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#### **Reliability of a novel method of predicting ACL graft size using preoperative MRI does not differ regardless of Orthopedic experience**

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##### **Introduction / Objection**

It is important to pre-operatively identify patients who may have small sized hamstring tendons, so surgeons can consider alternative graft sources. A novel and practical method was previously described to estimate the size of the hamstring tendon graft using preoperative MRI with a high specificity. However, the practicality of this method has not been assessed in a wider spectrum of clinicians ranging from medical students to senior Orthopedic surgeons.

This study aims to (1) Determine the performance of this method amongst a broader range of medical practitioners (2) Perform an interobserver reliability study– to assess whether differences amongst members with various clinical experience can affect the accuracy of the estimation of the hamstring tendon graft size.

##### **Materials & Method**

A retrospective review was conducted for 112 consecutive patients who underwent primary ACL reconstruction. Five evaluators were chosen to reflect a broad range of Orthopedic experience, including an Orthopedic senior consultant, a senior resident, a non-trainee medical officer and two medical students. All five evaluators measured the cross-sectional lengths and breadths of both semitendinosus and gracilis grafts in an independent and blinded manner.

##### **Results / Discussion**

The Pearson's correlation coefficient for the predicted graft diameter to the actual graft diameter was 0.645 ( $p < .001$ ), which shows a moderate positive correlation. Specificities ranged between 88.9% to 94.4% across all five evaluators. Percentage agreement was highest between the senior and junior surgeons (90.2%) but very high between the medical students (86.6%). High interobserver reliability was observed between the surgeons ( $\kappa=0.795$ ) and between the medical students ( $\kappa=0.713$ ). Overall, there is substantial interobserver reliability across all five evaluators ( $\kappa=0.714$ ) based on the Landis & Koch scale.

##### **Conclusion**

We have further established the accuracy and reproducibility of this novel practical method through an inter-observer study, thus enabling junior members of the surgical team to complete this role with similar competency.

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#### **Role of patient specific 3D printed models in patient confidence, understanding and satisfaction of care in Singapore**

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##### **Introduction / Objection**

Patient specific 3D models have been widely used for pre-op planning and intra-op guidance in orthopaedic surgery. These models however are not often used in pre-operative doctor-patient communication. This study evaluates the roles of customized 3D models in improving patient understanding, confidence, and satisfaction of patient care when they were used during preoperative counselling.

##### **Materials & Method**

A prospective survey was conducted on 33 orthopaedic trauma patients who were required to rate on a scale of 1 to 5, the effectiveness of patient specific 3D models in: 1) improving patient's understanding and, 2) helping patients cope with the condition, 3) boosting patients' confidence in the treatment and 4) in the surgeon; and on a scale of 0 to 10, their overall satisfaction. Subgroup analