown-Séquard Syndrome After Transarterial Embolization of Vertebral Metastatic Lesion : A Case Report

脊椎轉移性骨癌在動脈栓塞術治療後導致的脊髓半切綜合徵：病例報告

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### Introduction

Brown Se'quard syndrome(BSS) is a rare incomplete spinal cord injury showing a hemisection of the spinal cord which results in weakness and paralysis on one side of the damage and loss of pain and temperature sensations on the opposite side. BSS may be caused by injury to the spinal cord resulting from a tumor compression, trauma, ischemia, infectious or inflammatory diseases. We encountered a end stage lung cancer with T5 vertebral metastatic patient, who suffered from Brown-Séquard syndrome caused by transarterial embolization(TAE) treatment. To our knowledge, no report showing complications with BSS in vertebral body TAE has been published.

### Materials and Methods

This 52-year-old male was diagnosed of large cell neuroendocrine carcinoma of lung with brain metastasis. He suffered from back pain with bilateral calf numbness for half year. T5 spine metastasis with instability and continuous of neurological symptom was diagnosed after series image study and clinical examination. Palliative surgery with TAE company with *posterior lumbar decompression* and *fusion* was suggest for this patient. Five hours later of the TAE procedure. Right leg muscle power decreased with *hemibody numbness* on right side just below the level of nipple. Left side paraesthesia noted who cannot distinguish between cold or hot water bag. Brown Se'quard syndrome(BSS) was confirmed after neurological examination and neurologist consultation. Medication intervention immediately with steroid, aspirin and IV fluid challenge. *Posterior lumbar decompression* and *fusion arranged in the same day of Brown Se'quard syndrome diagnosis*.

### Results

After series treatment, the muscle power of right leg regained from 1 to 3, the numbness and paraesthesia was also subsided after days of rehabilitation and medication. The patient could walk without the support of walker with muscle power 4 post op 2 months. But there were still some numbness and paraesthesia of lower limbs. The right foot Babinski sign still positive. The potential for significant recovery is strong in this patient.

### Discussion&Conclusions

No complications as BSS in vertebral body TAE in the literature review. Knowing of radiculomedullary arteries, size of embolization materials, usage of microcatheters or micro guidewires may play a role for avoiding nontarget embolization. 90 percents of patients with BSS will regain the functional walking ability without assisted devices after rehabilitation. More than half of BSS patients recover well in the review article.

**Correlation Between Radiologic Study and Symptom of Lumbar Foraminal Stenosis****腰椎椎間孔狹窄之病人影像學與手術預後之關聯性**

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**Introduction**

Lumbar foraminal stenosis is an important etiology in patients with radicular symptoms with incidence is about 10%. MRI is considered an appropriate diagnostic tool for foraminal stenosis. However, the criteria of image used for the diagnosis has remarkable variability and correlation with symptoms is unknown. Therefore, we want to understand the correlation between MRI measurements and clinical symptom.

**Materials and Methods**

All patients with the diagnosis of foraminal stenosis since 2017 were screened. We included patient with single level transforaminal interbody fusion (TLIF) in VGHTC. Exclusion criteria included central stenosis spinal instability, revision surgery, infection and tumor. Radiology measurement including superior diameter, inferior diameter, disc height, foraminal height, superior articular process height, estimated superior area, estimated inferior area. The pre-operative functional score including VAS, ODI and EQ5D were documented.

**Results**

A total of 40 patients with the diagnosis of lumbar foraminal stenosis met the inclusion criteria and were included for analysis. Among the MRI parameter, inferior parameter and estimated superior area were associated with poor pre-operative ODI.

**Discussion**

Previous study conducted by Hasegawa et al think that foraminal high and disc high is critical parameter in diagnosis of foraminal stenosis(<15mm and <4mm respectively). However in our study, these were not related to clinical severity. However, inferior diameter and estimated superior area were significant correlation to ODI.

**Conclusions**

Among the MRI parameter, inferior diameter and estimated superior area were significant correlation to ODI in patient of lumbar foraminal stenosis. However due to small case number of the study, larger patient group should be included.

**Successful Vertebroplasty in a Patient with Coexistence of Compression Fracture and Spinal Epidural Hematoma: A Case Report****以脊椎成形術治療病患合併脊椎壓迫性骨折合併脊椎腔內硬膜上血腫：病例報告**張耀元<sup>1</sup> 蘇盈豪<sup>2</sup>國立台灣大學醫學院附設醫院骨科部<sup>1</sup> 國立台灣大學附設醫院新竹分院骨科部<sup>2</sup>**Introduction**

Traumatic spinal epidural hematoma (SEH) is a rare but serious cause of acute neurologic compression. According to previous study, the incidence is between 0.5% to 1.7% of all spinal injuries. Generally, surgical decompression is advised to prevent neurologic deficit. However, if the patient does not have any neurological symptoms at present. There is no consensus on treatment.

Vertebral compression fractures are the most common type of osteoporotic fracture. Most elderly patients are causes of low energy trauma. Conservative treatment or vertebroplasty in nonunion patients is recommended.

**Materials and Methods**

We reported an 82-year-old woman who suffers from back pain for one month. She was diagnosed with traumatic spinal epidural hematoma and vertebral compression fracture radiologically. The medical chart was reviewed. We also searched and reviewed the literature about traumatic SEH and vertebral compression fracture on PubMed.

**Results**

An 82-year-old woman presented to our orthopedic outpatient clinic with back pain for one month after a fall. Intermittent claudication was also complained. Physical examination revealed back pain without numbness and nor weakness over bilateral lower extremities. Muscle power was full. The plain films revealed L2 vertebral compression fracture. L2 anterior vertebral body height loss was 32% and kyphotic angle was 14 degrees. The MRI showed compression fracture at L2 with suspicious epidural hematoma at T11-L2 levels. The size of epidural hematoma was 78\*8mm. The image characteristics were confirmed with epidural hematoma. Therefore, the patient received vertebroplasty and recovered gradually. Post-operative plain films revealed L2 anterior vertebral body height loss was decreased to 12% and kyphotic angle was 8 degrees. Follow-up MRI revealed epidural hematoma was completely resolved.

**Discussion**

The mechanism of traumatic spinal epidural hematoma is not fully understood. Disruption of the tectorial membrane or spinal epidural vessel rupture is the possible etiology. In our hypothesis, mechanical instability may be one of the causes. Previous studies also pointed out intact posterior longitudinal ligament and no osseous disruption would delay hematoma formation. Our patient had coexistence of Traumatic SEH and vertebral compression fracture. However, no obvious neurological symptoms were noted except for back pain. MRI also revealed no spinal cord compression. To prevent progressive hematoma formation and resolved back pain, increased stability could be achieved by percutaneous vertebroplasty. Follow-up image study also revealed hematoma was gradually absorbed.

**Conclusions**

We reported a case of the coexistence of compression fracture and spinal epidural hematoma. In addition, the vertebroplasty was successful without complication.

## Risk Factors of Developing Shoulder Imbalance in Adolescent Idiopathic Scoliosis Patients Receiving Posterior Spinal Fusion

青少年原發性脊椎側彎(AIS)矯正術後產生肩膀不平衡之危險因子

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### Introduction

Shoulder balance plays a vital role in correction surgery for adolescent idiopathic scoliosis (AIS). Even with detailed preoperative evaluation of the patient, shoulder imbalance may occur. However, there is a scarcity of sufficient evidence comparing the various factors in current literatures and there is also a lack of linear prediction models. This study examines the correlation between the individual vertebral tilt and shoulder balance, specifically aims to identify parameters that may serve as an intraoperative proxy in surgical correction of AIS.

### Materials and Methods

AIS patients with (1) single posterior spinal correction and fusion (2) all pedicle screws instrumentation with derotation in two tertiary medical centers from 2015 to 2018 were recruited for analysis. We excluded patients who underwent correction over lumbar segments only (Lenke classification type 5) and patients with scoliosis other than AIS, such as neuromuscular scoliosis and congenital scoliosis. All patients had a minimum follow-up of 2 years with a complete set of standing anteroposterior radiographs for whole spine. Both inner and outer shoulder balance parameters were included for detailed analysis, including clavicular angle (CA), coracoid height difference (CHD), clavicular tilt angle difference (CTAD), clavicle-rib cage intersection difference (CRID), and 1st rib tilt. Individual vertebral tilt from C5 to T4, as well as the upper instrumented vertebra(UIV) tilt on coronal plane were also recorded for further analysis.

### Results

A total of 107 patients of AIS were recruited in the final analysis. The mean follow-up length was 2.5 years. Mean preoperative Cobb angle for main thoracic curve was  $52.6 \pm 9.8$  (range 36.6-91.5), and the post-operative Cobb angle was  $20.6 \pm 6.9$  degrees. (range 7.2-39.2). In Pearson correlation analysis, C7 tilt demonstrates significantly moderate to high correlation with both inner and outer shoulder balance parameters (coefficient [0.36-0.72],  $p < 0.05$ ). In subgroup analysis, post-operative C7 tilt on coronal plane was identified as an independent risk factor for developing shoulder imbalance (Odds ratio=1.19, 95% CI = [1.066, 1.329],  $p = 0.0019$ ) in multivariate logistic regression model. In addition, quantification for change of shoulder balance is established as follows:  $\Delta CA = 0.21 * [(\Delta C7 \text{ tilt} + \Delta T1 \text{ tilt})/2]$  (standard error =0.04,  $p < 0.001$ ).

### Discussion

Prediction of postoperative shoulder imbalance in AIS patient exists a considerable heterogeneity in previous literatures. Our findings demonstrate consistency in C7 tilt and its correlation to shoulder balance parameters. We infer that as thoracic vertebra tilt is more likely to be influenced by the instrumentation and thoracic cage, the C7 tilt may have a tendency toward similar inclination with shoulder balance parameters.

### Conclusions

C7 tilt on coronal plane is highly correlated to shoulder balance parameters in AIS surgical correction. There is higher risk of shoulder imbalance if increased C7 tilt is noted. More meticulous strategy to improve shoulder balance is warranting, and quantification of shoulder balance change by individual vertebral tilt may be adopted in the surgical correction of AIS.



## Suction Aspiration and Drainage for Extensive (C1-L2) Spinal Epidural Abscess: A Case Report

長節(C1-L2)脊髓硬膜外膿腫之抽吸引流治療：病例報告

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### Introduction

Incidence of spinal epidural abscess is 5-10 per 10,000 hospital admissions. We reported a case with extensive (C1-L2) spinal epidural abscess treated with suction aspiration and drainage through the limited surgical wound for cervical laminoplasty.

### Case Presentation

A 74-year-old male patient with multiple myeloma, ISS stage II which was diagnosed in March 2020 received posterior decompression and instrumentation for L4 pathological compression fracture and adjuvant chemotherapy in March 2020. He had smooth recovery after the surgery and was totally independent in ADLs.

In November 2020, he presented to NTUH emergency department with a history of progressive lower neck and back pain for about one week. Sudden onset bilateral lower extremity weakness developed in the afternoon and left upper extremity weakness accompanied few hours later. Muscle power of right upper and right lower extremities were grade 4; left upper and left lower extremities were 2 and were decreasing gradually. Laboratory data showed leukocytosis and elevated CRP level.

MRI revealed suspected epidural abscess along the craniovertebral junction to L1-2 level. A cervical wound was made and much frank pus was noted. Suction aspiration and drainage were performed via the limited cervical wound and C3 to C6 open door laminoplasty was conducted. Muscle power of extremities improved significantly after the surgery except for left lower extremity (grade 2-3). Pus culture yielded *Klebsiella pneumoniae*. Meantime, urine culture yielded the same pathogen. Antibiotic was administered accordingly.

The patient was transferred to rehabilitation ward afterwards. Muscle power was improving and left lower extremity advanced to grade 3 with limited dorsiflexion. He was able to stand up with the aid of a walker and started ambulation training with parallel bars at the last follow-up.

### Discussion

Common risk factors of spinal epidural abscess include intravenous drug use, diabetes, active malignancy, immunocompromised status, and previous spinal surgery. Only 50%-70% of cases could identify the pathogen. *Staphylococcus aureus* accounts 50%-60% and gram negative bacteria 10-20%. Hematogenous spread accounts for about a half cases and another common route of infection is direct spread from discitis. In our case, urinary tract infection might be the source. Sites of the abscess are ventral 36%, dorsal 41% and circumferential 23%. According to the previous study, mean involved segment number is 3.7 and about 20% of cases more than 5 levels.

The keystone of treatment of spinal epidural abscess is surgical evacuation of the abscess. Some cases had been shown successful treatment by percutaneous suction aspiration and drainage under real-time fluoroscopic guidance as an alternative to open surgery. In addition to debridement, parenteral antibiotic therapy is also crucial.

### Conclusions

In addition to improvement in neurological function, postoperative MRI was performed and confirmed resolution of the abscess and compression to the spinal cord. It is therefore a viable method in dealing with such extensive spinal epidural abscess.

**Oblique Lumbar Interbody Fusion as a Salvage Surgery of Adjacent Segment Disease****以斜側前脊椎融合術做為腰椎鄰近節病變的補救手術**王登冠<sup>1</sup> 許哲嘉<sup>2</sup>秀傳紀念醫院骨科部<sup>1</sup> 國立成功大學附設醫院骨科部<sup>2</sup>**Introduction**

Spinal fusion has increasingly been used in the treatment of lumbar disorders. However, spinal fusion increases mechanical stress and segmental motion at adjacent segments, putting the patients at risk for developing adjacent segment disease (ASD). ASD is one of the most common complications of lumbar spine fusion, which has been reported that it was observed in 36–84% of patients at the 5-year follow-up after lumbar fusion. Conventional revision surgeries for ASD have been performed posteriorly, which sometimes presents challenges because of the adhesions in the adjacent soft tissue. This approach is associated with a greater risk of dural tear and extensive surgical trauma to the paraspinal muscle. Oblique lumbar interbody fusion (OLIF) involves accessing the disc space via an anterior approach between the aorta and psoas muscle, which was reported to have minimal blood loss, short operation time, and excellent functional rehabilitation. To our knowledge, clinical outcomes of OLIF for the treatment of ASD have not been widely studied. Thus, we report three cases with symptomatic ASD after posterior fixation, which were salvaged by OLIF surgery.

**Materials and Methods**

A total of 3 cases undergoing OLIF for the treatment of symptomatic ASD after lumbar fusion were included in this retrospective case series study conducted in a 3-year period with a minimum follow-up of 1 year.

**Results**

A preliminary series of 3 patients with an average age of 63.7 years (range, 53-79 years) who underwent OLIF at the level adjacent to their fusion lumbar fusions is presented. The average operative time is 69.3 min and the average blood loss is 133.3 ml. The average hospital stay was 6.6 days. No patients had intraoperative complications such as dural tear was noted. The average VAS back pain score decreased from 7.6 preoperatively to 3.3 postoperatively and 1.6 at last follow-up.

**Discussion**

Regardless, with the increasing prevalence of spinal fusion surgeries, the incidence of ASD is undeniably increasing. Accordingly, the demand for salvage surgery for ASD has been expanding. Due to previous surgery, insufficient normal structure and severe tissue adhesion in the posterior approach are the frequent problems. The process of traversing the spinal canal, which may have formed adhesions to surrounding tissues, is an especially difficult phase. The incidences of neurological complications and dural tearing are not influenced by empirical considerations, but rather are common intraoperative complications experienced by both senior surgeons as well as trainees. Therefore, we should all strive to avoid surgical manipulation of this area to the greatest extent possible. Against this background, we recently successfully managed three cases of ASD using OLIF surgery, which leads us to the firm belief that OLIF surgery can be useful as a salvage procedure for ASD.

**Conclusions**

OLIF is a useful minimally invasive surgical technique to treat several ASD.

**Recurrent Herniated Lumbar Sacral Disc Treated with Uniportal Spinal Endoscopic Discectomy****使用微創脊椎內視鏡手術治療復發性椎間盤突出**

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**Introduction**

Reoperation in spine field is always complicate and difficult problem due to different anatomy and unknown adhesion, especially when the surgeon is different from the first operation. Therefore, we use uniportal spinal endoscopy to attack the recurrent herniated disc via different operation tract to avoid possible complications.

**Materials and Methods**

This is a 40-year-old woman, who received microscopic discectomy, L5/S1 three years ago. However, the patient suffered from severe low back pain with right lower limb radiation, accompanied by claudication. MR revealed a recurrent herniated lumbar sacral disc at right lateral recess, induced severe spinal stenosis. To avoid possible complications and adhesion, we performed discectomy by percutaneous uniportal spinal endoscopy through different tract from the previous surgery.

**Results**

During the surgery, we removed the herniated disc successfully with the technique of spinal endoscopy, even some adhesion above the dura of spinal cord still encountered. After percutaneous uniportal spinal endoscopic discectomy, the pain improved greatly immediately post operation. The patient could walk without claudication, and she was discharged at the post operation day 1.

**Discussion**

After the index surgery, the original anatomy will be changed more or less associated with some kind of adhesion. All these reasons make the following operation more difficult and complicated. Under this circumstances, we have to choose the relatively suitable approach to achieve the smoother and safer procedure. Therefore, we used percutaneous uniportal spinal endoscopy to perform discectomy, and the patient had very good satisfaction.

**Conclusions**

When we face the problems of recurrent herniated disc or spinal stenosis, we can treat with different approaches, such as laser, radiofrequency, open approach, microscopy, and percutaneous uniportal/ biportal spinal endoscopy. The surgeon has to use the most familiar and suitable procedure to get the promising outcome.

**Staged Pedicle Subtraction Osteotomy for Symptomatic Cervical Kyphotic Deformity in Ankylosing Spondylitis****階段性經椎弓切骨矯正術在僵直性脊椎炎病人合併症狀性頸椎後凸變形**

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花蓮慈濟醫院骨科部

**Introduction**

Ankylosing spondylitis (AS) is an autoimmune disease, mainly involving whole spine, sacroiliac and hip joints. Chronic inflammation determines degeneration of the affected joints induces fusion and ankyloses. Severe AS with hyperkyphotic deformity is vulnerable to vertebral fracture and the following spinal cord injury. However, the frequently delayed diagnosis of cervical fracture may bring more risk on permanent neurologic deficit and the progression of the deformity.

**Material**

There were 4 cases of patients with underlying AS suffered from progression of cervical Kyphotic Deformity result from either traffic accident or minor trauma. Persistent neck pain, progressive dysphagia, and neurologic deficit occurred under conservative treatment indicate surgical management in most of the cases. They all received the strategy of staged surgery started with closed reduction and alignment protection of the cervical curvature with Halo Vest fixation system. The cervical Kyphotic Deformity include cervical lordosis (CL), chin to brow vertical angle (CBVA), occiput-to-wall distance (OWD), C2–C7 sagittal vertical axis (C2–C7 SVA), C7 slope (C7S), and neck tilt were assessed. The advanced radiological investigations such as computed tomography and magnetic resonance imaging were also performed for preoperative and postoperative evaluations.

**Results**

In the first staged surgery, near 40 % of the correction in our cases resulted from the reduction of the post-traumatic lordosis loss. The pedicle subtraction osteotomy (PSO) over the appropriate level may gain the other 60% of the correction. So far, no surgery-related complications occurred in the midterm follow-up and most of the patients mentioned the improvement of neck pain, dysphagia, and myelopathy.

**Discussion**

AS commonly affects the axial skeleton, less leading to cervical deformity than thoracic deformity but devastating. This deformity is functionally and psychologically disabling. Therefore, surgical intervention should be adopted to correct deformity, to help the patient walk erect, and to improve balance and gait efficiency.

**Conclusion**

The strategy of staged PSO was secure and effective for the management of underlying Ankylosing spondylitis with progressive cervical kyphotic deformity

**Unusual Fracture Pattern of Axis: A Case Report****少見的頸椎第二節骨折型態分享**

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**Introduction**

An 18-year-old female amateurish cheerleader was referred for reports of persistent neck pain after falling down 2 days ago. Physical examination revealed no sensory deficiency and muscle weakness but displayed a positive Spurling test and Lhermitte's sign. X-ray and CT demonstrated axis vertebral body fracture and right pars interarticularis fracture with atlantoaxial subluxation.

**Materials and Methods**

The patient underwent a posterior cervical procedure for C1-C2 stabilization. Placement of C-2 laminar screws with C-1 and C-3 lateral mass screws(LMS) were performed. Intraoperative neuromonitoring (IONM) with somatosensory evoked potential (SSEP) and motor evoked potential (MEP) was used. The operative time was 5 hours, 40 minutes. The patient used neck collar for 3 months after the operation.

**Results**

There was no neurological worsening nor vertebral artery injury in this case. The patient had no neurologic deficit postoperatively but only pain and the symptoms were gradually improved. The range of motion of the neck was slightly limited. The bone is healing well and the instrumentation was removed after 11 months. The alignment of the bone remains well after the removal of implant.

**Discussion**

We evaluated the fracture pattern of our patients through complete radiograph. The surgery was done based on the patient's anatomy pattern. The laminar screws were used in our cases and this technique is advantageous in that it lessens the risk of vertebral artery injury while providing a biomechanically stable means of fixation

**Conclusions**

The choice of the suitable fixation technique should be determined by the local anatomy or fracture pattern. Odontoid fractures combined with Hangman fractures may result in the co-existence of C1-C3 instability. The principle for the surgery is that axis fracture type should be considered and the adjacent unstable segments should be fixed to restore the stability between C1-3. Placement of laminar screws into the axis may allow a safe and effective means for cervical stabilization. Last but not least, removal of implant should be considered in the young patient.

## Treatment of Cervical Spine Fracture-Dislocation and Lumbar Spine Burst Fracture Without Neurologic Deficits: A Case Report

### 治療無神經學缺陷之頸椎骨折併脫白及腰部爆裂性骨折之個案報告

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#### Introduction

The subaxial spine is a common site of cervical injury, with more than 50% located between the C5 and C7 region., which may range from minor ligament injury to complete fracture-dislocations resulting in severe spinal cord injury. The optimal treatment strategy of subaxial cervical spine fracture dislocation is still under debate. Conservative treatment as Halo vest protection was reserved only for unilateral reduced facet fractures without radiographic instability. Due to instability associated with dislocations, operation was required in most cases to achieve reduction and stabilization via the anterior, posterior, or double route. Posterior reduction and instrumentation offers better fixation and easier reduction, which was more suitable for osteoporotic cases but had risks of spinal cord, nerve root, and vertebral artery injury. Here we reported a case of subaxial cervical spine fracture-dislocation combined with lumbar spine burst fracture without neurologic deficits treated by anterior cervical discectomy and fusion with plate fixation and posterior instrumentation for burst fracture.

#### Materials and Methods

A 56 years-old male suffered from acute low back and neck pain noted after falling down from 6 meters height. Physical examination showed left arm to forearm radiation pain, numbness with intact muscle power and anal tone. Radiography revealed C6-7 facet fracture-dislocation(Unilateral) with disc herniation, distraction flexion type, Allen and Ferguson stage 2 and L3 burst fracture with PLC injury. Gardner-wells tongs traction was applied gradually but reduction was failed at ward. Operation of anterior cervical discectomy and fusion with plate fixation and posterior instrumentation for burst fracture was performed.

#### Results

Postoperative wound healed well and no neurological deficit noted. Follow up radiography revealed good segmental stability and alignment. Pain relief and functional recovery were noted with satisfaction.

#### Discussion

Woodworth RS et al. had reported that anterior cervical discectomy fusion provided excellent stability and fusion rates with the use of grafts and plating was high in patients with subaxial cervical spine injury. It provided direct anterior decompression, ability to remove ventral compressive structures with less blood loss, minimal surgical trauma, and lower infection rate, but may be contraindicated in case with posterior lesions compromising the spinal cord or roots. We suggested taking priority over anterior approach in cervical spine fracture-dislocation patients with disc herniation when reduction intraoperatively was achievable. Posterior approach may be considered if failed reduction without disc herniation. In more complex fracture-dislocations as high instability, disc herniation with reduction failure cases, a combined anterior and posterior approach is required.

#### Conclusion

Subaxial cervical spine fracture dislocation may be serious with risk of devastating consequences if not properly treated. Anterior cervical discectomy and fusion with plate fixation may be a valid alternative which provides good stability resulting in well symptoms relief and good functional recovery with less complication.

## Long Segment Spinal Fusion with Multi-Level Osteotomies for Severe Post-Traumatic Kyphotic Deformity in a Patient with Ankylosing Spondylitis

僵直性脊椎炎患者椎體骨折後不癒合併脊椎後凸之長節脊椎融合截骨手術

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### Introduction

Patients with ankylosing spondylitis are prone to experience vertebral fracture from minor trauma due to the brittle and osteoporotic nature of the vertebrae. In such cases, non-union and pseudoarthrosis eventually result in severe deformity. To correct severe sagittal imbalance and/or treat cases with neurological deficits, extensive surgery is often required for optimal results.

### Materials and Methods

We present a 37-year-old male patient with ankylosing spondylitis and a progressive kyphosis due to a T12 chance fracture with nonhealing. Nonhealing with severe focal kyphosis at T11-L1 level measured to be 35 degrees, and lumbar lordosis of -5 degree. We performed long segment posterior spinal fusion over T10-T12,L1-L2,L4-S2AI, laminectomy over T12-L1, L3-L5 with neurolysis, Smith-Peterson Osteotomy over T12-L1, L12, L45, and bilateral pedicle subtraction osteotomy at the L3 level.

### Results

Post-surgical radiography measures to be a T12-S1 lordosis of 40 degrees; compared to the presurgical T12-S1 kyphosis of 20 degrees resulting in an overall sagittal correction of 60 degrees. The patient was able to ambulate with long TLSO brace two days after the surgery, and there were no onset of neurological symptoms nor perioperative complications. The patient was discharged 11 days after the operation. At 2 months post operatively, there were no signs of implant failure nor further progression of deformity.

### Discussion

In correction of deformity in ankylosing spondylitis, surgical methods involving instrumentation fusion with or without osteotomies have been reviewed. Osteotomies including pedicle subtraction osteotomy (PSO), Smith-Peterson osteotomy (SPO), pedicle wedge osteotomy etc., can differ in terms of degrees of correction, and can vary in its technical demand. There are numerous comparative studies on post-operative radiography, peri-operative complications, implant survivalship in literature. Met with a large kyphotic deformity, we performed a combination of osteotomies in addition to instrumentation fusion, with SPO on three vertebral levels, and PSO at one level. We were able to correct a severe kyphotic angle, provide adequate decompression while maintaining maximal stability for this young ankylosing spondylitis patient with fair results.

### Conclusions

Surgical correction of kyphosis in ankylosing spondylitis is challenging in that global stability of the spine should be critically regarded to prevent implant failure and associated pseudoarthrosis. Instrumentation fusion will often require concomitant osteotomies to correct extensive deformities, and long segment fusion performed to counteract the poor bone quality for maximal implant purchase in maintaining a balanced-corrected spine.

## Diagnosis and Management of Post-Traumatic Spinal Cystic Lesion with Delay Neurologic Deterioration: A Case Report

### 創傷後脊椎囊腫合併神經學退化的診斷與處理：案例報告

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#### Introduction

Adult spinal extradural arachnoid cyst (SEAC) a rare cause of myelopathy secondary to spinal cord compression. Diagnosis is made on imaging studies with varying degrees of specificity. We report a case presenting SEAC of probable traumatic origin leading to irreversible neurological deficits including paraparesis and fluctuating paresthesia.

#### Materials and Methods

A case of 68-year-old female without noticeable systemic or congenital disease. She had back trauma history with residual right drop foot after falling from 3-meter-height more than 30 years ago. Then, she encountered traffic accident with intermittent left leg claudication 7 years ago. Because the condition is tolerable, the patient did not seek medical examination and treatment. In recent two year, she sustained sudden onset of bilateral lower leg paraparesis (muscle power: 3-4) with spreading numbness to left buttock and lateral thigh and lower leg was also mentioned. However, the symptom fluctuated. In our facility, CT myelography scan and MRI showed huge longitudinal-directioned cyst in extradural region over T12-L3 with focal myelopathy over T12-L1. Interestingly, early scanning myelography successfully 'caught' dura defect (at right dorsal L1 level) before it becomes isodense to CSF. Therefore, we performed laminectomy at T11 to L1 followed by in-lay dura plasty and tissue-sealant covering.

#### Results

Pathology study confirmed spinal arachnoid cyst. After index surgery, clinical gradually improved. She can walk without assistant at 3 month follow up. Postoperative MRI evaluation performed at 3 month following the surgery revealed decreased size of arachnoid cyst at T11 to L3 level along with decompression of the flattened spinal cord

#### Discussion

The etiology and pathogenesis of SEAC have been discussed controversially in the available literature. Most SEAC are presented in adolescence or in early adult life. However, the dura defect may enlarged and root may entrapped due to trauma. Long-standing myelopathy is unlikely to show significant improvement, as observed in the current case report. Therefore, in delayed cases, surgery may be offered as an intervention with prophylactic purpose to prevent further neurological impairment.



## Bilateral Vertebral Pedicle Fragility Fracture in a Young Patient with Cushing Syndrome: A Case Report

脊椎椎弓脆弱性骨折於年輕庫欣氏症病人:個案報告

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### Introduction

Vertebral fracture is the most common fragility fracture. Fragility fracture over bilateral pedicle or unilateral pedicle and contralateral pars interarticularis were rare. We report a 46-years-old male with history of Cushing syndrome who sustained low back pain without trauma. Two months after low back pain, MR image of Lumbar spine revealed L4 bilateral pedicle fracture. This fracture pattern is difficult diagnosed on plain film. Thus, we describe three image hints of bilateral pedicle fracture to avoid miss diagnosis.

### Materials and Methods

This 46-year-old male has history of hypertension and Cushing syndrome. He received laparoscopic adrenalectomy one month ago. He sustained insidious low back pain for 2months. He denied trauma history or repeated hyperextension stress. Plain film revealed spondylolisthesis of L4-5, Meyerding grade I and an osteolytic lesion over L4 pedicle. MR image was arranged which revealed bilateral pedicle fracture with right posterior vertebral body crush fracture

### Results

Due to tolerable pain, he received conservative treatment first. He received Denosumab injection due to osteoporosis (Z score: -3.4). Besides, he used lumbar sacral orthosis(LSO) daily for protection. CT scan three month after symptom onset revealed callus formation and partial union of pedicle fracture side. He has no neurologic symptom and the pain didn't progress in the final follow up.

### Discussion

Pedicle fracture is the rare site of fragility fracture compared to osteoporotic compression fracture. Unlike common fragility compression fracture, bilateral pedicle fracture is difficult to diagnose on plain film. Sometimes, it only presents one near invisible radiolucent line in pedicle. We describe three plain film characteristics to avoid miss diagnosis of pedicles fracture. First of all, radiolucent line or osteolytic lesion over neural arch. Secondly, spondylolisthesis without pars fracture. The last one, decreased posterior vertebral body height.

### Conclusions

Bilateral pedicle fracture is difficult diagnosed on plain film. In patients with risk factor of osteoporosis with insidious back pain, pedicle fracture should be considered. Plain film should be carefully assessed to avoid miss diagnosis.

## Cervical Angina — A Case Report and Literature Review

### 頸性心絞痛— 病例報告及文獻回顧

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#### Introduction

The etiologies of chest pain are many, cervical angina is one source of non-cardiac chest pain. Cervical angina is atypical clinical symptom of cervical stenosis and degenerative disc disease which is difficultly diagnosed and easily neglected. Here, we present a rare case of the cervical stenosis with symptom of angina and neglected for 3 years.

#### Materials and Methods

A 54-year-old female complained of anterior left chest pain for 3 years, accompanied with neck pain and chest tightness. She has been visited several departments such as emergency, gastroenterology, cardiology, traditional Chinese medicine and finally orthopedics. EKG and cardiac catheterization showed no ischemic change. Radiographies of cervical spine revealed C3-C6 degeneration change with osteophyte formation. MRI revealed C3-C4 and C5-C6 disc herniation with spinal cord compression. After 6 months of conservative treatment, the symptom did not show improvement. Under impression of cervical angina, she underwent surgical intervention with total disc replacement on C5-C6 and anterior cervical discectomy and fusion (ACDF) for C3- C4.

#### Results

After 3 months of following up, radiography showed C3-C4 in the processing of fusion. Symptom of angina and neck pain has improved and she has no longer need analgesics but time to time still feel mild chest tightness. More extensive rehabilitation has begun, the patient is tolerance well with current condition.

#### Discussion

According to many studies, the pathogenesis of cervical angina is remaining uncertain. Cervical angina has been reported most commonly seen in patient with disc herniation at C5-6 and C6-7, and which can present in both radiculopathy and myelopathy. Some patient has experienced autonomic symptom (Nausea, vertigo, diaphoresis and dyspnea) or accompany with typical radicular pain in dermatome of cervical nerve region. But our patient only accompanies with neck pain, which make it even harder to diagnosed.

#### Conclusions

Cervical angina is difficult to make correct diagnosis, and we spine surgeon should keep in mind if other etiology has been rule out. Most patient with cervical angina can be treated with conservative treatment, such NSAID, muscle relaxant, cervical collars, head traction and physical therapy. If the symptom presenting or even worsening, surgical management is necessary. Our patient experienced great improvement of the symptom after C3-C4 ACDF and C5-6 total disc arthroplasty.

## **C2/3 Spondylodiscitis with Left Upper Limbs Radiculopathy Treated with Posterior Percutaneous Endoscopic Interlaminar Discectomy and Debridement**

第二至第三頸椎感染伴隨上肢神經根病變使用經皮內鏡椎板間入路椎間盤切除及清創術

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### **Introduction**

High-level cervical spinal infection is relatively rare. Percutaneous endoscopic cervical approaches to the C2/3 cervical spine are challenged by the presence of several structures, including the spinal cord, the vertebral arteries, and the C2 and C3 nerves.

Our goal of this case report is to present a rare case of a patient with C2/3 spondylodiscitis with neck pain and left upper limb radiculopathy, who was treated with posterior-percutaneous endoscopic interlaminar cervical discectomy and debridement.

### **Materials and Methods**

A 42-year-old man was transferred to our hospital because of severe neck pain radiating to the left upper limb for three months. On physical examination, the patient had decreased sensation in the left upper extremity and the left Spurling test was positive. He denied any history of trauma, falls, fever, chills, and urinary or gastrointestinal symptoms.

Laboratory examination revealed leukocytosis ( $18.89 \times 10^3/\text{uL}$ ) and elevated CRP level (1.23 mg/L). Magnetic Resonance Image (MRI) of the cervical spine indicated spondylodiscitis with abscess formation at the level of C1-C3.

Thirteen days after admission, posterior percutaneous endoscopic surgery was performed in the prone position. Under fluoroscopic guidance, a left-sided longitudinal 5-mm skin incision was created above the facet joint at the level of C2/3. Necrosis of the ligamentum flavum and the foraminal stenosis of the left C2/3 were noted. Pus consolidation was observed around the C2/3 intervertebral disc. After C2/3 debridement, laminotomy and discectomy, the wound was closed in layers.

### **Results**

The patient experienced progressive alleviation of the posterior neck pain and left upper extremity pain after the surgery, and no signs of cerebrospinal fluid leakage, infection, or other complications were experienced.

### **Conclusion**

High-level cervical spinal infection is relatively rare, and its clinical manifestations are complicated. We applied a minimally invasive approach to the C2/3 cervical spine and performed debridement and discectomy successfully.

## Ligamentum Flavum Ganglion Cyst with Lumbar Stenosis Treated by Fully Endoscopic Tumor Excision and Decompression—A Case Report and Literature Review

個案報告：脊椎內視鏡黃韌帶囊腫移除及椎管減壓手術

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### Introduction

Ligamentum flavum (LF) ganglion cyst is rare and could result in neurological symptoms of patients. Lumbar stenosis is common and also characterized with neurological claudication and radiculopathy. There are many different surgical approaches for treating these two pathologies, which include open, minimally invasive, and endoscopic procedures. Here we present a rare case of lumbar stenosis combined with epidural LF ganglion cyst underwent full endoscopic tumor excision and decompression surgery.

### Materials and Methods

A 76-year-old female patient presents with claudication and bilateral lower leg numbness in both lower limbs for months. Her lumbar sacral x-ray revealed L3/4, L4/5 disc degeneration and grade one spondylolisthesis. MRI showed a posterior epidural cyst adjacent to ligamentum flavum with central and lateral recess stenosis at L4/5. She had extensive conservative treatment for 6 months but unfortunately without significant

### Results

The patient underwent one-staged full endoscopic unilateral laminotomy bilateral decompression (ULBD) and tumor excision. There was no intraoperative durotomy and good dura sac pulsation and root continuity were seen after delicate decompression. One 1/8 hemovac drain was placed and soft brace was applied for one month. She was discharged on the third day after surgery. Final pathology report confirmed the diagnosis of “ganglion cyst”. The postoperative clinical outcomes improved significantly at 3 months.

### Discussion

LF cyst is considered as a category of juxtafacet cyst, historically it belongs to ganglion cyst. The pathogenesis of these cysts is not fully understood, but it has been proposed that continuous stress to this ligament due to minor repetitive trauma, such as in spondylolisthesis and degenerative disc disease, may lead to the development of cyst. Surgical decompression is the gold standard of treatment. Compared to traditional open surgery, endoscopic decompression preserves midline structures and facet stability. Other advantages include better visualization, less bleeding, quicker recovery and ability of taking the surgery under local anesthesia with conscious sedation.

### Conclusions

Lumbar stenosis combined with epidural LF ganglion cyst is rare in our clinical practice. Full endoscopic surgery is the least minimally invasive method currently and may be considered as a viable option for decompression and tumor excision.

**A Case Report: Post-Operative Recurrent Stenosis Without Soft Tissue Compression****案例報告：腰椎減壓手術術後-積液引起的硬腦膜上壓迫**陳俊橋<sup>1</sup> 陳政光<sup>2</sup> 釋高上<sup>3</sup> 侯勝茂<sup>4</sup>新光吳火獅紀念醫院骨科部<sup>1</sup>**Introduction**

We present a case of spinal epidural seroma following lumbar decompression surgery, which caused dura sac compression.

**Materials and Methods**

This 74 year-old male patient has surgical history of L4 – S1 spinal spondylolisthesis, s/p decompression and instrumentation 7 years ago. Upon presented to our clinic, he complained lower back pain with radiation to right thigh and claudication. NCV showed right side L4-5-S1 radiculopathy and suspected left L4-5 radiculopathy. MRI showed L3-4 adjacent stenosis. Therefore, decompression and intervertebral fusion with TLIF cage between L3-4 level was done. Bilateral facet joint injection was done on 2020/9/25, and bilateral L4-5 epidural injection was done on 10/2. According to the patient's statement, acute onset with rapid progression of right leg weakness was mentioned since 10/3. Symptom became troublesome with medication of oral steroid and methylcobal. Therefore, he was admitted for epidural injection on 2020/10/19. Epidural injection was done with 1.5ml of 0.15% ropivacaine and 8.5 c.c of 120mg triamcinolone. There was no CSF, no blood aspirated during the procedure. However, L spine MRI showed suspected air accumulation over the epidural space at L3-L4 level. Therefore, re-open surgery from L3-4 was performed.

**Results**

During operation, an incision was made over the midline of back from L3 to L4 level. The upper levels of the lumbar spine were exposed. The nerve roots were all explored bilateral. Some pink appearance fluid accumulation was noted above the dura. Post operative physical therapy was kept, his right thigh weakness while climbing improved gradually.

**Discussion**

With recurrent stenosis, a detailed history of all previous surgery that has been performed is essential. MRI study is one of the most sensitive method. Postoperative fluid collection in the operative bed may represent seroma, CSF collection, haematoma, or abscess and can cause symptoms by compression of the thecal sac or nerve roots should be considered. There is a case report of epidural gas pseudocyst was reported in journal of BMC musculoskel disorder in 2019. New postoperative neurologic deficits may be noted, and recovery depends on the degree of deficit and the time of decompression

**Conclusions**

Fluid or gas collection following spinal surgery causes spinal cord compression is uncommon. If patient complained neurologic symptoms after surgery, we should pay more attention.

## Spondylolisthesis of Lumbar Spine Caused by Metastatic Lesion with Suspected Primary Hepatocellular Carcinoma - A Case Report

遠端轉移腫瘤造成的腰椎病理性滑脫 – 病例個案報告

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### Introduction

Spondylolisthesis is a major cause of low back pain and it may progress to spinal stenosis and result in neurological symptoms, such as leg pain, numbness and weakness. It is considered to have two main etiologies, spondylolytic and degenerative. However, Spondylolisthesis may also be caused by either by focal process or systemic disease with critical implication for functional dependence and morbidity. Here we demonstrated a rare case of pathological spondylolisthesis.

### Case Presentation

A 65 years old male without significant underlying disease had complaint of 2 weeks of progressed low back pain with difficulty urination and perianal region numbness. Right leg claudication was also mentioned. Physical examination revealed saddle anesthesia and right lower extremity weakness and paresthesia. Cauda equine syndrome was impressed. MRI showed 2 bone-destructing mass over right side of upper sacrum and defects at bilateral pars interarticularis of L4 and L5. Spondylolisthesis of L4 on L5 and L5 on S1 were noted. Biochemistry tests showed elevated GPT, GOT, tumor marker of CA-125 and CA-199. Incisional tumor biopsy was performed and metastatic carcinoma was diagnosed with suspected primary hepatocellular carcinoma.

### Discussion

Newman et al reported described 5 etiological factors that are responsible for the lumbar vertebrae slipping. Pathological spondylolisthesis is a rare type which can be caused from abnormal mineralization and remodeling or a focal process, including tumor or infection. A damage to the posterior elements of the spine then gives rise to instability of adjacent vertebrae and spondylolisthesis.

### Conclusions

Low back pain encompasses a variety of diseases because of its insidious onset and varying pathophysiologies, posing a challenge on diagnosis and treatment for many experienced clinicians. Although spondylolisthesis is mostly regarded as a degenerative disease, we should integrate patient's history, clinical symptoms and adjunctive images to make the accurate diagnosis and guide the treatment.

## Use of iCT for Early Detection of Pulmonary Complications in Spine Surgery 使用術中電腦斷層提早偵測脊椎手術的肺部併發症

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### Introduction

In the recent years, intra-operative computed tomography (iCT) has developed for navigation of transpedicular screw placement. iCT is known to improve safety and accuracy of transpedicular screw fixation. Screw malposition can be replaced immediately. However, another common complication other than screw malposition are pulmonary complications such as pneumothorax. Development of life-threatening complications such as tension pneumothorax due to iatrogenic injury could potentially be detected immediately and managed promptly. The use of iCT for checking for pulmonary complications is currently not incorporated in routine practice is not the main purpose of iCT. Checking for pulmonary complications does not require additional costs and provides additional benefits of avoiding potentially devastating complications.

### Materials and Methods

Case report including operation findings, peri-operative imaging, lab data, intra-operative computed tomography.

### Results

A 19-year-old male patient with adolescent idiopathic scoliosis Lenke type VI is admitted due to progressive back pain and deformity for 3 years. The patient denied any previous known systemic illness or any history of surgery. Posterior correction operation of scoliosis with instrumentation and fusion with iCT navigation is performed. Shortness of breath, low grade fever and intermittent dry cough is noted after the operation. Lab studies were unremarkable and chest x-ray showed no obvious pneumothorax. However, the iCT imaging reveal massive lung blebs and lung atelectasis when adjusted to lung window. Thoracic surgeon was consulted for evaluation. The condition was managed conservatively, and the patient was discharged uneventfully.

### Discussion

iCT navigation was used for guidance of pedicle screw placement. However, visualization of the lung after pedicle screw placement is not routine in iCT navigation. Typically, the iCT imaging settings are set for visualization of pedicle screw position and any lung lesions are difficult to discern simultaneously.

In addition to direct puncture of the pleura cavity due to thoracic screw malposition, high degree of scoliosis correction may have its effect on the lungs. The patient had lung blebs visualized in pre-operative x-rays which pose a high risk for pneumothorax. Although no screw malposition was noted during the operation, high degree of scoliosis correction could indirectly cough pneumothorax or lung atelectasis, resulting in the patient's dyspnea.

Early detection of pulmonary complications allows early intervention and table consultation if necessary. In the case discussed, the patient was managed conservatively due lack of presence of life-threatening pneumothorax. However, critical conditions such as tension pneumothorax would require prompt identification and management.

### Conclusions

The use of iCT for checking for pulmonary complications is currently not incorporated in routine practice is not the main purpose of iCT. Checking for pulmonary complications does not require additional costs and provides additional benefits of avoiding potentially devastating complications.

## Dose the Laminae Distal to the PSO Level Undercut Matter for Pedicle Subtraction Osteotomy ? A Case Report

遠端椎弓切除不足會影響經椎弓切骨矯正術術後結果嗎？-病例報告

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### Introduction

Pedicle subtraction osteotomy (PSO) is a powerful technique for correcting a fixed sagittal imbalance. PSO involves the removal of the posterior elements and the use of a vertebral body wedge to shorten the spine posteriorly and achieve sagittal-plane correction. However, the outcomes are accompanied by relative common neurologic complications (3%~15%).

### Materials and Methods

The authors report the case of a 57-year-old woman with degenerative sagittal imbalance, who had undergone previous multiple surgeries for degenerative lumbar disease, including laminectomy and fusion. The patient underwent deformity correction surgery with T11-L5 pedicle screw fixation, L2 laminectomy, and L2 PSO. Postoperatively, failure to left straight-leg hip elevation with hip abduction spared was noted. The MRI showed dorsal dural impingement by residual L3 laminae and upward migration of residual L3 laminae. The patient subsequently underwent revision surgery with left L3 lateral recess decompression with removal of the impacted ligamentum flavum and the rest L3 laminae. After the revision surgery, left quadriceps muscle power was found improved, and therefore aggressive rehabilitation was prescribed.

### Discussion

The mechanism of reported neurologic deficits following PSO is still unclear in previous studies. The combination of sublaxation, residual dorsal impingement, and dural buckling were possible causes, and usually the observed deficits are corresponded to a level distal to the osteotomy. The symptoms, image findings and operative findings of the reported case were compatible with previous studies.

### Conclusion

The neurologic complications following PSO are relatively common. A combination of sublaxation, residual dorsal impingement, and dural buckling were possible causes for the deficits. However, residual of laminae distal to the PSO level may also cause neurologic deficit postoperatively.



## Disc Herniation Induced Non-Structural Scoliosis: A Case Report and Review of Literature 椎間盤突出導致的非結構性脊椎側彎：個案報告及文獻回顧

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### Introduction

Sciatic scoliosis, characterized by non-structural scoliosis due to listing resulting from disc herniation induced nerve root irritation, is easily misdiagnosed. Since lumbar disc herniation is rare in adolescent and young adult, sciatic scoliosis can be confusing with idiopathic scoliosis and be treated with bracing or physical therapy, which are commonly in vain. Definite treatment could therefore be delayed and lead to permanent scoliotic curve. Surgical intervention with endoscopic discectomy is the choice of treatment. Antalgic position will improve once the offending painful stimulus was removed.

### Case report

A 22-year-old male with a history of myoclonus presented with low back pain, left buttock and lateral thigh pain for half-year. He suffered from a motor vehicle accident 2 months before his pain onset. The patient initially sought medical assistance and had received pain control and physical therapy. However, symptoms persist and worsened over time. The pain was aggravated with activity and decreased with rest. He had midline soreness of back. Straight leg raising test is positive at 70 degree of flexion. Neurological examination was otherwise normal with preserved muscle power. Scoliosis with trunk imbalance and listing to the right was noticed. Standing anteroposterior radiograph showed Cobb angle at 25.1 degree in measurement, there was more tilting than rotational deformity. Reviewing his lumbar plain radiograph half-year ago, flattening of the lumbar lordosis and loss of disc height at L3-4 was observed. There was no gross deformity. A new MRI scan was positive for disc prolapse at L3-L4 causing severe spinal stenosis. The left sided para-median disc protrusion was thought to cause the debilitating symptoms. Therefore, endoscopic discectomy was done through posterior inter-laminar approach, ruptured disc was found and removed. The procedure was completed without complications and the patient reported immediate relief of the leg pain. His posture gradually improved and the latest radiograph showed improved Cobb's angle at 13 degree at the time of recent follow-up after one month of surgery.

### Discussion

Identifying the cause of a presenting scoliosis is key to treatment. Reviewing the literature, there are several features to differentiate sciatic scoliosis to idiopathic scoliosis. Idiopathic scoliosis usually developed slow and insidious painlessly. On the other hand, rapid developed scoliotic curve with concurrent low back and limbs pains highly suggests a disc lesion. Antecedent trauma event or heavy axial working load is commonly recalled as the cause of annulus fibrosus damage. Physical exam including straight leg raising test and Adam forward bending test should be done. Rib hump may not be detected with no skeletal rotational profile. Sciatic scoliosis has minimal rotational component in A-P radiograph. Finally, MRI is required for definite diagnosis. Lesion usually appears at the side of convexity to enlarge foramen and decrease nerve root pressure. In our case, patient first presented with low back, buttock and lateral thigh pain. Scoliotic curve developed gradually. However, due to the ambiguous history of trauma, non-prominent radicular pain and the young age. Mechanical back pain was initially impressed and treated with medication and physical therapy. Patient presented to our clinic since pain worsened and listing posture appeared. However, despite we rapidly tackle the pathogenic lesion, some residual deformity may regretfully permanently persist.

### Conclusions

Physicians should keep in mind that sciatic scoliosis could be a differential in patient presenting with scoliosis, especially if pain is present. Thorough evaluation with history taking, physical examination and radiographic investigation should be done. Surgical intervention is warranted if scoliotic curve worsened despite treatment to avoid permanent deformity.

## Small Pulmonary Cement Emboli After Percutaneous Vertebroplasty (PVP) could be Asymptomatic and can be Treated by Supportive Care and Observation – A Case report 無症狀之經皮椎體成形術後造成的小的骨水泥肺栓塞能以保守治療處理 – 病例報告

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### Introduction

Percutaneous vertebroplasty (PVP) is a minimally invasive procedure used extensively to treat painful diseased vertebral bodies. However, cement leakage has been reported at rates of up to 73% of vertebral bodies treated, with venous leaks in up to 24% of cases.

We report a case of small pulmonary cement emboli after vertebroplasty for a vertebral body compression fracture, which are incidental findings from chest CT scans ordered 7 months after the index procedure.

### Materials and Methods

A 69-year-old man, with no other significant medical history, was hospitalized because of persistent severe back pain and immobilization refractory to conservative therapy after a fall. Radiography and MRI confirmed compression fractures at the L1 and T12 vertebral levels. PVP with polymethylmethacrylate (PMMA) cement was performed under local anesthesia, using a unilateral transpedicular approach. The postoperative course was uneventful and he was discharged on POD1. He complained of intermittent back soreness but no chest pain or dyspnea at his follow-up visit. Seven months after the PVP procedure, he sustained a compression fracture of the ninth thoracic vertebral body, which was identified in CT scans. However, the CT scan also revealed the presence of cement in the subsegmentary and segmentary pulmonary arteries of the right superior and inferior lobe, which were incidental findings. The chest X-ray on admission was reviewed and revealed two small radio-opaque foreign bodies mainly in the periphery of the right lung.

### Results

On admission, the patient denied any discomfort and had stable vital signs. He had normal arterial blood gases. The electrocardiogram was normal, with a stable sinus rhythm. Cardiology specialists were consulted immediately, and supportive care and observation were recommended because the pulmonary cement emboli were asymptomatic. PVP to T9 was performed smoothly and he was discharged on POD1.

### Discussion

Although percutaneous vertebroplasty is a relatively safe, simple, and commonly performed procedure for the management of vertebral compression fractures, it can be associated with fatal complications, such as spinal cord compression resulting in paraplegia, cerebral embolism, renal artery embolism, and acute respiratory distress syndrome; minor complications, including infection, radicular pain, and spinal cord compression. Moreover, most complications involved transitory worsening of pain or chest discomfort, dyspnea, and fever; these symptoms may also lead to cardiovascular collapse and, rarely, to death.

The frequency of local leakage of bone cement is relatively high (about 80–90%); moreover, the rate of cement leakage into the perivertebral veins (seen in up to 24%) with consequent pulmonary cement embolism varies from 4.6 to 6.8% (up to 26% in radiologic studies).

Patients may remain asymptomatic and develop no known long-term sequelae. However, when emboli are discovered incidentally on a conventional chest radiograph, their suggestive appearance is a high-density opacity in a tubular branching pattern, corresponding to pulmonary arterial distribution.

The treatment for symptomatic or central pulmonary cement embolism is surgical embolectomy, or percutaneous removal, whereas more conservative management with anticoagulants, antibiotics, and corticosteroid is reserved for smaller or peripherally located emboli.

### Conclusions

Small pulmonary cement emboli after PVP could be asymptomatic and can be treated by supportive care and observation.

**Case Report: Easily Neglected Isolated S3 Transverse Fracture with Neurologic Deficit****個例：易忽視的單獨薦椎第三節橫斷性骨折伴隨神經學症狀**

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**Introduction**

Sacral fractures usually result from high-energy trauma and accompany with pelvic ring instability. Lower segmental (S3-5) transverse sacral fracture is uncommon in reported literature, which is less than 5% of all sacral fracture. Among this, isolated transverse sacral fracture (TSF) is also rare. Lower (TSF) is often due to direct blow against coccyx, like fall, which result in break at the kyphos of sacrum mostly through the body of the lower 4-5 sacral vertebrae. Transverse sacral fracture is reported frequent associated with neurologic deficit. In this article, we present a case of diagnostic challenge, who suffered from low-energy trauma and was diagnosed of isolated S3 transverse fracture with saddle anesthesia and urinary retention.

**Materials and Methods**

A case of 57 years old female with history of L4~S1 posterolateral fusion with instrument and L5S1 posterior interbody fusion on 2019, suffered from left wrist pain and severe buttock pain since fall. At emergency room (ER), aggravated buttock pain with saddle anesthesia and urinary retention was complained by the patient. But there was no weakness or numbness in both lower limbs. Initial images revealed left radius shaft fracture and transverse S3 fracture. Further radiographic survey including lumbar spine lateral view and Computed Tomography (CT) with 3D volume rendering of pelvic was arranged to make definite diagnosis of isolated S3 TSF without pelvic instability.

**Results**

All images revealed no obvious displacement or angulation of S3 fracture. Besides, her neurologic symptom showed self-improvement gradually after pain control at ER, conservative treatment was first prescribed. At clinical follow-up 2 weeks after, there were no more neurologic deficit and released buttock pain.

**Discussion**

The diagnosis of TSF is easily missed by plain view X-ray since it may be influenced by bowel lumen and disc line, particularly in those with multiple fracture without pelvic involvement at ER. Accompanying neurologic deficit is a clue for the diagnosis of TSF. The S2 to S5 nerve roots have little contribution for lower limb movement or sensation, and pudendal nerve was made up of S2 to S4 which provides sensation to the external genitalia, anus, and perineum, as well as motor control of urethral sphincter and external anal sphincter. This distribution may explain our patient's neurological deficits. CT is better mean at suspicious of sacral fracture to rule out pelvic ring instability. Treatment of TSF remained debated. Low transverse sacral fracture pattern passes caudally through the sacroiliac joint, it is accounted as stable. Studies revealed no difference between surgical and conservative treatment if stable TSF, and good outcome of lower TSF was reported after conservative treatment.

**Conclusions**

TSF is easily neglected due to radiographic characteristic. Accompanying neurologic deficit can be clue to alarm. In suspect of TSF, CT can be helpful to diagnose. Lower TSF can be treated with conservative treatment and good results are reported in articles.

**Pediatric Atlantoaxial Rotatory Subluxation- A Case Report and Review****病例报告-兒童寰椎樞椎旋轉性半脫位**林杼璇<sup>1</sup> 江長蓉<sup>2</sup> 陳志華 曾永輝<sup>3</sup>衛生福利部雙和醫院骨科部<sup>1</sup>**Introduction**

Pediatric cervical injuries are uncommon. We describe injury circumstances, clinical and radiographic findings, and management diagnosed with atlantoaxial rotatory subluxation (AARS) in our case. Usually, the treatment of choice is traction using Halo/Gardner-Wells fixation devices for up to six weeks. We reported a case successfully treated with handmade cervical(skin) traction.

**Case presentation**

A 9 years-old girl without notable development disorder or systemic disease, who presented with progressed right posterior neck pain. She fell while playing somersault and landed on head. She suffered from right posterior neck pain and her head tilted and fixed in right antero-lateral rotated position (cannot turning head to left side). No neurologic deficit was noted.

Radiography (C-spine AP and Lateral view) showed malalignment of lateral border edges of cervical spine, also spinous process was not straight in a line. With malalignment of AV(anterior vertebral line) and PV (posterior vertebral line), step off over C1/2 and C2/3, subluxation or rotation deformity was suspected. CT scan with 3D reconstruction images revealed asymmetry of the atlanto-axial and atlanto-occipital joint and C1/C2 left anterior subluxation, right posterior subluxation with ADI (atlas-Dens interval) <4mm. Atlanto-axial rotatory dislocation (AARD) with Fielding and Hawkin type I was impressed.

Under management suggestion (J Bone Joint Surg Am. 1977;59;37-44), we attempt reduction by cervical (skin) traction, initial 2.0Ib under 6.0Ib, keep traction over day-time (30mins and rest 10mins). After three days of cervical traction, her head could smoothly rotate to left side without pain. Followed cervical X-ray showed normal C1-C2 anatomical position. She was discharged with immobilizing in a Miami cervical collar. A follow-up CT of the cervical spine showed normal C1-C2 position without subluxation.

**Discussion**

Atlantoaxial subluxation occurs predominate in the pediatric population than adults due to an enhanced elasticity of ligaments, horizontally oriented, shallower joint surfaces of the lateral masses, a not fully developed neck musculature and a bigger head-body relationship.

Children with AARS often usually presentation with neck pain and torticollis and falls are a common injury mechanism. The injury and reduction are crucial as it directly correlates with the prognosis. If the symptoms are mild and have been present for less than 2 weeks (acute stage), a simple soft collar and analgesics.

If untreated after 1 to 3 months it becomes irreducible and requires a surgical approach. Indications for operative treatment if present with neurologic deficit, anterior displacement, failure to achieve and maintain correction if the deformity exists for longer than 3 months, and recurrence of the deformity after an adequate trial of conservative management consisting of at least 6 weeks of immobilization.

**Conclusion**

Pediatric emergency physicians should have a high clinical suspicion for atlantoaxial rotator subluxation, particularly when a child presents with acute neck pain and abnormal head posture without the ability to return to a neutral position. Treatment varied across institutions according to severity of disease. Further work is needed to identify optimal management.

**Post-Traumatic Patella Baja - Case Report and Literature Review****創傷後的高位髌骨-病例報告與文獻回顧**

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**Introduction**

Post-traumatic knee stiffness and loss of range of motion are common complication of injuries to the knee area. The causes of post-traumatic knee stiffness can be divided into flexion contractures, extension contractures, and combined contractures. Post-traumatic stiffness can be due to the presence of dense intra-articular adhesions or fibrotic transformation of peri-articular structures. Various open and arthroscopic surgical treatments are possible.

**Materials and Methods**

The 54-year-old male has right knee contusion two weeks ago. The patella fracture was diagnosed and open reduction internal fixation with tension bend wiring was done. The postoperative course and rehabilitation was smooth. Removal of implant was done 3 months later.

**Results**

However, persist anterior knee pain still harassed him. The both knee standing view showed unequal level of patella. The right knee showed patella baja. The range of motion was 0-80 degree. There was no knee instability or meniscus injury by MRI examination.

**Discussion**

A flexion contracture is due to posterior adhesions and/or anterior impingement. Different modern surgical techniques for treating post-traumatic knee stiffness has been proposed. Any bony impingements must be treated before soft tissue release is performed. Intra-articular stiff knees with a loss of flexion can be treated by an anterior arthroscopic arthrolysis. Extra-articular pathology causing a flexion contracture can be treated by open or endoscopic quadriceps release.

**Conclusions**

A precise diagnosis and understanding of the pathology is mandatory prior to any surgical treatment. Failure is imminent if all pathologies are not addressed correctly.

## High Tibial Osteotomy in Posterior Cruciate Ligament Laxities

### 高位脛骨截骨矯正於後十字韌帶損傷的應用

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#### Introduction

The posterior cruciate ligament (PCL) is a primary restraint of posterior tibial translation and a rotational stabilizer. High tibial osteotomy (HTO) is indicated for medial compartment osteoarthritis and varus malalignment of the knee. It changes the mechanical weight-bearing axis and alter the loads carried through the knee. The knee instability associated with varus malalignment has been considered a contraindication in the past due to the reported inferior results. However, more recently attention has been directed to the effects of high tibial osteotomy on knee instability with posterior cruciate ligament injury again.

#### Materials and Methods

A review was conducted on the medical record of two patient with the diagnosis of PCL injury and medial compartment osteoarthritis treated with HTO. We recorded the result of posterior drawer test. Modified Cincinnati Knee Rating System was used and we also evaluated mechanical axis, weight bearing ratio, medial proximal tibia angle(MPTA), tibia slope were evaluated. A PubMed search was done to review the literature on HTO treatment for chronic PCL injuries with varus malalignment.

#### Results

Case one was a 53-year-old man and case two was a 47-year-old man with chronic PCL injuries, varus malalignment, and medial compartment osteoarthritis. They both received HTO for treatment. The radiographic data were weight bearing ratio(24%, 66%), MPTA(84.4, 92.4 degrees), and tibia slope(7.5, 8.7 degrees) preoperative and postoperative subsequently for case one. The radiographic data were weight bearing ratio(27%, 70%), MPTA(87.6, 89.5 degrees), and tibia slope(9.1, 10.8 degrees) preoperative and postoperative subsequently for case two. Their symptoms, MCKRS, and knee stability improved.

#### Discussion

Chronic instability has become the indication for HTO again nowadays, because it corrects both the coronal and the sagittal alignment. The increased tibial slope causes anterior tibia translation and helps the posterior cruciate ligament injuries knee.

#### Conclusions

High tibial osteotomy can be an effective treatment for patients with chronic combined posterior cruciate ligament injuries and genu varus alignment combined with genu varum deformity.

## High-Tensile Strength Tapes Show Greater Ultimate Failure Load and Less Stiffness Than High-Tensile Strength Sutures in a Subpectoral Biceps Tenodesis Porcine Model

使用高強度縫帶於胸大肌下二頭肌肌腱固定術具有較佳的極限破壞但較差的剛性

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### Introduction

Lesions of the long head of the biceps brachii (LHB) tendon can possibly lead to anterior shoulder pain and shoulder dysfunction.<sup>1,2</sup> Both biceps tenotomy and tenodesis are considered to be effective treatments for symptomatic LHB pathology. A high-tensile strength tape has the potential to enhance the tendon-suture interface in the biceps tenodesis structure using a suture anchor. The purpose of this study is to compare the biomechanical properties of high-tensile strength tape and a high-tensile strength suture in subpectoral biceps tenodesis using a suture anchor in a porcine tendon model.

### Materials and Methods

A total of 24 artificial composite (polymer and glass fiber) humeri and porcine flexor profundus tendons were used. Two types of suture materials, high-tensile strength sutures (group S) and high-tensile strength tapes (group T), were evaluated. After we inserted metallic suture anchors with either 2 sutures or tapes 5 cm from the superomedial corner of the greater tuberosity, a Krackow suture technique was used to secure the tendons. After a preload of 5 N for 2 minutes, a cyclic loading test from 5 to 70 N was conducted for 500 cycles. Finally, the specimen was loaded to failure at a rate of 1 mm/s.

### Results

There were no significant between-group differences in elongation after cyclic loading and elongation at failure load for group S and group T ( $P = .977$  and  $.630$ , respectively). The ultimate failure loads in group T ( $278.2 \pm 54$  N) were significantly greater than those in group S ( $249.4 \pm 32$  N) ( $P = .028$ ). In contrast, the stiffness values in group T ( $28.5 \pm 4.0$  N/mm) were significantly lower than those in group S ( $32.3 \pm 4.5$  N) ( $P = .028$ ). Ten specimens in group S and 8 specimens in group T failed, with tendons being cut through by the sutures, whereas the other 2 specimens in group S and 4 specimens in group T failed due to suture breakage.

### Discussion

The principal findings of this study indicated that using high-tensile strength tapes in subpectoral biceps tenodesis using a suture anchor leads to significantly greater ultimate failure load but lower levels of stiffness as compared with using high-tensile strength sutures. A strong suture-tendon structure may prevent clinical failure of a subpectoral biceps tenodesis using a suture anchor.

### Conclusions

Using high-tensile strength tapes in subpectoral biceps tenodesis using a suture anchor leads to significantly greater ultimate failure load as compared with using high-tensile strength sutures in a porcine model. Although lower levels of stiffness were found in high-tensile strength tape group, the difference in the means were not large between 2 groups.

## Discoid Meniscus Horizontal Tear with Meniscus Posterior Dislocation in a 9 Years Old Girl 外側盤狀半月板撕裂併後向脫位—9 歲女性之案例報告

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### Introduction

Discoid meniscus is a developmental abnormalities of the meniscus leads to a hypertrophic and discoid shaped meniscus. It also referred as popping knee syndrome. Discoid meniscus present in 3~5% of population, usually lateral meniscus involved and has 25% bilateral involvement.

### Materials and Methods

We retrospectively review a 9 years 3 months old girl. Her birth history was quite normal and she denied any congenital, systemic disease. She had occasional right knee pain with palpable clunk sensation since 2016/09/21. At that time, radiography revealed no obvious bony lesion. Sonography showed right knee protruded lateral meniscus, especially at posterior horn, and no disrupted meniscus was noted. After then, she had regularly follow up at our OPD. Since 2020/12/28, symptoms of her right knee getting worse. PE revealed right knee swelling, right knee lateral joint line protruding while flexion, right knee snapping and ROM limitation. MRI was arranged and it revealed right knee lateral discoid meniscus horizontal tear. Therefore, arthroscopy was arranged and it showed right knee lateral meniscus horizontal tear with posterior dislocation and entrapment. Arthroscopic meniscus repair with one all-inside suture and two outside-in suture were done. After operation, there was no further dislocation of lateral meniscus and snapping sensation. She still under OPD follow up.

### Results

After arthroscopic lateral meniscus repair with 1 all-inside suture and two outside-in suture, Her symptoms improved. PE showed right knee full ROM and no snapping sensation. She could walk without assist and no daily activity limitation.

### Discussion

Her symptoms improved well in post-operation 2 weeks. However, lateral discoid meniscus tear with posterior dislocation was relatively rare. Arthroscopic meniscus repair showed excellent short term outcome. We still need long term follow up, more case series, and prospective cohort to prove long term outcome.

### Conclusions

Arthroscopic meniscus repair in pediatric lateral discoid meniscus tear with posterior dislocation showed excellent outcome.



## Trochleoplasty Techniques Provide Good Clinical Results in Patients with Trochlear Dysplasia

遠端鼓骨滑車成型術針對滑車生成不良的病人效果良好

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### Introduction

The management of recurrent patellofemoral instability is challenging. The etiology of the instability is multifactorial, requiring the examination of lower limb alignment, relationship of the patella to the trochlear groove and tibial tubercle, and the soft-tissue restraints. As initial surgical efforts were aimed at isolated soft-tissue repair or reconstruction, patients often had continued instability.

### Materials and Methods

A trochleoplasty is a surgical correction of the femoral trochlea to restore a normal or nearly normal entry of the patella into the trochlear groove during extension and flexion. Some general prerequisites are necessary to performing this procedure successfully. Any of these procedures are clearly contraindicated in patients who complain about anterior knee pain without any signs of patellofemoral instability!

### Results

To gain access to the cancellous bone of the trochlea, one must remove a thin strip of cortical bone at the osteochondral edge at the supratrochlear region. This is completed with an osteotome. Cancellous bone from the trochlea must now be removed. This can be achieved with a special burr and a guide that maintains a 5-mm thick osteochondral flap or can be done free hand.

### Discussion

It has been accepted at this point that trochlear dysplasia is an important factor to consider in the diagnosis and treatment of patellofemoral malalignment and resulting instability. The trochlear anatomy is 1 factor that plays a role among several other factors that influence patella stability. However, given the fact that in almost all cases additional procedures such as medial soft-tissue reefings, MPFL reconstructions, or associated tibial tubercle transfers are being performed on almost all patients undergoing concomitant trochleoplasty it is difficult to isolate the true value of this procedure. B however, is intriguing and warrants further careful investigation to evaluate the deepening trochleoplasty as a potential primary treatment option.

### Conclusions

Trochleoplasties provide a fascinating concept of recreating normal anatomy in the patellofemoral trochlea and deserve further careful investigation in order for this procedure to be utilized to its fullest potential for the benefit of our patients.

## Percutaneous Anatomic Reconstruction Technique Applied in Elite Athletes with Ankle Lateral Instability

微創經皮重建技術應用於踝關節外側不穩定之專業運動員

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### Introduction

Chronic ankle instability following ankle sprains causes pain and functional problems, which may interfere performance in elite athletes. Operative options include anatomic repair, non-anatomic reconstruction and anatomic reconstruction. In elite athletes, the repaired ligament may be not strong enough to support high-demand performance which may lead to re-tear easily. In the current paper, Percutaneous Reconstruction of the Lateral Ligaments (Perc-Anti RoLL), which is a new minimally invasive surgical technique for anatomic reconstruction of the lateral ligaments of the ankle, utilizes the anatomic graft with inside-out technique.

### Materials and Methods

From 2017 to 2020, we recruited 15 patients who were national team athletes, including 8 males and 7 females. The sports contained soccer, windsurfing, weight-lifting, volleyball, gymnastics, Taekwondo, basketball, and athletics. The mean age was 21.6 (15-30). They were all suffered from ankle lateral instability, with 7 right feet and 8 left feet involved. Ligament reconstruction was performed with 2 autografts and 13 allografts, respectively. Mean follow-up period was 13.7 months (6-28 months).

### Results

At the last follow up, decreasing VAS (visual analogue score) from 3.0 ( $\pm 1.2$ ) to 1.2 ( $\pm 0.8$ ) was found. The AOFAS (The American Orthopaedic Foot & Ankle Society) score was improved from 66.2 ( $\pm 4.8$ ) to 91.6 ( $\pm 5.2$ ). Significant improvement was also seen radiologically. Mean anterior talar displacement from 13.7 ( $\pm 2.3$ ) mm preoperatively to 5.6 ( $\pm 1.2$ ) mm, and mean varus talar tilt angle from 14.8° ( $\pm 2.2$ ) to 5.2° ( $\pm 1.7^\circ$ ) were measured. All patients were satisfied ('excellent' or 'good') except 1 patients reported residual instability but less apprehension than the preoperative condition.

### Discussion

In general patients, anatomic repair is the most popular treatment choice, which utilizes ligament remnants that are either reattached or tightened to improve stability of the ankle. If pre-existing ligament structures have been damaged beyond repair or are insufficient to allow repair, then reconstruction technique is required. In elite athletes, the repaired ligament may be not strong enough to support high-demand performance which may lead to re-tear easily. The non-anatomic reconstruction may lead to subtalar stiffness with pain. Under these considerations, choosing an anatomic reconstructive technique is more appropriate. These procedures have traditionally been performed using open techniques and have been successful in restoring function and decreasing pain. In 2005, an open anatomic reconstruction technique using a gracilis Y-graft and Inside-out technique was reported with good results, which were also verified in our elite athletes.

### Conclusions

The Perc-Anti RoLL technique can be performed percutaneously which decrease peripheral soft tissue damage and help athletes return to competition level activity in shorter time.

## Non-Absorbable Suture Fixation Technique for the Osteochondral Fractures Repair of Patella

### 髌骨骨軟骨骨折的不可吸收縫線固定技術

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#### Introduction

Patellar osteochondral fractures are typically present after an acute trauma. It is commonly in the pediatric or adolescent population with the condition of generalized ligamentous laxity and decreased biomechanical strength at the osteochondral junction. Direct shear impaction during patellar dislocation is the most common mechanism, which is followed by indirect shear stress during a twisting motion of the knee. The aim of osteochondral lesions fixation focuses on preservation of native articular hyaline and promotion of osteochondral healing. Previous studies on osteochondral fracture fixation with bioabsorbable materials have favorable results. However, scarce cases were reported with non-absorbable suture use.

#### Materials and Methods

Two patients were reviewed who were both suffered from acute displaced osteochondral fracture of patellas with lateral dislocation. There were intact ligaments including ACL (anterior cruciate ligament)/ PCL (posterior cruciate ligament)/ MM (medial meniscus)/ LM (lateral meniscus)/popliteal tendon/ PLC (posterolateral corner). The sizes of fragment were 1.5x1.3 cm<sup>2</sup> and 2.0x1.5cm<sup>2</sup>, respectively. We performed knee arthroscopic shaving, debridement as well as lateral release for patella subluxation in both cases. The operation of ORIF over patella with Ethibond pull-out suture was also used. During the post-op course, knee brace protection and rehabilitation exercise program were arranged. At least 3-month outpatient follow-up was recorded.

#### Results

At the last follow up, decreasing VAS (visual analogue score) was found. Besides, rising range of motion over knee joint was recorded. Significant improvement was also seen radiologically. Bony union of patella osteochondral fracture was seen. Both patients were satisfied. No complication was noted.

#### Discussion

In non-displaced patellar osteochondral fracture, conservative treatment was suggested. On the other hand, surgical intervention was preferred in displaced fracture or concurrent acute patellar dislocation. Operative options include both surgical debridement and fixation techniques. Surgical removal of bony fragment is applied in which fragment size was less than 4mm, non-articular involvement or irreparable multi-fragment. Anatomic repair technique is utilized in fragment size more than 9mm, single solid fragment piece or articular involvement. If the fragment cannot be fixed, then surgical debridement will be suggested. Bio-absorbable materials including suture, rod or screw have been depicted in previous studies. Ethibond polyester suture is a kind of non-absorbable, braided, sterile suture which is composed of ethylene terephthalate. In our cases, good results were presented while using non-absorbable Ethibond suture fixation techniques.

#### Conclusions

The non-absorbable suture fixation is viable in osteochondral fracture of patella in acute setting.

## Treating Medial Discoid Meniscus Complicated with Tear with Arthroscopic Partial Meniscectomy and All Inside Repair; Case Reports and Literature Reviews

治療內側盤狀半月板合併破裂使用部分半月板切除手術及修補手術:病例報告及文獻回顧

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### Introduction

Discoid meniscus is a type of anomaly that thicker meniscus cover larger surface of tibia plateau and is more common in lateral meniscus. Discoid medial meniscus is rare with reported incidence around 0.12%. Since the first discoid medial meniscus described by Cave and Staples in 1944, no more than 70 cases were reported in the literature. It remains mysterious and almost all literature were case report. We report a case of discoid medial meniscus complicated with posterior to anteromedial horn tear treated with partial meniscectomy and all inside repair.

### Material and method

Our case is a 20 years old man who complaint left knee pain for 2 months. Pain was especially during walking and he denied any trauma history. Physical exam revealed normal muscle power, medial site joint line tenderness, McMurray test positive and Thessaly test positive. No ligament instability was noted. Left knee x-ray image showed left knee medial tibia plateau cupping and lateral tibial spine hypoplasia. Magnetic resonance imaging (MRI) showed left knee medial discoid meniscus with diffuse degenerative change, probable tear. His contralateral right knee was asymptomatic then.

### Results

Conservative treatment was tried in local medical clinic but in vain before he visited us. We performed arthroscopic partial meniscectomy and all inside repair to remove the central portion of the discoid meniscus as well as established a stable peripheral rim. Partial weight bearing with crutch was executed on the first day after operation. The patient was reviewed at 2 years after operation and was asymptomatic with full range of motion, no joint line tenderness and negative McMurray testing. Image result also showed no osteoarthritis change.

### Discussion

The incidence of discoid lateral meniscus was reported around 1.5 % and while discoid medial meniscus was rarer, estimated around 0.12%. Discoid medial meniscus was believed to be congenital anomaly and is asymptomatic in childhood until revealed by tear years later. Unlike discoid lateral meniscus, discoid medial meniscus presented more common with medial side pain, iterative effusion and locking in flexion rather than snapping was mention by Song et al in 2017. Beside the clinical correlation, our case also presented the typical imaging finding of discoid medial meniscus such as medial tibia plateau cupping, lateral tibial spine hypoplasia and posterior femoral condyle aplasia reported by Wang et al in 2017 and WKII in 1994. Though the gold standard of diagnosis of discoid meniscus is arthroscopy, MRI does help in preoperative diagnosis with bow tie sign and ratio of minimal meniscal width to maximal tibial width.

Only symptomatic lesion should be operated. Though total meniscectomy was reported to offer best prognosis in the past, partial meniscectomy was preferred due to fear of osteoarthritic change. The surgical aim to remove the central portion of the discoid meniscus and leave a stable, balanced peripheral rim.

### Conclusion

In treating discoid medial meniscus, partial meniscectomy with all inside repair can provide satisfactory result without recurrence of symptoms.

## A Case Report: A Successful Reconstruction of Lateral Collateral Ligaments and Ulnar Collateral Ligaments with Autograft of Right Elbow

### 個案報告: 右肘雙側側韌帶重建手術

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#### Introduction

Elbow dislocations are the most common major joint dislocation second to the shoulder. Closed reduction is usually adequate in the management of simple elbow dislocation. However, ligament repair may be indicated in persistent instability of the elbow joint. Here we present a case with both Lateral collateral (LC) complex and Ulnar collateral ligament (UCL) injury underwent autograft reconstruction.

#### Materials and Methods

A 74-year-old female patient is a victim of traffic accident. She suffered from right elbow dislocation which was reduced in ER with arm sling protection. Then 4 days later, the patient came back to the ER because of the extreme swelling and pain in her elbow. The global instability on right elbow was noticed. The surgery was performed on the 9th day after injury. The poor quality and resorbed ligamentous tissue, the surgery was shifted from ligamentous repair to ligamentous reconstruction.

We used the autograft, palmaris, from both arms to reconstruct the lateral ulnar collateral ligament (LULC) and UCL. The UCL was reconstructed through modified Tommy John procedure in a triangular construct. Under the Kocher approach, the LC complex was repaired and the LUCL was reconstructed with modified docking technique. In the end, the elbow was protected with a long arm splint in 90° flexion and wrist in neutral position. The passive range of motion rehabilitation was started a week after the surgery.

#### Results

After 6 weeks of rehabilitation, the stable range of motion can be achieved by extension 0°, flexion 120°, supination 85°, pronation 75°. Both the valgus and varus stress tests are intact. There was no ulnar nerve neuropathy mentioned. Patient denied any daily active limitation and was satisfied with the treatment.

#### Discussion

The simultaneous tear of LCL and UCL is rare. The mechanism of injury is unclear. We are also questioned about the cause of early resorbed and poor quality of ligaments. Based on the literature, the LUCL is the primary stabilizer for posterolateral rotatory instability. We believe the additional lateral elbow structures are also important for posterolateral stability. The technique of reconstructing the ligaments may base on the bone quality and the length of autograft.

#### Conclusions

We suggest identifying the ulnar nerve during the surgery to prevent any injury of the nerve. The ulnar nerve transposition may not be necessary. Be sure to check and repaired the additional lateral elbow structures after reconstructing the LUCL.

## Surgical Management of Neglected Achilles Tendon Ruptures Using Minimal Invasive Tendon Transfer with Peroneus Brevis Tendon – A Case Report

使用微創腓骨短肌肌腱轉移來重建被忽略的阿基里斯腱斷裂：病例報告

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### Introduction

Management of chronic Achilles tendon ruptures is challenging by the high risk of wound complications and infection. This case report demonstrate a promising method to reconstruct a largely retracted rupture of Achilles tendon using minimal invasive tendon transfer technique.

### Case Presentation

A 50 year old female was presented with a limping gait and progressive left lower leg weakness since a falling accident 6 month ago. Marked atrophy of left calf muscle with positive Thompson's test was noted. MRI for the left lower leg revealed complete rupture of Achilles tendon with retraction more than 10cm and degenerative change.

We then reconstructed the neglected rupture of Achilles tendon with ipsilateral peroneus brevis tendon transfer using minimal invasive technique. After one month of immobilization with short leg casting followed by aggressive rehabilitation for 2 months, this patient returned back to her pain-free daily activity smoothly without wound complications and limping gait. Follow-up MRI on the post-operative 4 months revealed complete regeneration of ruptured Achilles tendon and reinforced calf muscle.

### Discussion

Traditional method for treatment of neglected Achilles rupture includes fascia turn-down, allo- or auto-tendon graft and tendon transfer, but criticisms exist on the large incision wound resulting in high risk of wound complications and infection. The minimal invasive tendon transfer technique can prevent wound complications and have excellent result in treatment of largely-retracted Achilles tendon rupture.

### Conclusions

Minimal invasive tendon transfer technique is a promising method to reconstruct a largely retracted rupture of Achilles tendon in avoidance of wound complications and infection.

## A Trap You Should Know when Using Inlet View to Guide the Insertion of Sacroiliac Screw 使用 Inlet View 打經皮骶髂關節螺釘會遇到的問題

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### Introduction

Pelvic fracture is commonly seen in high energy trauma. Fixation is needed once the pelvic became unstable. Sacroiliac (SI) screw is commonly used in minimal SI joint displaced fracture. Compare to plate fixation, screwing technique can provide less operation time and blood loss.

The SI screw is inserted under fluoroscopic control. However, due to the geometry of the sacrum bone, the SI screw is easily misplaced. This time, we presented three patients with SI screw malposition. The malposition screw was not found in intraoperative fluoroscope.

### Case

From 2018/1/1 to 2019/12/31, there were 3 patients who received SI screw fixation and then removed it within a month. All the preoperative study included pelvic x ray and CT. In these cases, the “in-out-in” placement happened. We checked the inlet and outlet view during operation and the screws were placed in proper place. The in-out-in placement was found in the CT after the operation.

No.	Age and Gender	Pre op diagnosis	Operative method	Time to remove the screw
1	59 y/o female	APC type III Dysmorphic pelvic	Anterior ramus plate + Left S1S2 SI screw	37 days
2	48 y/o male	LC type II Dysmorphic pelvic	Right SI screw + left retrograde superior ramus screw	9 days
3	77 y/o male	1. Left anterior column fracture 2. Right Sacrum zone 1 fracture 3. Left SI fracture, Zone 2, comminuted	1. Retrograde anterior column screw for left anterior column fracture 2. Right SI screw for right Sacrum zone 1 fracture 3. Two reconstruction plates for left SI fracture, Zone 2, comminuted	9 days

### Discussion

The penetration screw sometimes can be found in inlet view. However, there is a blind spot around the anterior cortex of superior sacral ala. The axis of anterior sacrum cortex is different from the inlet view trajectory. This create a blind spot once the screw is inserted too anteriorly. The screw penetration is hard to detect in this area. The penetration screw may irritate the nerve root and need to remove once the impingement happened.

Pre-operative CT is recommended to better understand the patient's pelvic structure. Also keep in mind of the in-out-in placement especially at anterior cortex of sacrum ala may help improve the surgical outcome.

### Conclusions

CT is helpful in understanding the patient specific pelvic morphology. Carefully plan the entry point and the screw trajectory on CT before the operation. Make sure the screw didn't penetrate the anterior sacrum cortex in inlet view. If the nerve root impingement happened, remove the screw may relief the condition.

## Arthroscope-Assisted Reduction in Tibia Plateau Fracture : Our Experience and Literature Review

### 關節鏡在脛骨平台骨折的文獻回顧與經驗分享

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#### Introduction

Open reduction and internal fixation (ORIF) are the main stay treatment in tibia plateau fracture. As the minimal invasive surgery getting more and more popular, arthroscope is considering an alternative method to help the reduction. Several studies show clinical outcome of AIRF is not inferior to ORIF. However, ARIF is not widely adapted due to the higher technique requirement and the increased medical cost. This time, we present 2 cases of tibia plateau treated with ARIF.

#### Results and Surgical techniques

2 cases were collected in 2020/11~12. Both cases were Schatzker type III tibia plateau fracture and received arthroscopic reduction and internal fixation. One is 48 y/o man and another is 50 y/o woman.

Arthroscopic joint examination was performed through 2 parapatellar portals under the tourniquet pressure 300mmHg. Skin incision through lateral knee proximally and curved toward shin distally. Elevated the anterior tibialis muscle from Gerdy's tubercle and exposed the fracture site. Elevated the depressed joint surface under arthroscopic guidance and filled the bone defect with artificial bone graft. Inserted K pins to keep the reduction. The K pins were pulled medially and only the very end of the pin could be felt on the lateral cortex. Applied the plate and checked the alignment under fluoroscope. Inserted the rest of screws and closed the wound without placing a drain. Long leg splint was applied in knee extension after the tourniquet released.

The average operative time was 212 mins. The blood loss was minimal in both groups due to tourniquet used. The hospital stay was 3.5 days. Post-operative x achieved excellent Rasmussen radiological score. No complication was found.

#### Discussion

The traditional ORIF of tibia plateau fracture require arthrotomy and even osteotomy to better visualize the depressed joint surface. The more soft tissue dissection lead to longer recovery and more postoperative stiffness. ARIF was introduced as an alternative of the ORIF.

ARIF revealed to be safe and reliable in treating Schatzker type I~IV or unicondylar tibia plateau fracture in several studies. ARIF provided comparable clinical outcome to ORIF. Esmat Elabjer et al. described shorter hospital stay( $p=0.0001$ ) of ARIF ( $3.1\pm 0.63$  days) compare to ORIF ( $5.51\pm 1.66$  days). ARIF can provide direct visualization of the joint surface and checked the ACL, PCL, and meniscal injuries simultaneously.

A systemic review published by Chen XZ et al. which included total 609 patient showed 42.2% meniscal injury and 21.3% ACL injury present with tibia plateau fracture. 6 cases with severe complication (1 compartment syndrome, 3 deep infection, and 2 deep vein thrombosis) were identified in the same study.

#### Conclusions

Arthroscopic-assisted reduction allow the operator to manipulate the joint depression visually and can help reduced the fluoroscopic exposure. However, it takes longer tourniquet time, higher surgical skill demand, and additional instrument cost with limited advantages compare to ORIF. It needs more evidence to illuminate the indication and benefit of ARIF in tibia plateau fracture in the future.



**Synthes Femoral Neck System May Not Be a Suitable Implant Choice for Fixation of Osteoporotic Basicervical Femoral Neck Fracture - A Case Report of Early Fixation Failure**  
新式股骨頸固定骨板可能非骨鬆型股骨頸基底骨折適合的固定選擇 - 早期固定失敗病例報告

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### **Introduction**

Synthesis Femoral Neck System (FNS) was a newly developed implant indicated for fixation of subcapital, transcervical and basicervical femoral neck fracture in recent years. Mechanical evidence has revealed that FNS takes advantage of minimal invasiveness and higher overall construct stability compared to 3 cannulated screws and dynamic hip screw system in fixation of unstable femoral neck fractures. Nevertheless, clinical evidence is still lacking. Here we demonstrate a patient with basicervical femoral neck fracture treated with FNS suffering early fixation failure.

### **Case presentation**

A 75 years old female with past history of right intertrochanteric fracture and osteoporosis (T-score: -4.7) suffered a severe left hip pain after a falling accident on her left buttock. Left basicervical femoral neck fracture was found upon the plain film. She then received fracture fixation with FNS (1-hole plate with 130° angle) on the same day of falling accident. After operation, she was informed to avoid weight bearing for one month and discharged on the third day after the operation.

Unfortunately, ten days after discharge, she suffered a sudden onset of left hip painful disability when she tried to move from the wheelchair to the back seat of a car. Followed plain film revealed varus collapse of femoral neck with back-out of FNS side plate and broken lateral femoral cortex. Removal of FNS and refixation with cemented Proximal Femoral Nail Antirotation II (200mm x11mm, 90mm blade, PFNA II, Synthes) was then applied with achievement of near-anatomical reduction after revisional surgery. She was discharged on the 6th day after revisional surgery and under regular clinic follow-up for two months without subsequent complications.

### **Discussion**

Although FNS was indicated for fixation for basicervical femoral neck fracture, FNS with short 1-hole side plate may have shorter lever arm against varus force of femoral neck, resulting in potential sources of stress risers over fixation screws on the side plate. In severe osteoporotic bone as presented in this case, stress concentration on the side plate of FNS may be therefore vulnerable to fixation failure.

### **Conclusion**

Synthes Femoral Neck System may not be a suitable implant choice for fixation of basicervical femoral neck fracture especially in patients with severe osteoporosis. Further clinical and biomechanical evidence are warranted to prove the feasibility of FNS for fixation of basicervical femoral neck fracture.

## Outcomes of Intramedullary Steinmann Pin Fixation for Concurrent Fibula Fracture in Comminuted Tibia Shaft or Distal Metaphyseal Tibia Fractures

粉碎性脛骨幹骨折及遠端幹骺骨折合併腓骨骨折以髓內 Steinmann 針固定的結果

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### Introduction

Fracture of the tibia shaft accounts for 17% of lower extremity fractures, with concurrent fibula fracture in about

78% of these cases. Intramedullary fixation for fibula fractures can restore fibula alignment and thus facilitate fracture reduction, especially in cases with comminuted shaft or distal metaphyseal tibia fractures.

### Materials and Methods

Patients who had internal fixation of comminuted tibia shaft or distal metaphyseal tibia fracture and a concurrent fibular fracture treated with intramedullary Steinman pin fixation were included in this study. Patients' demographic data and fracture patterns were analyzed retrospectively. Postoperative X-rays were used for fracture union evaluation and alignment analysis.

### Results

Nine males and one female were included in the present study. Tibia fractures were classified as four OTA42 and as six OTA43, including one type I, two type II, one type IIIA, and three type IIIB open fractures. Intramedullary nail and locking plate were used as definitive fixation in four and six cases, respectively. Complications required additional surgeries including wound debridement for one patient, bone graft for three patients, and revision surgery from a broken plate to an intramedullary nail for one patient. A total of 14 fibula fractures were identified in ten patients due to four segmental fractures. Eight were Weber type C, one was Weber type B, and five were midshaft fractures. The mean duration of fibula fracture healing according to radiographs was 6.9 month.

### Discussion

To date, the necessity of adjunctive fibular fixation remains debatable. Prior fibula fixation restores lateral column length and facilitates tibia fracture reduction, especially for comminuted or distal metaphyseal tibia fractures. Furthermore, the restored stability of the lateral column can decrease the incidence of malunion by lower-limb alignment maintenance, especially when using intramedullary fixation for distal tibia fixation. The results of biomechanical studies suggest that adding supplemental fibular fracture fixation to intramedullary nail fixation of distal tibia fractures increases construct stability and may decrease the risk of valgus malunion.

### Conclusions

This study suggests that intramedullary Steinmann pin fixation for concurrent fibula fracture is a critical procedure when dealing with comminuted shaft or distal metaphyseal tibia fractures.

## Outcome of Distal End Clavicle Fractures Treated with Locking Plates

### 以互鎖式鋼板治療遠端鎖骨骨折之結果

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#### Introduction

Fracture of distal end of the clavicle is an entity which always creates a doubt in the mind of orthopaedic surgeons. With so many treatment options and numerous recommendations available in the literature, this is one of the most controversial fracture. Till date there is no gold standard treatment recommendation for this injury. At most times the deforming forces are not taken into consideration, and the fracture is not fixed securely. In this study, we assessed a fixation technique using the precontoured locking plates to find out whether it provided a stable fixation with good functional outcome.

#### Materials and Methods

Totally, 24 patients with lateral end clavicle fracture (Neer's Type II) were included in the study. After the informed consent and preoperative investigations were obtained, open reduction and internal fixation was done using a precontoured superior locking plate with lateral extension under general anesthesia. Postoperative X-rays were done on day 1 and every 6 weeks after operation, until radiological union was achieved. The postoperative pain was assessed using Visual Analogue Scale (VAS) on postoperative days 1, 2 and 10. Postoperatively arm pouch sling was given for 2 weeks followed by active mobilization. Patients were asked to do their daily routine work and avoid lifting heavy weights. The functional outcome was assessed at the end of 2nd and 6th months with the help of Disabilities of the Arm, Shoulder and Hand (DASH) scoring.

#### Results

All fractures united within 6–12 weeks except one which went to non union following a deep infection. On an average all patients had good to excellent results. There were two major complications. One had a fracture at the medial end of the plate and one had deep infection which went to symptomatic nonunion. In addition to these there were four minor complications – one superficial infection and three hardware symptoms. 14 out of 24 patients had a repeat surgery for plate removal (4 for hardware symptoms, 1 for deep infection and 9 had them removed voluntarily).

#### Discussion

Plating is one of the surgical option for this fracture. But the distal fragment will be too small to be rigidly held with ordinary plates. Special pre-contoured superior locking plates were particularly developed for this purpose. The lateral end of the plates has multiple 2.7 mm locking screw holes, in diverging configuration for the best possible hold. This allow early mobilization. This implant neither cross the AC joint nor hinders the rotational movement of clavicle at the AC joint making implant removal unnecessary. But due to impingement, 4 patients needed plate removal and this had to be done under general anaesthesia.

#### Conclusions

The pre-contoured locking plates with lateral extension may be a good method to fix the fractures of the lateral end clavicle, which provide a stable fixation with good functional outcome with very few instances of stiffness and decreased range of motion of the shoulder with the hook plates and failure of fixation in screw and K-wire fixations. It may well be the answer to the fixation questions of the lateral clavicle fractures, although larger comparative studies between the surgical treatment methods are required to confirm the same.

## Displaced Scapular Fractures: Indication and Long-Term Results of Open Reduction and Internal Fixation, Our Experience

### 位移性肩胛骨骨折的適應症及長期追蹤

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#### Introduction

Displaced scapular fractures are often found in polytraumatized patients. In emergency treatment they assume a minor role. Advances in dealing with severely injured patients in most instances allow us to perform an operation on the fractured scapula within the first 2 weeks after injury. A differentiated approach is necessary as exclusively conservative treatment does not always bring about good results.

#### Materials and Methods

From 2000-2010 we performed open reduction and internal fixation (ORIF) in 30 patients with displaced fractures of the scapula. The long-term results could be assessed in 25 patients after an average of 6.5 years. The different types of fractures were classified according to Habermeyer/Ideberg, and the Constant score was used in the evaluation of results. Some 64% of patients were involved in road accidents, and 64% suffered concomitant injuries. Articular fractures (n = 8) were the most common ones, followed by fractures of the coracoid process (n = 6) and the neck of the scapula (n = 3).

#### Results

There was no early postoperative complication, and follow-up showed a breakage of K-wires in one patient (fracture of the acromion). Sixteen patients obtained a very good, four patients a good, three a fair and two a poor result (according to the Constant score). Fractures of the scapular neck had the best results in terms of pain, daily activity, range of motion, and strength) as compared with fractures of the glenoid and apophyseal fractures. The radiological evaluation of the articular fractures showed advanced arthrosis of the glenoid with a discrepancy of the surface of more than 2 mm in one patient and a moderate arthrosis (first degree) with an intra-articular displacement of less than 2 mm in another one. The remaining six patients were free of articular incongruities and other signs of arthrosis. In this retrospective study of operatively treated patients with displaced scapular fractures, more than 70% achieved very good or good results. In severely injured patients, the diagnosis of scapular fractures should be carefully excluded.

#### Discussion

The high number of severe injuries accompanying scapular fractures (up to 92%) is adequately documented in the literature, and it is generally accepted that fracture treatment of the scapula is of minor importance in the severely injured patient. Nevertheless, this fact should not be used as a justification for inadequate therapy. A judicious concept considering the benefits of conservative and operative treatment for each patient and each fracture type is essential to achieve good results. Better understanding of polytrauma-induced pathophysiology with a favorable impact on therapy and patient outcome enables us to operate on most patients within the first 2 weeks following the accident.

#### Conclusions

Depending on age, activity, and general condition of the patient, ORIF is recommended in: grossly displaced fractures of the acromion and coracoid process; displaced fractures of the anatomical neck; unstable fractures of the surgical neck; displaced fractures of the glenoid. Often, CT scanning with 3D reconstruction has to be combined with conventional radiography to define the exact type of the fracture. On the basis of our experience, we recommended early operative treatment for the type of fractures enumerated above in order to achieve good results.

## Operative Treatment of 2-part Surgical Neck Type Fractures of the Proximal Humerus, Interlocking Nail Versus Locking Plate

比較互鎖式鋼板跟互鎖式骨髓內釘於近端肱骨手術頸在治療上的差別

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### Introduction

The purpose of this prospective randomized controlled clinical trial was to compare locked plating with intramedullary nailing in the treatment of displaced 2-part surgical neck type proximal humeral fractures in elderly patients

### Materials and Methods

Patients  $\geq 65$  years of age with a displaced 2-part surgical neck type fracture of the proximal humerus were surgically treated and randomized for either augmented locking plate fixation Group LP or intramedullary nailing Group IN . The primary outcome parameter was the Disabilities of the Shoulder, Arm and Hand (DASH) Score after 24 months. Secondary outcome parameters were the age- and gender adjusted Constant Murley Score (CS), the American Shoulder and Elbow Score (ASES), the Oxford Shoulder Score (OSS) and the Short Form 36 (SF-36) after 6 weeks, 3 months, 6 months, 12 and 24 months. Further parameters included the quality of fracture reduction as well as complications and revision surgeries. 62 patients with a mean age of  $73 \pm 9.7$  were included and longitudinally followed over 24 months (follow-up rate: 83.4%).

### Results

The mean DASH-Scores at 24 months was  $33.6 \pm 9.6$  points in Group LP versus  $36.8 \pm 8.1$  points in Group IN (  $p = 0.041$ ). The mean Constant Murley Score at 24 months follow-up was  $75.2 \pm 7.6$  points in Group LP compared to  $73 \pm 9.3$  points in Group IN (  $p = 0.0 \bullet$  ). The ASES at 24 months follow-up was  $73.1 \pm 8$  points in Group LP versus to  $72.5 \pm 8.8$  in Group IN (  $p = 0.51$ ). The OSS at 24 months was  $43.6 \pm 8.3$  in Group LP compared to  $37.2 \pm 9$  in Group IN (  $p = 0.03$ ). The SF-36 at 24 months was  $73.1 \pm 11.5$  in Group LP versus to  $70.3 \pm 12.8$  in Group IN (  $p = 0.28$ ). Screw cutting out was observed in  $n = 2$  (6,7%) cases of Group LP , and in none of Group IN (  $p = 0.49$ ). Revision surgery was necessary in  $n = 2$  (6.7%) cases of Group L P and in two cases of Group IN (6.7%,  $p = 1$ ).

### Discussion

The purpose of this prospective randomized controlled clinical trial was to compare locked plating with intramedullary nailing in the treatment of displaced 2-part surgical neck type proximal humeral fractures in elderly patients. One of the most important findings of this trial is that both, the locked plating and the intramedullary were found comparable in recovering shoulder function after a 2-part surgical neck type fracture in elderly patients. The results of this trial showed no significant differences between the study groups in terms of quality of life at 24-month follow-up.

### Conclusions

Functional outcomes are similar at 2-years follow-up in locked plating compared to intramedullary nailing. Both implants reached low complication and revision rates for two-part surgical neck types fractures of the proximal humerus in patients  $\geq 65$  years, if anatomic fracture reduction and accurate implant position was obtained.

**A Rare Case: Patellar Tendon Rupture with Avulsion from Tibial Tuberosity in an Old Lady**

罕見病例報告：髌骨肌腱受傷併脛骨粗隆扯裂性骨折的一位年長女性

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大林慈濟醫院骨科部

**Introduction**

Tibial tuberosity avulsion fracture is not common. The incidence of patellar tendon rupture with avulsion fracture from tibial tuberosity varies from 0.4% to 3% of all knee extension system injuries. In most cases, the patellar tendon is ruptured from the upper end as a sleeve fracture of the patella. We herein report a case of patellar tendon avulsion with a tibial tuberosity fragment in elderly patient and discuss the diagnosis and treatment with a brief review of the literatures.

**Materials and Methods**

We present a case of a 76-year-old woman with history of diabetes who sustained right patella tendon rupture with avulsion from tibial tuberosity after falling off while doing household chores. She was treated operatively with cannulated screw and anchor suture technique with post-operative bracing immobilization.

**Results**

After the surgery, the VAS score was decreased regarding the satisfaction with the outcomes. There was no wound complications, nerve injury, or complaint about problem with footwear. The fracture healed and the patient regained her full range of movement of the knee at 5 months after the operation.

**Discussion**

Patella tendon rupture with avulsion from tibial tuberosity in elderly is rare. Previous literatures showed most case were reported to occur during sports activity, especially in pediatric patients with patellar tendon avulsion at the distal attachment of the tibia with small fragments due to uncompleted ossification. The main cause of extensor mechanism injuries of the knee is forceful contraction of the quadriceps against a partially flexed knee or firm resistance. The quadriceps undergoes an eccentric load avulsing the patellar tendon complex. Failure of the patellar tendon is relatively uncommon among extensor mechanism injuries of the knee. In most cases of patellar tendon rupture, the patient has tendon degeneration due to chronic renal failure or diabetes.

In isolated traumatic tendon rupture, early mobilization has been advocated without cast immobilization after primary repair. However, for tibial avulsion fracture, the patients are usually immobilized with a cast for 4 to 6 weeks, after which, physiotherapy is commenced.

**Conclusions**

Patella tendon rupture with avulsion from tibial tuberosity in elderly is rare. Early diagnosis and adequate surgical management are necessary to restore the extensor mechanism. Patella baja should be avoided during surgery. Postoperatively, range of movement exercise should be commenced as early as possible after casting or bracing for 4 to 6 weeks.

缺繳 E-Poster

**Simultaneous Bilateral Femoral Neck Fracture Following Low-Energy Trauma Treated with One-stage Bipolar Hemiarthroplasty: Case Report and Literature Review**  
同時雙側股骨頸骨折以一階段半髖人工關節治療:病例報告與文獻探討

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**Introduction**

Simultaneous bilateral femoral neck fractures comprise an uncommon condition that is associated with metabolic bone disease, high-energy trauma, and seizure disorders. Its occurrence following low-energy trauma in the geriatric population due to osteoporosis is even rarer, with only a very few case reports to date. We herein report an 84-year-old female who sustained bilateral displaced femoral neck fracture that was successfully treated with single-stage bilateral cemented bipolar hemiarthroplasty. The mechanism of injury, clinical features, diagnosis, treatment options, and post-operative osteoporosis survey in achieving the best outcome are discussed along with a review of the available literature.

**Materials and Methods**

An 84-year-old female was brought to the emergency department with complaints of bilateral hip pain and being unable to bear weight after falling down from a chair. She denied any previous complaints of hip pain and was mobilizing well with a walker. Standard anteroposterior and lateral X-ray of the pelvis and bilateral hips confirmed the diagnosis of bilateral displaced intracapsular femoral neck fractures.

**Results**

Considering her old age and comorbidities, one-stage bilateral cemented bipolar hemiarthroplasty (Stryker, USA) was performed 2 days after the injury under general anesthesia. A direct lateral approach with alternate left and right lateral decubitus position was performed using two sets of sterile drapes and surgical instruments. She was started on bedside rehabilitation and mobilization using a wheelchair at day 3 after the surgery. Before discharge, she was able to partially bear weight on both legs using a walker smoothly. During the recent follow-up at 4 months after the surgery, the patient was ambulating well and remained pain-free.

**Discussion**

Simultaneous bilateral femoral neck fractures are one of the rarest injuries encountered by an orthopedic doctor in daily practice, with only a few cases being reported in the literature. The majority of reported cases have described this injury to be caused due to high-energy trauma or known underlying pathologies such as primary or secondary bone disease, chronic renal disease, abnormal anatomy and chronic steroid use. It is important to obtain radiographs of the pelvis and anteroposterior and lateral views of both hips for initial assessment, and a CT scan with 3D reconstruction is also advised to rule out other associated injuries and for preoperative planning. We treated our patient with one-stage surgery because we believed that a repeat anesthesia procedure should be avoided to reduce the anesthetic risk and peri-operative complications. In addition, with one-stage surgery, the patient will be able to start rehabilitation and partially bear weight on both legs once the post-operative condition is stabilized.

**Conclusions**

Simultaneous bilateral femoral neck fractures caused by low-energy trauma in the geriatric population due to osteoporosis are an extremely rare condition, with a relative paucity of reports in the literature. Comprehensive, preoperative blood tests and imaging studies should be performed considering the higher rates of pre-existing comorbidities and peri-operative morbidity/mortality. The one-stage bilateral hip hemiarthroplasty technique is a better option for treating this type of injury provided the patient's medical condition permits. Orthopedic surgeons and emergency physicians should be aware of such injuries when treating hip fractures in the elderly population with a medical history of dementia and severe osteoporosis.



**Conventional Condylar Plate with Allograft in Fragile Bone in Patient of Poliomyelitis with Distal Femur fracture****使用傳統鋼板與捐贈骨在小兒麻痺患者合併遠端股骨骨折**

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**Introduction**

Poliomyelitis is caused by an enterovirus infection of the anterior horn cells in the spinal cord. Up to 40% of survivors recover full muscle strength, however 60 – 90% are left with varying degrees of residual paralysis, where the patient suffers from cramping myalgia and lower motor neuron pattern weakness. Joint contracture is common in affected limb and fracture in those with poliomyelitis is difficult to union.

**Materials and Methods**

We present a case with right low limb weakness and knee contracture for many years. The affected limbs make her difficult to perform daily activity. She recently suffered a fall accident and hurt her affected limb leading to a tibial plateau fracture. Conservative treatment was suggested due to no need for weight bearing. The long leg casting was performed for two months and partial union was noted during follow-up. However, she fell again, causing a distal femur fracture (AO/OTA 33A3) over the upper rim of the casting. Considering her condition, ORIF or casting were debated.

**Results**

After discussion with the patient, ORIF with allograft combined with femur shortening was done. Considering her osteoporosis and fragile bone quality, we used ulnar allograft inserted into the distal femur to increase stability. The proper length of femur shortening was made via full extension of the knee. After plate (conventional condylar plate) fixation, at least, three cortex over the metaphysis was reached. The patient was satisfied with the stability, pain relief and ROM. The six months post-op showed union of the fracture without loosening of the screw.

**Discussion**

Treatment of distal femoral fracture in post-polio patients is difficult because the bone is usually osteopenic, small and deformed. Modern locking plate systems provide stable fixation of distal femoral fractures in post-polio patients. Bony union and good functional outcomes are achieved. However, the cost of LCP is a burden to patients with poliomyelitis who are usually of low social class.

**Conclusions**

Conventional condylar plate with allograft could reach as good stability as LCP.

## Treating Proximal Tibia Fracture Postoperative Varus Malunion with High Tibia Osteotomy in Poliomyelitis Patient

使用高位脛骨截骨矯正術治療小兒麻痺患者近端脛骨骨折術後內翻畸形癒合不良

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### Introduction

Post-traumatic tibia varus malunion altered knee joint load distribution and caused great discomfort to the patient. High tibial osteotomy is a surgical procedure to re-align varus or valgus mal-alignment of the knee. Here, we shared our experience in treating proximal tibia fracture postoperative varus malunion with high tibia osteotomy

### Case and Surgical Operative Technique

Our case was a 59-year-old male with right side poliomyelitis. He suffered from right proximal tibia oblique fracture, AO-OTA 41A2.2, after a fall from standing height. He was treated initially with open reduction and internal fixation with anterolateral proximal tibia locking plate. However, gradual varus collapsed noted during follow up. He then came to our clinic for second opinion. Physical examination showed right knee gross varus deformity with skin tenting by the implant. Plain radiographs showed varus malunion with MPTA 68.2 degree.

Medial open wedge high tibia osteotomy was performed to restore normal lower limb coronal alignment. Under general anesthesia, patient was placed on supine position. Original anterolateral plate was removed first, then paramedian longitudinal skin incision over proximal tibia was carried out and pes anserinus and MCL were dissected. We made the transverse osteotomy plane along previous fracture site with the lateral cortex remained intact. 2 osteotomes were inserted between the proximal and distal fragment for opening the osteotomy site. One wedge strut femoral head allograft was impacted inside the open wedge and provided cortical support with medial calcar. Then we fixed the construct with Synthes medial proximal tibia LCP subcutaneously. Good alignment was achieved with MPTA around 86.5 degrees. Good alignment was remained during serial clinic follow up with excellent subjective outcomes. No complication noted during serial follow up.

### Discussion

For post-traumatic tibia varus malalignment, conservative therapy is not effective in managing this post-traumatic deformity. To restore the function of knee joint maximally, surgical correction of the displaced mechanical axis is needed. Medial open wedge high tibia osteotomy has long been used as a method for correcting tibia coronal plane varus malalignment. Here, we shared a case of poliomyelitis patient with proximal tibia varus malunion who treated with medial open wedge high tibia osteotomy. Good alignment could be restored with MPTA improved significantly from 68.2 to 86.5 after medial open wedge high tibia osteotomy. Good functional outcomes and satisfaction were noted during follow up.

### Conclusions

We believed that medial open wedge high tibia osteotomy with femoral head allograft for varus malunited proximal tibial fracture is a safe and effective procedure that provides excellent functional outcomes, good radiologic outcomes, and carries minimal complications. Future follow up and study is needed for long-term outcome assessment.

## The Pararectus Approach for Quadrilateral Plate of Acetabular Fractures

### 經腹直肌外側入路於髌白外側四面板骨折的治療

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#### Introduction

Quadrilateral plate fractures are normally associated with pelvic column disruption and challenging group of acetabular fractures to manage. The pattern of acetabular fractures has changed within the last 20 years with increased prevalence of quadrilateral plate fractures due to the rising number of elderly osteoporotic trauma fractures. Pararectus approach has been introduced as the approach to surgically stabilize quadrilateral plate fractures allowing for better visualization of the acetabular dome.

#### Materials and Methods

A review was conducted on the medical record of 28-year-old man with right acetabulum fracture, associated both column and central dislocation of the femoral head, right pelvic ring fracture, LC type II, involved quadrilateral plate. He presented to our emergent department with right hip painful disability after a traffic accident. He then received open reduction and internal fixation over right acetabulum and pelvis in pararectus approach. A PubMed search was done to review the literature on pararectus approach for the management of quadrilateral plate fracture.

#### Results

The patient received open reduction and internal fixation in pararectus approach with two semitubular plates for quadrilateral plate buttress and Synthes locking plate for iliac wing bridging. Anatomic restoration was achieved and the follow-up plain films showed good alignment.

#### Discussion

The pararectus approach had been described as a less-invasive, single-incision approach. It allowed clear visualisation of the fracture with good access to the acetabular dome and quadrilateral plate. The pararectus approach also kepted inguinal canal intact and avoid the iatrogenic inguinal hernia. It provided safe surgical dissection and favorable outcome.

#### Conclusions

In the treatment of acetabular fractures involving the quadrilateral plate, the pararectus approach allowed anatomical restoration with minimal access morbidity.

## Combination of Anterior Subcutaneous Internal Fixation and Posterior Spinopelvic Fixation in Unstable Pelvic and Sacral Fractures: A Case Report

不穩定骨盆及薦椎骨折之前側皮下內固定合併後側脊椎骨盆固定治療:病例報告

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### Introduction

We present a case of traumatic unstable pelvic and sacral fractures with spinopelvic dissociation in an accidental fall which was treated by the combination of anterior subcutaneous internal fixation and posterior spinopelvic fixation.

### Case Presentation

A 32-year-old woman without systemic disease had a fall from 6 meters high while playing rope swinging in March 2020. She was referred from a local hospital to NTUH for multiple fractures. CT revealed pelvic fracture, Young-Burgess vertical shear type, right sacral fracture, Denis zone II, with spinopelvic dissociation, active bleeding at pelvic floor, L1 chance fracture, TLICS 7 points. ATLS program was initiated promptly. Emergent transcatheter arterial embolization of bilateral internal iliac artery was then performed, followed by external skeletal fixator application for pelvic fracture.

After medical optimization, she received the following procedures.

- (1) Posterior instrumentation with transpedicular screws at T12 and L2 with MIS technique
- (2) ORIF for sacrum and spinopelvic dissociation with transpedicular screws (bilateral L5 and left S1) and right side iliac screw
- (3) triangular fixation at right sacroiliac joint with headless screw

The external fixator was shifted to anterior subcutaneous internal fixator few days later for multiple anterior ring fractures. Suspected right side lateral femoral cutaneous nerve paresthesia was noted after the application of ASIF. The patient was transferred to rehabilitation ward for intense rehabilitation program. ASIF was removed 9 months later. She recovered well and was able to walk independently without remarkable walking abnormality and do YOGA and aerobic exercise at the last follow-up.

### Discussion

Unstable pelvic ring fractures are usually associated with high energy trauma and could lead to high rate of morbidity and mortality. Spinopelvic fixation is indicated in traumatic unstable sacral fracture, sacroiliac injury and spinopelvic dissociation. It offers great mechanical advantage, stabilizes the spinopelvic junction and allows early weight bearing.

However, in some cases with anterior pelvic ring instability, additional anterior fixation may be needed. The concept had been proposed and named the “Hula Hoop” technique. Minimally invasive anterior subcutaneous internal fixation (ASIF) is an option with low soft tissue complication rates. Potential complications included lateral femoral cutaneous nerve irritation, anterior thigh pain and heterotopic ossification.

### Conclusions

In this case, lateral femoral cutaneous nerve irritation was noted and resolved after removal of ASIF. Good bone healing is achieved during the follow-up period and the patient has satisfied functional recovery. Combination of ASIF and posterior spinopelvic fixation is a viable procedure in such fracture pattern.

## Floating Knee Injuries in Our Clinical Practice

### 針對浮動性膝部損傷的處理經驗

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#### Introduction

Floating knee, referred to as ipsilateral fractures of the femur and tibia, is usually associated with several complications and mortality. Our purpose was designed to present our clinical practice with treatment of this injury throughout; age, sex, mechanism of injury, associated injuries, method and results of treatment, and complications of floating knee are discussed.

#### Materials and Methods

We retrospectively reviewed all patient with neglected floating knee injuries in Chi-Mei Medical center over a five-year period from 2016 to 2020, and we excluded patients owing to death by other major trauma reasons in half year. All the patient's age, gender, past medical history, clinical presentation, radiograph, special image and follow-up OPD outcome.

#### Results

41 cases were enrolled with 8 women and 33 men. The average age was 42.3 years-old. Type (D) according to "the classification of Letts and Vincent" was observed in 38.9% cases. The most frequent mechanism of injury was car to motorcycles accidents (48.2%). The most common associated injury was pelvic fractures (76.8%) and the next one was ankle fractures (12.1%). Open reduction and internal fixation was the common type of initial treatment (70%). The most common early and late complications were knee hemarthrosis in 8 cases (19%), knee stiffness in 6 cases (14%) and knee osteoarthritis in 5 cases (12%), respectively. Death during the 5 years follow up was due to circulatory disruption, followed by deep vein thrombosis (61%).

#### Discussion

Previous studies showed good result after operative treatment of floating knee injury. Besides, there is common agreement on recent studies that best management for floating knee injury is surgical fixation of both the fracture. The complication and poor prognosis may result from initial other major trauma, surgical time, reaming too much or bed rest without rehabilitation. Retrospective study and small sample size are limitations of our study.

#### Conclusions

Our practice revealed that the complication rate associated with floating knee injuries remained high, regardless of the used treatment regimen and surgeons should focus on reducing complications while treating it. Excellent outcomes following these injuries can be achieved with individualized plan of management by multidisciplinary team.

## Supraclavicular Nerves Protection During Open Reduction and Internal Fixation for Clavicle Fracture

### 針對鎖骨骨折復位內固定時對鎖骨上神經的保護經驗

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#### Introduction

The supraclavicular nerve is a sensory nerve with branches in the proximal region of the clavicle and provides sensitivity for the clavicle, anteromedial region of the shoulder and proximal region of the thorax. Our study was to verify whether the approach of protecting supraclavicular nerve could effectively reduce the discomfort caused by iatrogenic injury to the supraclavicular nerve.

#### Materials and Methods

We retrospectively reviewed all patient of clavicular fracture with supraclavicular nerves preservation during open reduction and internal fixation in Chi-Mei Medical center over a five-year period from 2016 to 2020, and we excluded patients due to fracture over 4 weeks or above, open or pathological fracture, ipsilateral limb trauma history or skin hypoesthesia before surgery. All the patient's age, gender, past medical history, clinical presentation, radiograph, special image and follow-up OPD outcome were recorded.

#### Results

The preservation of supraclavicular nerves (diameter > 0.5 mm) during ORIF significantly decreased the degree and range of numbness at two weeks after operation. In addition, there was a trend indicating the modified ORIF could reduce the incidence of complications related to supraclavicular nerve injury during one year follow up.

#### Discussion

The longer incision, blood loss was significantly less in experimental group compared with control group. Meticulous dissection can not only identify and protect the nerves but also avoid the injury of vessels, which may be the main reason leading to the reduction of blood loss.

#### Conclusions

The preservation of supraclavicular nerves (diameter > 0.5 mm) during ORIF had effect on relieving the skin numbness in patients with unilateral midclavicular fractures. Surgeons should aim to preserve the branches of the supraclavicular nerve although this may not always be possible as we have demonstrated.

**Rhabdomyolysis in Unilateral Femoral shaft Fracture : A Case Report****病例報告：單側股骨骨幹骨折導致橫紋肌溶解症**周佳佑 林威廷 簡基勝

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**Introduction**

Rhabdomyolysis is a syndrome caused by musculoskeletal tissue damage that leads to the release of intracellular elements such like myoglobin, which causes acute kidney injury. The most common causes are severe trauma, ischemia, surgical procedures, and drug abuse. In this case report, we report a case of rhabdomyolysis that occurred in a simple unilateral femoral shaft fracture.

**Case presentation**

This 73-year-old male patient with underlying disease of the hypertension, diabetes mellitus and coronary artery disease was brought into the emergency department by emergency medical services after traffic accident. Emergency medical technician reported that no one had seen how the traffic accident happened. His Glasgow Coma Scale score was 15. He was stuck in his car with the car windscreen broken. He was boarded, collared, and brought to the ED. In the ED, he complained of pain in his right leg. His vital signs were temperature of 30.8°C at first soon returning to 35.8°C, heart rate of 119 beats/min, blood pressure of 191/79 mm Hg, respiratory rate of 22 breaths/min, and an O<sub>2</sub> saturation of 97% on room air. His physical examination was notable for multiple abrasions around his left hand and a laceration wound on the middle finger. Right thigh tenderness and deformity was also noted. There was no distal neurovascular compromise in right lower limbs. Plain film showed right femoral shaft transverse fracture. CT scan revealed there were no intracerebral hemorrhage, or abdomen internal bleeding. Lab data showed hypoglycemia (37 mg/dL) and leukocytosis (WBC:27,800 cells/mL). No electrolyte imbalance was noted. The patient was stabilized after intravenous glucose infusion, followed by open reduction and internal fixation. However, after the operation, oliguria and dark urine was present. His blood pressure was 73/40 mmHg. Lab data showed high level of total creatine kinase (3183 U/L), myoglobin (>12000 ng/mL) and hyperkalemia. Hypovolemic shock and acute kidney injury were confirmed. After hydration and electrolyte correction, the patient became stable and lab data of myoglobin and total-CK returned to normal level.

**Discussion**

Rhabdomyolysis often occurs after severe multiple traumas. In Taiwan, we routinely do not check myoglobin and total-CK levels after motor vehicle injuries. As a result, we do not always aware of the possibility that rhabdomyolysis may occur in patients with a single bone fracture. After we reviewed the patient's history, the primary causes of rhabdomyolysis in this case were considered to be hypothermia and crush muscle injury.

**Conclusions**

Rhabdomyolysis following a single bone fracture is relatively uncommon but we should still keep in mind the possibility of rhabdomyolysis. Clinical history including mechanism of injury should be acquired more comprehensively in our practice, while and checking myoglobin and total-CK levels is necessary in the case where rhabdomyolysis is highly suspected.

缺繳 E-Poster



**Conversely Distal Clavicle Interlocking Plate Fixation of Proximal Clavicle Fracture****近端鎖骨骨折之內固定**

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**Introduction**

Proximal clavicle fracture, also known as medial end clavicle fracture, is the least common type among whole clavicle fracture patterns. About 3~10% was documented in the previous studies. However, acute medial end clavicle fracture usually associated with high-energy trauma, such as traffic accident, X-sports, or multisystem damage. The combination with chest, head, neck and visceral trauma can lead to serious situation. Management of proximal clavicle fracture is mainly conservative, but complication of pain, limitation in range of motion and non-union was reported some times.

**Materials and Methods**

We retrospectively review a 69 years old lady. She had underlying disease of HTN and DM and her activity of daily life was totally independent. She suffered from left shoulder and chest wall pain after traffic accident as a motorcyclist on 2020/11/03. PE at emergency department of Chi-Mei Hospital showed tenderness in left upper lung field and left shoulder painful limitation in range of motion. CT showed left proximal clavicle fracture, left 3<sup>rd</sup>~8<sup>th</sup> ribs fracture and left scapular fracture. She was admitted to ward of thoracic surgery for further evaluation and management. However, unbearable left shoulder pain was complained and we were consulted. Conservative treatment was suggested initially, but after discussed with the patient, she worried about the functional outcome of conservative treatment and asked for operation. Therefore, open reduction internal fixation with distal clavicle interlocking plate conversely was performed on 2020/11/19 and under arm sling protection postoperatively.

**Results**

After the operation, the pain relieved gradually and she was regularly OPD followed up. Xray showed status post open reduction internal fixation without displacement. Moderate range of motion could be done. Further rehabilitation program will be started after the union of the lesion.

**Discussion**

Operation for this kind of fracture were seldom mentioned. Complication of K-pin migration and iatrogenic injury of mediastinum with plating fixation were previously reported. We used the distal clavicle interlocking plate conversely for proximal clavicle fracture. No obvious complicated was noted after the operation and the symptom improved gradually. We still need long term follow up, more case series, and prospective cohort to prove long term outcome.

**Conclusions**

Conversely distal clavicle interlocking plate fixation could be a good choice for proximal clavicle fracture.

## Modified Approach for MIPO of Distal Femur Fractures

### 遠端股骨骨折微創內固定之途徑改良

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#### Introduction

Distal femur fracture is not quite common, with about 5% of all femur fracture pattern and less than 1 % of all fracture injury as previous reported. Most cases of distal femur fracture involving articular surface need further operative treatment. Various procedures including ORIF, IM nail, and distal femur replacement had been considered for different distal fracture types. Traditional lateral approach for ORIF is difficult for reduction complex fractures especially with articular surface involvement due to poor visualization and thus results in more soft tissue injury. Therefore, modified approach for MIPO of distal femur fractures is performed in our practices.

#### Materials and Methods

We retrospectively review 5 cases since 2017 to 2021. They were all diagnosed as distal femur fracture and modified approach for MIPO with locking plate was performed. Apart from lateral approach of AO surgery reference, a flap-like incision is started from lateral side of epicondyle to the superior-lateral area of patella, then extended along with the knee joint line. Iliotibial band incision and joint capsule arthrotomy is made for better visualization of articular surface. Reduction of the articular surface can be performed in soft tissue friend way. At last, minimal invasive plating and stab incisions percutaneous screw placement are performed.

#### Results

In our 5 cases, no obvious complication was noted after the operation and the symptom improved while OPD follow up. For cases with over 6 months follow up, nearly full ROM was observed and no daily activity limitation was complained.

#### Discussion

Traditional lateral approach for ORIF is difficult for reduction complex fractures. With this modified approach for distal femur fractures, better visualization is obtained and better reduction of femoral articular surface can be restored. Besides, flap-like incision can provide soft tissue pressure release while intermuscular septum elevation. Bridging plate with percutaneous screw is used for minimal invasive concepts. We still need long term follow up, more case series, and prospective cohort to prove long term outcome.

#### Conclusions

Modified approach for MIPO of distal femur fractures might be better than traditional lateral approach.

**Management of Isolated Greater Trochanter Fracture: A Case Report****單獨大轉子骨折的處置：病例報告**

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**Introduction**

Hip fractures have long been recognized as a major public health problem in elderly. In acute emergency settings, initial visualization of hip fractures most often is on radiographs. However, occult fracture may not be seen at initial radiographs. In cases of isolated greater trochanter fracture, to extinguish the possible intertrochanteric fracture is difficult. Underestimation of occult intertrochanteric extension may result in displacement of a previously non-displaced fracture. The following case is 86-year-old female initially diagnosed as isolated greater trochanter fracture.

**Materials and Methods**

This is a 86-year-old female with history of hypertension and type 2 diabetes mellitus under medical control. She experienced right hip painful disability after a fall from standing-height. She was brought to our outpatient clinic for evaluation. Physical examination showed a positive Patrick test. Plain films revealed right greater trochanter fracture without obvious intertrochanteric extension. Bed rest was suggested first and follow-up two weeks later was suggested. However, more intense right hip pain occurred without further trauma. She came back to our outpatient clinic and follow-up plain film revealed a displaced right intertrochanteric fracture.

**Results**

The patient was admitted and received open reduction and internal fixation with Gamma nail. The intertrochanteric region was comminuted and caused the fracture relatively unstable to keep reduction under traction. The post-operative course was uneventful and the patient was discharged smoothly.

**Discussion**

A systemic review had reported that isolated greater trochanter fractures diagnosed on initial radiographs could accompany with intertrochanteric extension up to 90%. MRI is a reliable tool to distinguish the occult fracture. To date, established guidelines for the treatment of greater trochanter fractures with occult intertrochanteric fractures do not exist. Some suggested that the intertrochanteric fracture which cross the midline tend to be treated surgically. A retrospective review of 85 greater trochanter fractures receiving conservative treatment reported a good result even in the presence of occult fractures identified on CT or MRI. Thus, the author declaimed that cross sectional imaging rarely changed the treatment protocol for isolated greater trochanter fractures and further advocated a treatment protocol that encourages early mobilization.

**Conclusions**

The occult intertrochanteric extension is frequent in isolated greater trochanter fracture diagnosed by plain films. CT or MRI is helpful for detecting these occult fracture. However, the corresponding treatment is still debating. We demonstrate a case with isolated greater trochanter fracture and occult intertrochanteric extension received conservative treatment and failed. The treatment should be based on the actual fracture involvement, the compliance, patient's comorbidities, and baseline activity. Further investigations to establish a guideline for management of greater trochanter fracture are needed.

## A Rare Postoperative Complication of Acetabular Fracture— External Iliac Artery Thrombosis

一個少見的髌臼骨折術後併發症-外髂動脈栓塞

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### Introduction

Acetabular fractures may result in variable complications including infection, sciatic nerve injury, avascular necrosis, or blood clot formation. External iliac artery (EIA) thrombosis is also a rare and limb-threatening complication of acetabular fracture, which usually arises from an embolic event. Unrecognized, it can lead to limb ischemia, tissue necrosis and even amputation. We describe a case of a young healthy female with right acetabular both column fracture and pelvic fracture, who was then found to have right external iliac artery thrombosis after ORIF of acetabular fracture intra-operatively.

### Materials and Methods

We report a case of 25-year-old female without any major systemic disease. She suffered from right hip painful disability after a motorbike traffic accident (motorbike passenger, and collided with tour bus from behind). At our emergency department, vital sign was stable, and there were no abdominal, chest, or brain injuries. Physical examination showed no distal neurovascular deficit. Pelvis CT(+) revealed right acetabular both column fracture, bilateral pubic ramus fracture, and right iliac wing fracture. There were no contrast medium extravasation nor vascular occlusion noted. She received right acetabular ORIF 5 days after the initial accident.

### Results

Intra-operatively, para-rectus approach and Smith-Peterson approach were used. ORIF of right acetabular fracture with reconstruction plate and interfragmentary screws was performed smoothly. However, decreased pulse of right external iliac artery (EIA) was observed after ORIF intra-operatively. Emergent CTA disclosed occlusion of the proximal right EIA, but patency of the right common femoral artery to tibial and peroneal arteries. Cool right lower leg and decreased distal pulsation comparing to left side were taken into notice, whereas right foot movement and sensation were intact. Right side ABI was 0.5, while left ABI was 1.07. On the next day, open embolectomy with Fogarty catheter was done, and much thrombus was removed. After operation, the distal circulation improved. And the pelvic and acetabular fracture recover well.

### Discussion

Literature review showed that only 5 cases have been reported. The causes of thrombosis were speculated as an inappropriate surgical procedures in three cases (such as aggressive retraction and extensive exposure around the vascular bundle, fracture manipulation, or malpositioned instruments), and atherosclerotic plaque rupture in three cases (one case: both inappropriate surgical procedure and atherosclerotic plaque).

### Conclusions

Post-operative thrombosis of the EIA following ORIF for acetabular fracture is extremely rare. Still surgeons must consider EIA thrombosis as a potential complication following ORIF. In this case, EIA thrombosis could be explained by intraoperative vascular handling procedures. Vascular bundles should be handled as gently as possible. Close circular monitoring is necessary, especially those with high risks of atherosclerotic changes.

## Economic Analysis of Open Reduction and Internal Fixation of Metacarpal Fracture with WALANT Procedure Versus General and Local Anesthesia

### 完全清醒無止血帶手術與傳統全身麻醉和局部麻醉的經濟效益分析報告

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高雄榮民總醫院骨科部<sup>1</sup>

#### Introduction

Traditional hand surgery is performed with GA or LA and tourniquet is necessary to create a bloodless field. WALANT technique is based on local infiltration of lidocaine and epinephrine, which eliminates the need for tourniquet and constriction of blood vessels. The purpose of this study is to investigate the anesthesia, operative time and to perform an economic analysis between GA, LA and WALANT hand surgery of metacarpal fractures ORIF.

#### Materials and Methods

All cases of metacarpal ORIF surgery performed between 2015 and 2019. Age and gender of all patients were recorded and were divided into three groups, GA, LA and WALANT technique. All surgeries were performed in the same procedure and by the same orthopedic surgeon specialized in hand surgery. The National Health Insurance, standard cost estimation protocol in Taiwan, was used to determine the cost of performing each procedure and supplement. Time of surgery include ER to OR time, anesthesia time, surgical time, and recovery time and post-operative vomiting were documented.

#### Results

63 patients met the inclusion criteria with metacarpal fractures. Three groups, 24 in GA, 28 in LA and 11 in WALANT procedure. The ER to OR time, GA group had an average of 2.3 day, LA group 1.4 day and WALANT group 2.0 day ( $P > 0.05$ ). The anesthesia time, patients in the GA group had an average of 32.8minutes, LA 19.5minute and WALANT 21.4minutes. GA group has a statistically longer time, compared to other two groups ( $P < 0.05$ ). The surgical time, patients in the GA group had an average total OR time of 44.7minutes, LA group 43.7minute and WALANT group 50.7minutes ( $P > 0.05$ ). Complication of vomiting after anesthesia in these group were 20 in the GA group (38.1%), 0 in LA group and WALANT group ( $P < 0.05$ ). According to Taiwan National Health Insurance, we estimated that each case performed under GA had excess charges were 8233 point, approximately equal to 8233 TWD.

#### Discussion

Literature have showed that WALANT offered patients and surgeons an alternative way for surgical treatment of metacarpal fracture. In our analysis, we found no significant difference in the length of the procedure or the surgical time spent in the OR. However, our results did demonstrate a trend of less time in the anesthesia time, low incidence of post-op vomiting and lower medical cost. WALANT group do not receive anesthetic agents, they do not have to recover from their side-effect and savings of 8233 TWD per case.

#### Conclusions

Metacarpal ORIF surgery under WALANT demonstrated a trend of less time in anesthesia, post-operative vomiting and cost but no difference in surgical time from incision to closure and intraoperative complication. Patients in the WALANT group also spent less time in post anesthesia care unit, and reduce costs, which is likely an underestimate amount.

**Case Report: Application of Masquelet Technique in Non-union of Tibio-fibular Fracture****案例分享：誘導膜技術於脛腓骨骨折不癒合的應用**陳易鉉<sup>1</sup> 盧康樂<sup>2</sup> 呂俊寬<sup>3</sup>

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**Introduction**

Masquelet's induced membrane technique is a relatively new, two-stage surgical procedure to reconstruct segmental bone defects, first performed by Dr. Masquelet in the mid-1980s.

Posttraumatic bone defects and nonunions mostly affect the tibia. However, their management is challenging for surgeons. It is generally accepted that bone defects shorter than 6 cm can be treated by nonvascularized autologous bone grafting. The two-step bone grafting method in the Masquelet technique used for tibia non-unions is a promising treatment option.

**Case Scenario**

This 28 years old male without underlying diseases presented to our emergency department with the left lower leg open wound and deformity after a motorcycles traffic accident. On physical examination, skin defect with fracture bone exposure was noted and there were no obvious associated neurovascular injuries. Radiographs confirmed the diagnosis of tibio-fibular comminuted open fracture, Gustilo type IIIC. Since the soft tissue envelope was compromised, external fixation was applied initially and shifted to tibia nail with fibula plate after achieving the adequate skin coverage.

However, non-union of tibia shaft was addressed about 10 months post nailing. Allo-grafting was applied first but the problem remained in 1 year follow up. Then dynamization of proximal screws of tibia nail was performed but the non-union persisted in the next 10 months. Thus we removed the nail and revision with plating and allo-grafting was done. However, in the next 10 months of follow up, the non-union still existed.

To address this condition, we performed the Masquelet technique with 6 weeks interval. After the membrane was induced, the vancomycin laden cement was replaced with iliac bone autograft combined with allograft. In the postoperative follow, the union was achieved and the functional motion of daily activity of this patient was restored.

**Discussion & Conclusions**

The Masquelet technique is a useful tool to deal with bone loss, however, consolidation time is somewhat unpredictable and prolonged non-weight bearing is required.

The general steps and principles of the induced membrane technique are well established, but the details of the procedure are highly variable and dictated by personal preference and clinical conditions rather than evidence.

The induced membrane technique is a reliable and reproducible treatment for segmental tibial defects. However, initial infected nonunion and larger defect are risk factors for postoperative infection and nonunion. The application to non-unions of tibia shaft with bone loss or infections provides a high degree of safety for the patient.

**Bilateral Floating Knee: A Rare Case Report and Review of Literature****雙側漂浮膝骨折：罕見案例報告及文獻回顧**蘇皇嘉<sup>1</sup> 陳建志<sup>2</sup>

高雄醫學大學附設醫院骨科部

**Introduction**

Floating knee injury (FKI) was described in 1975 by Blake and McBryde. It associates ipsilateral fractures of the femur and tibia that isolate the knee from the rest of the lower limb. FKI are associated with high-velocity mechanisms like road side accident, fall from height. Although exact incidence of a FKI is not known, they are relatively uncommon. They are usually associated with extensive soft tissue injuries and life threatening multiorgan injuries. Treatment is difficult with a high risk of complications and poor functional outcomes. Presentation, in the same patient, of bilateral floating knee is exceptional, and the principle has never been published.

**Case report**

A 67 year old male, with underlying disease of hypertension and coronary artery disease, presented in emergency room with trauma of bilateral legs secondary to a traffic accident. Bilateral distal pulses were well palpable. The capillary filling of the toes was present. No motor or sensitive defect was found. Plain radiograph revealed fracture of right femur basal neck and subtrochanter, right ankle, left distal femur and left distal tibia. A diagnosis of bilateral floating knee was made and skeletal traction was given on both sides initially. As per protocol of damage control orthopaedics, surgical fixation was done in staged method. Open reduction and internal fixation (ORIF) were done first on left femoral supracondylar fracture and right ankle bimalleolar fracture and external fixation for left distal tibiofibular comminuted fracture. After a week on right proximal femur and further ORIF of left distal tibia and distal fibular was done in another week. Post-operative radiographs showed good reduction condition. Knee movements were started time of post-operative day 3 on each side at time of drain removal. The patient was then discharged under stable clinical condition and regular followed up at our outpatient department. The radiological union sign was noted on following image.

**Discussion**

Although floating knee injury with is a rare injury but increasing population and rise in motor vehicles, there is a rise in incidence of these injuries. Management protocol for these patients involves haemodynamic stabilisation followed by surgical fixation. Following the principles of damage control orthopaedics, overall patient stabilization is priority and skeletal stabilization is done by fixators at first and final definitive fixation is to be done once patient is stable. FKI injuries was treated with intramedullary nail for most of extraarticular fracture and plate for most of intraarticular fracture, and found the fracture union time and functional recovery was better in those patient which were treated with intramedullary nail. Theodoratus et al in their study recommended intramedullary nail as method of choice for treatment of ipsilateral diaphyseal tibia and femur fracture except open grade 3b and c fracture. Dwyer et al concluded that excellent to good result were obtained when shaft femur and tibia fracture were treated with intramedullary nail or combined modality (intramedullary nail for femur fracture and cast brace for tibia fracture), and poor result when both fracture treated with external fixator.

**Conclusions**

The simultaneous occurrence of ipsilateral fractures of the femur and tibia causes isolation of the knee joint from the rest of the lower limb skeleton called “floating knee”. It is an extremely serious injury, causing immediate local and general complications that can result in death of the patient in the short term. A multidisciplinary approach is essential for management of these injuries including hemodynamic stabilization. Bilateral occurrence of these types of injuries is extremely rare and underreported in literature.

## Concomitant Traumatic Ipsilateral Femoral ITC, Femoral Shaft and Tibial Plateau Fracture 創傷性股骨轉子間骨折合併同側股骨幹及脛骨平台骨折

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### Introduction

Surgical management options for femoral shaft fracture and ipsilateral proximal femur fracture vary from single-implant to double-implant fixation. Cephalomedullary fixation in such fractures has relative advantages over other techniques especially because of less soft tissue dissection and immediate postoperative weight bearing with accelerated rehabilitation. We presented a concomitant femoral intertrochanteric fracture with ipsilateral femoral shaft fracture and tibial plateau fracture who was treated with single cephalomedullary nail fixation for femur and LCP for tibial plateau.

### Case report

This 51 y/o female was sent to our ER for traffic accident. Right hip and thigh painful disability was told. Initial loss of conscious was noted but brain CT showed no active lesion. Physical examination showed right hip, thigh and knee swelling, tenderness and deformity. X-ray showed right femoral intertrochanteric fracture, right femoral shaft transverse fracture and right tibial plateau fracture. After observation for one day due to head contusion, ORIF with single cephalomedullary nail for femur and locking plate for tibial plateau were performed smoothly and patient was discharged on POD 3

### Discussion

Intertrochanteric/basicervical neck fractures and shaft fracture in the proximal half of the femur can be satisfactorily managed with a DHS with long side plate. If the shaft fracture is distal, options include (1) a proximal DHS with a distal low contact dynamic compression plate or (2) a proximal DHS with distal retrograde nail like a distal femoral nail. However, these implants have some basic disadvantages such as large surgical dissection, significant soft-tissue trauma, excessive periosteal stripping to fix plate to shaft (which interferes with union), blood loss during surgery due to long incisions, delayed rehabilitation due to restricted weightbearing, higher femur shaft nonunion rates, potentially higher infection and refracture risk, and implant failure.<sup>1,2,22</sup> Retro-grade nail insertion through knee joint can cause pro-longed knee pain, higher nonunion rates, technical difficulty in fixing neck fractures when traction cannot be applied due to inability to use the fracture table(Retrograde nails require high knee flexion that cannot be achieved on a fracture table)

### Conclusions

Combination of ipsilateral femoral shaft fracture and neck/intertrochanteric fracture is a difficult fracture pattern for trauma surgeons. Cephalomedullary nail is an excellent implant for such fractures but it requires careful insertion to avoid complications. Surgery is technically de-manding with a definite learning curve. Nevertheless, a majority of these fractures can be surgically managed by single-implant cephalomedullary fixation by following basic surgical principles



## Spontaneous Femoral Shaft Re-fracture after Removal of Locking Plate: Case Report and Literature Review

罕見病例報告：鎖定式骨板移除後自發性股骨再骨折

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新光醫院骨科部<sup>1</sup> 台灣大學醫學工程研究所<sup>2</sup>

### Introduction

Re-fracture after implant removal is a rare. Revision osteosynthesis is often indicated. We report a rare case of spontaneous re-fracture after distal femur locking plate removal surgery.

### Materials and Methods

A 55-year-old female was healthy before. She suffered from a traffic accident with her left distal femoral fractured. Surgical fixation was performed with distal femur locking plate at other hospital. Post operation course was smooth and she was referred to our clinic for follow up. Left knee implants irritation was noted during follow up. And surgery for distal femoral locking plate was arranged 15 months after primary surgery.

### Results

The surgery was performed under general anesthesia. The implant was surgical approached along previous scar. Solid union of fracture site was noted and the locking plates with screws was removed smoothly. However, severe pain complained when she return to ward. Left thigh deformity was noted. Plain radiograph taken which showed intact previous fracture site but a displaced fracture was noted over subtrochanteric region, through proximal second screw hole of previous implant. After explanation, another surgery was arranged for open reduction and internal fixation of the fracture. Interlocking nail was utilized and post operation image showed a perfect reduction and good alignment. After surgery, physical therapist taught her rehab protocol and she can immediately weight bearing. Throughout the rest of the hospitalization courses there was no other complication, and the patient was discharged and keep office follow up.

At 2 months follow up, the patient walked with single crutch and the followed-up image revealed good callus formation union around her fracture site.

### Discussion

To our knowledge, literature reported re-fracture after trauma after implants removal surgery. No published literature study on spontaneous re-fracture after implants removal. The fracture may be caused by patient's osteopenia bone quality. Another possible course is the implant designed with large screw up to 5.5 mm in diameter. Such a big hole created over the biomechanically unstable region like subtrochanteric area, the weak point may result in another fracture under a small load. Current report will also review literatures on implants removal and summarized current concept on this topic.

### Conclusions

Re-fracture after implant removal is a rare but major complication. Implant removal surgery should be arranged cautiously and the complication should always be informed to patients before this procedure.

## Fracture on Proximal Screw Hole after Removal of Distal Femur Plate: A Rare Case Report 罕見病例報告:骨折在近端第二螺孔於遠端股骨骨板移除後

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### Introduction

Re-fractures of long bones after implant removal are a rare but serious complication, which in most cases make a reoperation necessary. We report a rare case of a displaced fracture on proximal second screw hole site after removal of distal femur plate

### Materials and Methods

A 55 year-old female without major systemic disease but long term insomnia. She has history of accident injury of her left femoral shaft fracture and was received open reduction and internal fixation at E-Da Hospital on 4th September 2019. This time, she came to our hospital due to the discomfort of her left leg after fixation plate.

The implant removal surgery and post operation course was done smoothly under general anesthesia on 17th November, 2020. Fracture union was noted during the surgery. However, according to the operation room staff, the patient was irritable after the surgery even kick the bed rail. We arranged emergency ORIF for her with interlocking nail. There was a lower limb deformity noted when the attending surgeon visited her at 2pm. X-ray imaging was done and revealed that she has a displaced fracture on proximal second screw hole of previous plate site. We arranged emergency open reduction and internal fixation for her. We used open approach through her previous surgical wound with interlocking nail. X ray showed it was a perfect reduction. After surgery, we also gave education about the rehab protocol that she can immediately weight bearing. Throughout the rest of the hospitalization courses there was no other complication and the patient can walk on her own.

### Results

At 2 months after operation, the patient walked to our outpatient department and the followed up image revealed good union of bone on her fracture site.

### Discussion

To our knowledge, re-fractures of long bones after implant removal are a rare but serious complication, which in most cases make a reoperation necessary. It is usually re-fracture on the previous fracture site. However, our case showed newly fracture on proximal second screw hole. We suppose this may because of her sever osteoporosis and her femur is too skinny to have a 5.5 mm screw hole. It made a weak point of the femur after removal of implant.

### Conclusions

To avoid this complication, we would suggest to be very careful when removal of long bone plate especially in osteoporosis patient. And, spinal anesthesia may be better to avoid the irritable and pain of patient after operation. In addition, post operation splint may be arranged to avoid the patient hurting himself.

**Acquired Hemophilia A Developed After Trauma Operation****骨科手術後診斷 A 型血友病**

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**Introduction**

Acquired Hemophilia A is a rare autoimmune disorder with autoantibodies against coagulation factor VIII, affecting coagulation and potentially causing fatal hemorrhage. This report discusses a case of fluid accumulation, high leukocyte count and inflammatory markers in blood tests, and swelling around previous operation site. No erythema or local heat is noted over the affect area. Some discoloration and bruising is noted. Due to high risks of implant infection, debridement operation was arranged but no obvious pus or inflammatory tissue was identified. All cultures were negative or insignificant.

**Materials and Methods**

Case report including operation findings, peri-operative imaging, lab data, hematological study and factor analysis.

**Results**

The patient was an 85-year-old female patient admitted previously due to an intertrochanteric fracture. Debridement operation yielded no obvious infectious tissue but copious amounts of hematomas. Progressed swelling and multiple sites of bruising eventually developed. Serial hematology tests were arranged and Acquire Hemophilia was diagnosed.

**Discussion**

Operation was arranged for the patient due to initial presentation of high WBC count, extreme elevations of CRP, and swelling over previous operation site. The patient had isolated elevated APTT at the second admission, despite normal PT and APTT during the admission of initial operation. Nevertheless, debridement operation was arranged due to suspected infection from imaging report and blood test results suggesting infectious process. During the operation, no pus was identified but large amounts of hematomas were noted. None of the cultures obtains had significant growth.

**Conclusions**

Implant infection is one of the major nightmares of the orthopedic surgeon. After a patient presents with acute swelling and pain months after the operation, examinations and tests are arranged to evaluate for infection. Usually, the combination of physical examination, lab data, imaging exams are evidence enough for operation site infection. However, some situations may be unaccounted with this diagnostic strategy. Acquired Hemophilia A is a rare disease, and its cause is often uncertain. However, care evaluation of the patient demonstrated multiple bruises unrelated to the surgical site and eventually hematoma of the contralateral thigh. This suggested bleeding tendency and the necessary lab evaluations were done to suspect a hematological disorder. After multiple hematology consultations, factor analysis and autoantibody tests, Acquired Hemaphilia A could be diagnosed. This case report presents a rare case of Acquired Hemophilia A coincidentally developed months after an orthopedic operation but not before.

**Alternative Approach for Posterior Acetabulum Fracture : Single Surgeon Experience**

另一個針對後側髌臼骨折的入路方法：單一手術醫師經驗

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**Introduction**

The current study reviews our experience with a modification of the K-L approach in the treatment of acute, displaced posterior wall or column acetabular fractures. The modification involves a minimally invasive approach by which the neurovascular bundles are well protected from undue traction or damage by avoiding vigorous retraction. The study was conducted to assess the quality of reduction and the incidence of complications in patients who underwent the modified “one-incision two-window” K-L surgical approach

**Materials and Methods**

Between January 2015 and December 2017, a total of 13 consecutive patients (10 men and 3 women) were treated by a single surgeon (TTY) for acute, displaced posterior wall or column acetabular fractures by using the modified “one-incision two-window” K-L surgical approach. Among these patients, seven had transverse with or without posterior wall acetabular fracture and six had posterior wall acetabular fracture alone..

**Results**

Among thirteen consecutive patients, seven patients were classified as having a transverse with or without posterior wall fracture (group 1) and six patients had a solitary posterior wall fracture (group 2). With respect to the clinical treatment outcome, the mean visual analogue scale (VAS), mean modified Harris Hip Score (mHHS) and subjective satisfaction rate were 1.7 (1.0-2.0), 90.6 (81-100), and 84.6% (80%-90%), respectively. Although there was no significant difference in the satisfaction rate (82.9% vs. 87.0%,  $P = 0.941$ ) at 12 months after surgery, group 1 patients had more increased VAS score (2.0 vs. 1.2,  $P = 0.016$ ) and more decreased mHHS (87.7 vs. 94.6,  $P = 0.014$ ) than group 2 patients.

**Discussion**

This study has several limitations. First, this pilot study was a retrospective case series study with a small number of patients. Additionally, there was no control group for comparison to provide reliable evidence for the superiority of the proposed technique. Second, although the major fracture prototype was a posterior wall or column fracture, several specific types of acetabular fractures were diagnosed in the current study. This could cause bias while analyzing the data, produces false conclusions, and is potentially misleading. Prospectively randomized controlled trials are needed in the future to compare this modified technique with the conventional approach for the specified fracture type.

**Conclusions**

Our pilot study confirmed that the “one-incision two-window” K-L approach is a simple, safe, reliable, and effective way to manage acute, displaced posterior wall or column acetabular fractures.

**The Experience of Non-Threaded Femur Neck System(FNS) with a Length-Stable Fixation in Femoral Neck Fractures- A Case Report****無螺紋股骨頸系統 (FNS) 在股骨頸骨折長度穩定固定的經驗-病例報告**邱冠瑋<sup>1</sup> 江紀明<sup>2</sup>彰化基督教醫院骨科<sup>1</sup> 耕莘醫院安康院區骨科<sup>2</sup>**Introduction**

Femoral neck fractures, compared with other fractures are more difficult to treat because they sometimes give rise to unsatisfactory consequences, such as non-union and osteonecrosis. Internal fixation with either cannulated screws or a sliding hip screw is the most widely accepted treatment for undisplaced femoral neck fractures. However, uncontrolled collapse and subsequent shortening of the femoral neck, which lead to impairment in hip abduction, gait function, and quality of life, have been reported in some cases. Therefore, implants with non-sliding and length-stable characteristics have been advocated to prevent shortening of the femoral neck. We will report the result regarding a patient with a femur neck fracture fixated with Femur Neck System (FNS).

**Case**

A 47-year-old female was sent to the emergency department due to a painful disability over the right hip joint after falling down. X-ray was arranged and it revealed a right femur neck fracture. Then she received open reduction and internal fixation with the newer fracture fixation device - Femur Neck System (FNS). However, shortening of the femoral neck and varus collapse failure occurred in the hip joint.

**Discussion and Conclusions**

It has been hypothesized by FNS that fixation devices for femoral neck fractures without screw thread may create a non-sliding length-stable construction. However, FNS did not prevent femoral neck shortening in this case. This newer fixation device did not reduce femoral neck shortening and varus collapse before fracture union. Furthermore, cost-effectiveness should be considered before choosing different implants. Future studies are still required to focus on how to preserve femoral neck length and hip function after femoral neck fractures.

## Reverse Distal Fibula Locking Plate Fixation and Amorphous Calcium Carbonate for Proximal Radius Comminuted Fracture - A Clinical Case Report

### 遠端腓骨鎖定式骨板和無定形碳酸鈣治療近端橈骨粉碎性骨折-臨床病例報告

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彰化基督教醫院 骨科部<sup>1</sup>

#### Introduction

Radial head fractures (RHF) are common fractures, accounting for up to 4% of all fractures in adults. Mason classification is often used for RHF. Although it has been reported that radial head resection can produce acceptable outcomes in some limited cases, restoring radiocapitellar contact is preferred. Since a prosthesis may have its inherent drawbacks such as overstuffing, open reduction and internal fixation is preferable to preserve normal articulation and bone stock.

#### Clinical Case

A 34-year-old male was previously in good health. His chief complaint was that his right elbow was injured after having a traffic accident and subsequently receiving debridement in Cambodia. Two days after the debridement, he returned to Taiwan and transferred to our emergency room where the physical examination found huge and deep abrasion wound of the right elbow with suture wound and limited motion of right elbow with wrist drop. X-rays and bone reconstruction on 3D CT scans showed right proximal radius shaft comminuted fracture which also involved radial head and neck. He admitted to our isolation ward due to the epidemic-related and wound care for 2 weeks. Nerve Conduction Velocity (NCV) examination reported isolated severe injury of right posterior interosseous nerve before surgery. The patient has scheduled operation with open reduction and internal fixation with reverse distal fibular locking plate, mini screws and 5 ml artificial bone graft. Oral Amorphous calcium carbonate "Density" two caplets (200mg per caplets) twice daily was prescribed for more than 3 months after surgery.

#### Results

He followed up our orthopedic clinic, fracture site was near complete healing after 2 months of fracture reduction. Meanwhile, he received removal of implant due to the limited range of motion in the right elbow (10 to 70 degrees and could not supination). After that, he continues received intensive rehabilitation program.

#### Discussion

In this patient, right proximal radius shaft comminuted fracture which involved radial head and neck with posterior interosseous neuropathy doesn't have appropriate implant fixation currently. Therefore, we used the way mentioned above which can keep the adequate alignment and providing a high dose of amorphous calcium carbonate "Density" earlier may reduce the risk of delay union and promote fracture healing.

#### Conclusion

Comminuted fracture of proximal radius shaft which involved head and neck still remains a challenge for the orthopedic surgeon. Active assessment and appropriate calcium supplement for orthopedic patients could reduce risk and cost, especially in comminuted fracture and osteoporotic fracture.

## Subclavian Venous Thrombosis Following Clavicle Fracture Surgery : A Rare Case Report 在鎖骨骨折後產生的鎖骨下靜脈的栓塞:一個罕見的案例報告

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### Introduction

Clavicle fracture fixation is becoming an increasingly common operation, with good clinical outcomes and a low rate of significant complications. However, there are several reports of rare but potentially life or limb threatening, neurovascular complications. Most complications are due to vessel tear that may from fracture fragments or operative procedure. We would like to present a interesting case about subclavian venous acute thrombosis following clavicle surgery.

### Materials and Methods

This 56-year-old male has past history of hypertension and arrhythmia with regular medicine control for 1+ years, drug withdrawal for 6+ months. Unfortunately, he experienced a traffic accident on 2020-08-27. He was sent to our ER that X-ray showed left clavicle fracture, non-displacement. Conservative treatment with short arm sling protection was suggest. He was discharged on 2020-08-28 in a stable condition. However, left shoulder pain got worse and he visited our OPD that X-ray showed left clavicle fracture, displacement. Under these findings, open reduction and plate fixation was advised.

When he left the recovery room and arrived at the ward, he complained of left arm dark appearance and numbness sensation. We visited him after several minutes, 5P signs was noted. We arranged CTA as soon as possible.

### Results

CT reports showed There is poor enhancement at left subclavian vein, axillary vein, proximal cephalic vein, and brachial-basilic vein suspected thrombosis. We consult the CVS specialist that conservative treatment was suggest first. After one day, he complained of left arm persist numbness and anticoagulation treatment was started with IV heparin pump. The symptoms and signs got improvement gradually. He discharged after 7-day IV treatment and take oral anticoagulation medicine for another one month.

### Discussion

The subclavian vein is at significant risk during clavicle surgery because it is adjacent to the clavicle, is thin-walled and has a substantial blood flow. Most reports after clavicle fracture and surgery were subclavian vein tear and there was only one stenosis complication as we known in the past. We follow up his history and old CVA, hyperlipidemia, hypertension, and DM were noted. There may relationship exist between these findings and this rare complication.

### Conclusions

Deep vein thrombosis in the upper limbs is uncommon in the orthopedic literature. We report on a case of subclavian vein thrombosis that occurred after operative treatment of the clavicle fracture. This is difficult to diagnose and requires a high degree of suspicion. Treating it may prevent fatal thromboembolism. In some rare cases, it has been described in association with fractures of the clavicle.

**Giant Cell Tumor of Proximal Phalanx of Thumb, A Case Report****病例報告：大拇指近端指骨之巨細胞瘤**林聖傑<sup>1,2</sup>中山醫學大學附設醫院骨科部<sup>1</sup> 中山醫學大學醫學研究所<sup>2</sup>**Introduction**

For the hand tumors, Giant cell tumour (GCT) of bones is very rare, only 2% of all hand tumors, but unacceptably high recurrence rates (up to 90%) have been reported. In the image, diagnosis can be challenging due to its rarity and some characteristics similar to enchondroma or chondrosarcoma. Careful examination, complete investigation and optimum follow-up scheduling are key to avoiding a misdiagnosis and further disease recurrence.

**Case report**

This 23-year-old young woman considered herself well and denied having any significant illnesses in recently years. The left thumb deformity with limited range of motion was noted for months. She visited other hospital at first with the image survey first performed. She was then visited our clinic for second opinion. As the ambiguous image, we arrange the operation with frozen section first. With the GCT result, the bone grafting procedure was performed after excision and curettage. The operation was performed smoothly. The pain has gradually improved, but still some limitation for the range of motion. The monthly Denosumab is planned for one-year course.

**Discussion**

Most GCTs in the phalanx have been treated with conservative, digit-sparing techniques such as curettage and bone grafting, but has been found to have recurrence rates up to 79%. The local recurrence rate is highest in the first 24 months following treatment, ranging from 4% to 30%. Follow-up should be scheduled with serial physical examination and imaging of the surgical site as well as a routine chest radiograph. Approximately 3% of GTCs metastasize to the lungs. They are mostly associated with recurrent disease. Metastases are usually found within 3 years from the initial treatment, but still can occur even after 10 years from the primary site.

The surgical management still be the golden standard, which has some different options: amputation, curettage with bone grafting, and, polymethylmethacrylate(PMMA) cement. Systemic control can also be beneficial

in both unresectable and metastatic cases. The denosumab still has more evidence showing lower the recurrent rate, although some paper showed bisphosphate has similar effect.

**Conclusions**

GCT in the hand is a rare, benign, locally aggressive tumor. The diagnosis is based on the clinical, radiological, and histopathological findings with primary treatment being surgical. Due to high recurrence rate and possible of further metastasis, the regular follow-up is necessary.



## Surgical Outcomes of 18 Patients with Pigmented Villonodular Synovitis (PVNS) of the Knee at a Mean Follow-up of 3 Years

膝關節色素沉著絨毛結節性滑膜炎患者經手術後追蹤三年結果

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### Introduction

Pigmented villonodular synovitis (PVNS) is characterized by the presence of inflammation and hemosiderin deposition in the synovium. Two forms of PVNS distinguished in the literature are diffused and localized involvements. There are controversies in the literature about the surgical management of PVNS. We report our experience in the management of knee PVNS at a mean follow-up of 3 years. We also introduce our preferred method of treatment for these patients.

### Materials and Methods

A number of 18 patients with histologically proven PVNS of the knee were identified between January 2012 and February 2018. Annual clinical follow-up was conducted in all patients and a follow-up MRI scans was ordered for symptomatic cases. All patients were examined according to the Knee Society Score (KSS) in which the knees were graded from excellent to poor.

### Results

Mean age of the patients was  $28.08 \pm 12.5$ . A number of 10 patients (56%) had diffused involvement of the knee joint and 8 (44%) had a localized form of involvement. Mean follow up was 3 years. The mean duration of symptoms prior to presentation was  $34.40 \pm 38.69$  months. In five cases (28%) subtotal synovectomy and in 13 cases (72%) total synovectomy was performed. Two cases (11.1%) had recurrence. In a comparison between new methods vs. routine methods, after adjusting the pre-operation KSS scores, there was a significant difference between both methods in their post-op results. There were no complications in the form of knee instability, infection or neurovascular injury.

### Discussion

Although there are several hypotheses for the PVNS, but the etiopathogenesis still remains unclear. Some more important ones are, for example, inflammatory synovial hyperplasia, benign neoplasm of unknown etiology, abnormality of local lipid metabolism, repetitive trauma and hemorrhage. The main etiology of PVNS has been proposed to be precipitated by trauma, proposing a hyper vascular cellular phase subsequent to trauma produced by hyalinization and fibrosis

### Conclusions

The PVNS of knee joint; especially the diffused form should be carefully observed and managed using appropriate investigations. Staged open total synovectomy with a posterior and then an anterior approach seems to be a superior method for surgical treatment of diffused forms.

**Sclerosing Epithelioid Fibrosarcoma in Posterior Thigh and Foot: A Case Report****個案報告：在大腿後側及足底的硬化性上皮樣纖維肉瘤**

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**Introduction**

Sclerosing epithelioid fibrosarcoma is a rare soft tissue sarcoma. It is a variant of low-grade fibrosarcoma and first reported by Meis-Kindblom in 1995. Multiple lesions at primary presentation is relative uncommon (27% is reported previously). The genetic characters of sclerosing epithelioid fibrosarcoma is already known as rearrangement of 10p11 and amplification of 12q13 and 12q15. Treatment of sclerosing epithelioid fibrosarcoma is still challenging, because there is no standardized treatment regimens are reported.

**Case Report**

We report on a 56-year-old male who presented with masses at right posterior thigh and foot for about 2 years. The size of both masses was gradually enlarged and accompanied with load-dependent pain. On physical examination, there is only mild tenderness without other signs of inflammation or loss of function. Plain film of both femur and ankle showed no obvious osteolytic or osteoblastic lesion. MRI showed a 8cm heterogeneous tumor at popliteal fossa and a 12.7cm heterogeneous tumor at medial plantar side of right foot. Sonogram guide biopsy was performed and pathological differential diagnosis of sclerosing epithelioid fibrosarcoma was reported. Chest CT scan and whole body PET/CT were done for routine staging and showed negative for lymph node and distant metastases. Thus, we arranged operation of wide excision for both masses at popliteal fossa and plantar foot. The margin of the mass was well-defined.

To date, seven months after diagnosis of sclerosing epithelioid fibrosarcoma, the patient is regularly follow-up in our out-patient department. He is well and his function is not influenced. Follow-up MRI for knee and ankle were done and showed hyperintensity at operative site, which was preferred of post-operative granulation tissue. There is no evidence of lymph node or distant metastasis.

**Discussion**

Sclerosing epithelioid fibrosarcoma is very rare. After excision of the tumors, we've discussed with oncologist for adjuvant chemotherapy and radiation therapy. Until now, we gave him neither chemotherapy nor radiation therapy, because there is no large study about the presentation and treatment of sclerosing epithelioid fibrosarcoma. Thus, we need further study for sclerosing epithelioid fibrosarcoma treatment with its efficacy in a long term follow-up.

## Diagnosing Rapid Progression Of Myxofibrosarcoma Over Left Thigh In A 73 Year-Old Male: A Case Report

病例報告：73 歲男性左下肢快速成長的黏液纖維肉瘤

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### Introduction

Myxofibrosarcoma (MFS) is a subtype of soft tissue sarcoma with a locally infiltrative behavior. It represents approximately 5% of soft tissue sarcoma diagnoses. Mostly, MFS arises as a slowly enlarging, painless mass, which usually affects older male. As diagnosis, MRI is the diagnostic modality of choice. In most cases of MFS, histology reveals a highly myxoid neoplasm with a distinctly hypo-cellular appearance. Margin-negative surgical resection is the cornerstone of treatment for patients with MFS. However, local recurrence is common postoperatively, and a subset of patients with high-grade lesions will develop distant metastases. Postoperatively, there are reports noted that radiation may be beneficial in reducing local recurrence.

### Materials and Methods

A 73-year-old male presented in CMUH orthopedic out-patient-department, complaining an enlarging mass noted in his left thigh over last two months, accompanying with mild painful sensation off and on. Computed tomography of left femur reported a huge soft tissue mass with bone cortex destruction located over medial aspect of left thigh. The patient was admitted for further examination. MRI showed a huge soft tissue sarcoma with some cystic and myxoid component. Local invasion of adjacent left femoral shaft was seen. CT guild biopsy study favored sarcoma due to the specimen contained spindle and pleomorphic cell neoplasm.

### Results

Operation of tumor excision, curettage and local treatment for left femur lesion was done. During the operation, a huge tumor (20x12x8 cm) with bone invasion of femur shaft was observed, while vessel and nerve were intact. Frozen section study reported inflammatory infiltrate, fibrin exudate and no obvious malignant pleomorphic tumor cells. But the surgical pathology study showed high grade sarcoma composed cellular proliferation of pleomorphic and spindle cells bearing hyperchromatic nuclei, focal myxoid stroma with curvilinear vasculature and pseudo-lipoblasts were seen, indicating high-grade myxofibrosarcoma.

### Discussion

Generally, MFS was defined as having at least a 5% hypo-cellular myxoid component, while anything with less than 5% myxoid is best considered as undifferentiated pleomorphic sarcoma. Besides, scattered pseudo-lipoblasts are sometimes encountered in the myxoid areas. In this case, both CT guild biopsy and intraoperative frozen section failed to identify MFS, for spindle and pleomorphic cell component but myxoid component was seen. Final diagnosis was made only after surgical pathologic study was done.

### Conclusions

Myxofibrosarcoma is a soft tissue sarcoma with a predilection for local recurrence. Wide surgical resection with 2 cm soft tissue margin is the mainstay of treatment. However local recurrence is common even adequate treatment was done. Appropriate diagnosis was crucial for MFS, while there were no standardized diagnostic criteria pathologically. If pathological diagnosis has not been established, high-quality T2 weighted MR imaging with gadolinium is critical for preoperative planning.

## Secondary Malignancy Change of Giant Cell Tumor after 40 Years in Distal Tibiofibular Region

脛骨遠端良性巨大細胞瘤 40 年後轉變為惡性骨腫瘤

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### Introduction

A giant cell tumor of bone is a primary benign but locally aggressive neoplasm. Giant cell tumor of bone is treated primarily surgically. The most common complications were tumor recurrence, and the second was deep infection.

### Materials and Methods

This 86-year-old female presented to our outpatient clinic due to right ankle swelling and redness after massage, and the swelling and redness persisted for one month. In reviewing her medical history, she had giant cell tumor of distal tibia, right lower leg, 40 years ago. And she received 1st time operation of curettage and autologous human bone graft placement then. Three years ago, the plain radiograph and computer tomography revealed osteolytic lesion over right distal tibia. Local recurrence of giant cell tumor was proved by pathologic exam. Thus, she received a 2nd time operation of curettage and bone cement placement.

### Results

Ankle plain film showed osteolytic lesion involving with right distal fibula and medial talar dome, with pathologic fracture of lateral malleolus. Magnetic resonance imaging showed right distal lower leg a 9.5cm multilobulated space-occupying lesion with hemosiderin deposition, causing adjacent bony erosions. Cord needle biopsy was done. The final pathologic diagnosis was secondary malignancy in giant cell tumor of bone, right ankle. No distant metastasis was found in total tumor survey. Eventually, Due to secondary malignancy in giant cell tumor of bone, right ankle, we performed below knee amputation. The patient post-operative status was stable, and wound healed well without complication.

### Discussion

Generally, curettage with polymethylmethacrylate (PMMA) bone cement can be repeated for recurrence because it presents acceptable re-recurrence rates of 14%–22%. Secondary malignant transformation in a previously histologically typical giant cell tumor of bone is exceptionally uncommon, and report showed less than 1% of patients. However, the choice of treatment should be balanced between preserving maximal joint function and risks of tumor recurrence.

### Conclusions

In our case, due to fail of local disease control after second time of curettage and cementation, we performed core needle biopsy, which showed malignant change of giant cell tumor of bone. In regarding of locally unresectable malignant tumor in distal tibiofibular region, we choose below knee amputation for achieving a prolonged survival.

## Aggressive Curettage and Bone Substitute Grafting for Large Giant Cell Tumor of Proximal Tibia – A Case Report

近端脛骨之碩大巨細胞瘤以完整刮除術和骨替代移植治療之病例討論

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### Introduction

Giant cell tumor of bone(GCTB) is a benign bone tumor with aggressive characteristics. They are more prevalent in the third decade of life and demonstrate a preference for locating in the epiphyseal region of long bones. They have a high local recurrence rate, which depends on the type of treatment and initial tumor presentation. The risk of lung metastases is around 3%. Intralesional excision with curettage is the standard method of GCTB treatment, but the ideal filling material after curettage remains controversial.

### Materials and Methods

A 42-year-old male patient, often goes hiking during holidays, denied any past history. He presented himself for right knee pain with tenderness for more than 3 months. Roentgenography disclosed radiolucent, measured as 6x5x5 cm in size, cystic lesion of right proximal tibia. MRI revealed a lobular well-demarcated space-taking lesion, high T2 with intermediate T1, involving proximal tibia epiphysis and metaphysis. Focal cortical thinning and internal hemorrhagic locules were also detected. Differential diagnoses were included of giant cell tumor, brown tumor, chondroblastoma and osteosarcoma. Intralesional biopsy was performed, and frozen biopsy revealed diffused large osteoclast-like multinucleated giant cells, suspect giant cell tumor of bone. Therefore, intralesional, aggressive curettage with curettes and high-speed burring was made. The large cavitory defect was treated with bone substitutes (Bicera granules). Giant cell tumor of bone was proved by pathology after curettage.

### Results

There was no other major complication during the hospital stay, and post-operative image showed good condition. OPD followup showed good result of ROM of affective knee joint. No recurrence observed within first 6-month follow-up.

### Discussion

Campanacci et al. classified GCTBs into three types according to their biological behavior, radiographic appearance, and degree of bone destruction. Type I are considered latent and are represented by small, intraosseous lesions. Type II are active and radiographically larger, but with intact periosteum. Type III are aggressive, extending throughout the periosteum and surrounding tissues. Intralesional resection is usually the treatment of choice for Campanacci I and II tumors. Campanacci III tumors, due to their size and local aggressiveness, are usually best addressed through wide resection with defect correction.

### Conclusions

The proximal tibial lesion of our patient, Campanacci type II, was treated with aggressive curettage and grafting with bone substitutes, but no hard ware applied due to integrity of cortex. How to fill the cavity after GCTB curettage is an important question. Bone cement is used widely in cavity filling and structural reconstruction in aggressive bone tumors and some low-grade malignant bone tumors. Some authors worry that the usage of acrylic cement may damage the articular cartilage and increase stiffness of the subchondral bone leading to degenerative changes in the adjacent joint. We filled the large cavitory defect with bone substitutes providing scaffold of bone healing. Further follow-up for recurrence and degenerative change is necessary.

**Management of a Patient with Melorheostosis in 15-Year Follow-up, A Case Report**  
十五年追蹤之肢骨紋狀肥大症病患之治療及處置之個案報告

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花蓮慈濟醫院骨科部

**Introduction**

Melorheostosis, also known as Leri disease, is a very rare mesenchymal dysplasia manifesting as regions of sclerosing bone along part or all of a tubular bone with a characteristic flowing candle wax appearance. Leri and Joanny presented the first case in 1922. The etiology is unknown. There is no familial tendency and no sexual predominance. Usually melorheostosis is limited to the long bones of extremities with less tendency for the ribs, vertebrae and the skull. Limited mobility for the involved joints and pain over the involved areas are the usual symptoms.

**Materials and Methods**

This is a 56 years old lady present with left leg discomfort since she was 8 years old. The symptom improved after the medication. However, left leg progress deformity noted as time goes on and limited range of motion of knee ( $0^{\circ}$ - $50^{\circ}$ ) with limping developed. She went to our orthopedic out-patient-department for help in 2004. X-ray revealed thick undulating ridges of bone as flowing candle wax appearance over left distal femur and tibia and foot. Biopsy was performed, revealed thickened cortical bone compatible with melorheostosis. TKR with tumor prosthesis was performed on 2006/05/02. She tolerated well after TKR, she could walk and keep ADL independent for years. Post-operative ROM of left knee was  $0^{\circ}$ - $90^{\circ}$ . But in recent one year, limited ROM of her left knee was noted, recurvatum of left knee when extension was also found. The following X-ray showed left TKA femoral stem loosening, thus, revision TKR was performed on 2021/01/07. And she tolerated the whole procedure well. Then she was kept followed up in OPD.

**Discussion**

After reviewing literature, Due to chronic progressive course of melorheostosis in adults and a faster course in children, out-patient-department follow-up is needed. As the disease progress, occasionally resulting in substantial disability from contractures or deformity. The general principle of management of melorheostosis is conservative management as first-line treatment, in severe cases, surgical intervention may be required, including tendon release, osteotomies and even amputation. There are 3 articles about melorheostosis managed with TKR, like our case, the cases presented with intraarticular melorheostosis or soft tissue contracture which severely limited the range of motion.

**Conclusions**

Melorheostosis is a very rare disease as sclerosing bone with a characteristic flowing candle wax appearance. Limited mobility for the involved joints are the usual symptoms. In severe cases, surgical intervention may be required, including tendon release, osteotomies, arthroplasty and even amputation.

**Brown Tumor Mimicking Metastatic Malignancy 2 Year Follow up: A Case Report and Literature Review****棕色細胞瘤模仿惡性腫瘤兩年追蹤:病例報告及文獻回顧**

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**Introduction**

The most common clinical presentation of primary hyperparathyroidism (PHP) is asymptomatic hypercalcemia, and diagnosis of PHP based on the presence of bone manifestations such as osteitis fibrosa cystica (OFC) is increasingly uncommon. In the middle aged and elderly, when osteolytic lesions are identified in imaging studies, metastatic bone tumor and multiple myeloma are both the first impression that comes to the clinician's mind. In addition to the worst-case scenario being ruled in, other differential diagnoses such as metabolic bone disease should also be considered as well.

**Materials and Methods**

Here we introduce a case which was mimic malignant tumor, and bone biopsy was done, its pathological showed that Giant cells and epithelioid shaped stroma cells and negative for monoclonal plasma cell. The clinical and radiologic abnormalities resolved after treating hyperparathyroidism. In addition to the location of one of the brown tumors at the femur, spine, unusual features in this case were the explosive onset of hyperparathyroidism and the absence of detectable subperiosteal resorption.

**Results**

After hyperparathyroidism is diagnosis, we treat hyperparathyroidism firstly without any associated surgical intervention for the impending fracture site. After treatment of hyperparathyroidism, the clinical symptom including bone pain, impending fracture were all resolved. After 2 year follow up, there was no new osteolytic lesion in the plain film and the patient could return to daily activity as usual status.

**Discussion**

Brown tumors represent a rare clinical manifestation reported in approximately 3% of patients with primary hyperparathyroidism and correspond to radiologically osteolytic lesions with well-defined borders in different parts of the skeleton. Treating hyperparathyroidism should be the first step to be performed before the management of impending pathologic fracture. According to our experience and literature review, surgical intervention for the osteolytic lesion of brown tumor could be avoided after adequate and immediate treatment of hyperparathyroidism.

**Conclusions**

The present case report emphasizes the need of inclusion of brown tumors in the differential diagnosis of multifocal osteolytic bone lesions. Laboratory testing of serum phosphate, calcium levels, and parathyroid hormone levels should always be included in the routine survey of patients with multifocal osteolytic lesions. Accurate diagnosis could avoid patient receiving non-necessary surgical intervention and return to life successfully with adequate treatment.

## Surgical Approach for Excision of Giant Cell Tumor Through the Femoral Triangle 經股三角巨大細胞瘤切除手術案例報告及文獻探討

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### Introduction

Lesions and pathologies of the hip can be located within and outside of the articular proximal femur. While intra-articular lesions are often symptomatic early-on, extra-articular lesions can have longer asymptomatic period, delaying initial diagnosis. For intra-articular lesions, multiple surgical approaches of the hip joint have been developed, each with its advantages and disadvantages. Surgical approaches of the extra-articular proximal femur are less frequently performed due to lower clinical encounter of extra-articular pathologies.

### Materials and Methods

We present a 55 year old male with a 4.1cm lobulated mass in the left trochanter on MR during metastasis screening for primary esophageal cancer. We prepare the patient for a surgical exposure described by Vosmer & Linge in 1976 with an inguinal incision directly over the femoral triangle. The patient was placed in supine with the hip abducted and externally rotated in a figure-of-four position. The incision was made parallel and lateral to the palpable femoral artery. The sartorius muscle was retracted laterally to expose the femoral artery, vein and nerve. The femoral nerve was retracted laterally, while the femoral vessels are left within the sheath and retracted medially, exposing the vastus medialis overlying the proximal femur.

### Results

A single tumor mass measuring 5x4x5cm was excised in complete integrity without disruption of the capsule. The total length of the wound was approximately 10cm. The total time of surgery was 65 min from incision to extubation. The total blood loss was less than 5cc and no drainage devices were placed. There were no event of neurovascular injury and no delayed wound healing nor wound infection. The healed wound was able to be covered up by boxer-shorts. The pathological diagnosis of the tumor was tenosynovial giant cell tumor, diffuse type. There were no signs of recurrence nor complaints of pain in the 6 months follow up period.

### Discussion

A direct approach through the femoral triangle has the advantage of exposure of the lesser trochanter, with minimal skin to lesion distance. The femoral triangle contains vital blood vessels and nerves which may result in major intraoperative complications. Structures within the triangle are easily identified, proper retraction and exploration can prevent injuries. Associated complications have been reported in literature including proximal femur blood supply disruption leading to femoral head osteonecrosis, prolonged vascular retraction causing intimal injury or thrombus formation and neurological deficit from nerve injury within the femoral triangle.

### Conclusions

A direct femoral triangle approach to the lesser trochanter is a feasible and efficient approach for lesions located in proximal medial femur. This approach is met with thin muscle layers and easily identifiable nervous and vascular structures. Minimal muscle destruction and no disruption of the articular capsule are surgically advantageous. The wound is cosmetically satisfactory and easy to be hidden post operatively.



## Preoperative CT-Guided Localization with Wire Hook Help Locating the Sporadic Phosphaturic Mesenchymal Tumors Responsible for Tumor-Induced Osteomalacia

案例分享與文獻回顧：以鋼絲鉤輔助術前電腦斷層有助於定位散發性腫瘤導致的腫瘤性骨軟化症

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### Case reports

A 71-year-old woman presented with right hip pain, accompany with anorexia for 1-2 years, especially night pain. Physical examinations showed no limited range of motion of four limbs, no motor weakness, negative FABER/SLRT tests. Radiographs showed right hip sub-trochanteric a wide, transverse lucency traversing through the bone, preferred pseudo-fractures. Whole body bone scan (Tc-99m MDP) demonstrated active bone lesions in ribs, right femur and left scapula, nature to be determined; malignancy with bony metastasis cannot be excluded. She was then transferred to oncology out-patient department. Lab data revealed high alkaline phosphatase (ALK-P = 186 U/L; normal: 28-94), high PTH (120.8 pg/mL; normal: 12-7), low serum calcium (7.6 mg/dL; normal: 7.9-9.9), very low inorganic phosphate (0.7 mg/dL; normal: 2.5-4.5) and low vitamin D3 (25-OH, 16.11 ng/mL; normal  $\geq 30$ ). Tumor markers (CA19-9, CA15-3, CEA, SCC, CA-125, LDH and AFP) were within normal range. Immunofixation electrophoresis (IFE) showed no paraprotein was identified. Chest and abdomen computed tomography (CT) scan found no nodules/mass nor lymph nodes enlargement. Right knee magnetic resonance imaging (MRI) showed a 2.2cm heterogeneous ill-defined mass in the posterior metaphysis of distal femur (intermediate high signal intensities on T1WI/T2WI) with cortical breakthrough. Observation with conservative oral medication control was suggested firstly. However, she complained of intermittent and progressive right knee pain afterwards. Then, she went to other hospital for tumor excision of right knee, where the pathology revealed phosphaturic mesenchymal tumor with tumor-induced osteomalacia. After surgery, she was back to our hospital for oral phosphate solution treatment and regular monitoring for recurrence/metastasis.

After surgery around one year, the MRI showed three sporadic tumors (1.4, 1.0, 0.7cm) in the posterior distal femur at the prior excision site. After discussion with the patient, she hesitated the surgery until seven years after the first surgery. The follow-up MRI showed slight regressive change of three enhanced nodules (1.3, 0.9, 0.4cm). Before surgery, due to the major concerns of tissue adhesion and neurovascular protection, we cooperated with radiologists for CT-guided localization with wire hook\*1 over the 1.3cm nodule. The other two nodules were invisible under CT scan by radiologist. We then performed sporadic tumor excision surgery along the hook wire, and used relative distance to find the other two nodules. No peri-/post-operative complications occurred.

The second patient, 38-year-old male, has phosphatic mesenchymal tumor-induced osteomalacia over right greater trochanter of femur. We performed tumor wide excision with CT-guided wire-hook localization as well. Both patients stated no discomforts over right knee and right hip respectively, while the serum phosphate was within normal range under regular medication control.

### Discussion

Tumor-induced osteomalacia is uncommon, and identification of the responsible tumors is often challenging. Due to the fact that complete tumor resection achieves a good prognosis in most cases, we declared that preoperative CT-guided localization with wire hook help locating sporadic tumors for complete resection. After surgery, these patients still should be monitored for recurrence and metastasis.

## An Unusual Pathological Fracture of the Clavicle -Case Report and Literature Review

### 罕見鎖骨病理性骨折-案例報告與文獻回顧

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#### Introduction

The metastatic colorectal cancer that lead to pathological clavicular fracture was extremely rare. Here, we present a case of clavicular pathological fracture in an unusual site with low-energy mechanism.

#### Case presentation

A 52-year-old man visited emergency department due to pain over the right clavicle area. The pain occurred when he woke up in the morning and try to get up from bed to take his cell phone. There was only mild swelling over the right clavicle without tenting or ecchymosis. The radiographic examination revealed right middle-third clavicular fracture. Due to low-energy mechanism, we arranged further examination to survey the underlying disease. The bone scan and the Gallium scan were arranged and revealed multiple area with increased uptake. The patient underwent surgery with open reduction and internal fixation to the clavicular fracture. The histopathological report revealed moderately differentiated adenocarcinoma, compatible with colorectal metastasis. We suggested consecutive chemotherapy and radiotherapy for him. The patient received the palliative chemotherapy and expired about three months after his clavicular fracture.

#### Discussion

The medial clavicular fracture was less common than middle-third clavicle. However, in term of pathological fracture, most happened in the medial site. The metastasis of clavicle bone from colorectal cancer is very rare. A total of three cases of clavicular metastases from colorectal cancer since 2002 are reviewed in this study. Patel et al. reported the patient with right clavicular fracture after falling down. The computer tomography scan revealed huge masses over clavicle and sacrum. Pathology reported metastatic colorectal adenocarcinoma. Doughan et al. presented a case with swelling in right supraclavicular fossa. The radiograph disclosed osteolytic lesion. Fine needle aspiration of the clavicle lesion proved to be malignant cell, compatible with metastasis. J. Sheen et al. demonstrated a patient of colorectal cancer with hepatic metastases. A swelling mass over the medial aspect of the left clavicle developed during adjuvant chemotherapy period. The radiograph disclosed an osteolytic irregular lesion in the medial head of the clavicle. The fracture site of these cases were all in medial aspect of clavicle. Here, we presented a case with middle-third clavicular fracture. To the best of our knowledge, this uncommon site of clavicle pathological fracture metastasis from colorectal cancer and unusual mechanism has rarely been reported in the previously literature.

#### Conclusions

Metastasis in middle-third of clavicle is rare. Our case reminds us when a patient present with clavicular fracture with low-energy mechanism, we should always survey the underlying disease such as infection, metabolic disease or malignancy. Keeping in mind that despite the low incidence, clavicular metastasis is possible.

**Timosaponin AIII as a Potential Antimetastatic Agent Against Human Osteosarcoma in Vivo**  
**Timosaponin AIII 在動物實驗中具有抗人類骨肉瘤細胞轉移的潛力**林任家<sup>1</sup>，楊順發<sup>2</sup>，謝逸憲<sup>2</sup>，呂克修<sup>1,2</sup>中山醫學大學附設醫院骨科部<sup>1</sup>，中山醫學大學醫學研究所<sup>2</sup>**Introduction**

Pulmonary metastasis is the most common cause of osteosarcoma, the 5-year survival rate remains dismal at less than 20% in patients with osteosarcoma and metastatic lesions. Timosaponin AIII (TSAIII) is a steroidal saponin and has been reported to demonstrate proapoptotic and antimetastatic activities. TSAIII was demonstrated to significantly inhibit the pulmonary metastasis formation of human osteosarcoma cells *in vivo* in metastasis animal models.

**Materials and Methods**

Human 143-B osteosarcoma cells ( $1 \times 10^6/100 \mu\text{L}$ ) suspended in 0.1 mL of PBS were injected into the tail vein of Immunodeficient nude mice. Mice were randomly divided into three groups (n = 5 per group) and fed TSAIII (5 and 10 mg/kg of body weight, daily) or DMSO was orally administered to the nude mice. after 2 months, the mice were euthanized with CO<sub>2</sub>. Subsequently, the lungs were isolated and fixed in 5% neutral-buffered formalin. Tissue sections were collected and stained with hematoxylin and eosin for morphological analysis.

**Results**

Histopathology of lung tissues revealed a notable reduction of tumor mass in the mice treated with TSAIII. Lung metastases of the mice treated with TSAIII were significantly reduced compared with the control group. TSAIII significantly inhibited pulmonary metastasis formation in human osteosarcoma cells. A marked reduction in the number of lung nodules was observed in the mice treated with 5 or 10 mg/kg of TSAIII. These results indicated that TSAIII significantly inhibits human osteosarcoma cell-mediated lung metastasis *in vivo*.

**Discussion**

Pulmonary metastasis is the major cause of morbidity and mortality. TSAIII also demonstrated antimetastatic activity in human osteosarcoma cells *in vivo*.

**Conclusions**

In conclusion, these results indicate that TSAIII can be used as a potential antimetastatic agent against human osteosarcoma.

**Alpha-mangostin Repressed Proliferation and Migration of Human Osteosarcoma Cells**  
山竹果氧雜蒽酮抑制人類骨癌細胞增生及移動林任家<sup>1</sup> 楊順發<sup>2</sup> 謝逸憲<sup>2</sup> 呂克修<sup>1,2</sup>中山醫學大學附設醫院骨科部<sup>1</sup> 中山醫學大學醫學研究所<sup>2</sup>**Introduction**

Osteosarcoma, the most prevalent malignant bone tumor in children and adolescents, is responsible for the great majority of bone cancer-associated deaths because of its high metastatic potential.  $\alpha$ -mangostin, a natural xanthone isolated from the pericarps of mangosteen, was found in 1855. This compound has been discovered to possess a wide range of biological activities. In this study, we investigated the anti-cancer effects of  $\alpha$ -mangostin in human osteosarcoma cell lines *in vitro*.

**Materials and Methods**

Cell viability was measured by the MTT assay with various concentrations of  $\alpha$ -mangostin (0, 6, 12, 18, 24, and 30  $\mu$ M) on human osteosarcoma cell lines. After being treated with different concentrations of  $\alpha$ -mangostin (0, 6, 12, and 18  $\mu$ M), flow cytometric analysis was performed on cells co-stained with annexin V and PI to detect apoptosis in U2OS and HOS cells. Mitochondria membrane potential was determined after JC-1 stain and analyzed the data by Muse cell analyzer. The levels of apoptosis-related proteins were examined by Western blot analysis. Wound healing assay was used and U2OS and HOS cells were wounded and treated with  $\alpha$ -mangostin (0, 6, 12, and 18  $\mu$ M) for 18 hours.

**Results**

$\alpha$ -Mangostin (0-30 $\mu$ M) did effectively inhibit the cell viability of U2OS and HOS cells after treatment for 24 hours with dose-dependent manners. No difference in expression of caspase protein in U2OS and HOS cells.  $\alpha$ -mangostin treatment resulted in the up-regulation of proapoptotic Bax proteins and the down-regulation of antiapoptotic Bcl-2 proteins.  $\alpha$ -mangostin dose-dependently reduced U2OS and HOS cells moving into the wound.

**Discussion**

We observed that  $\alpha$ -mangostin inhibited the growth and migration of the human osteosarcoma cells. The possible mechanism is possible related to mitochondrial-induced pathway.

**Conclusions**

We need more study to investigate the possible mechanism.

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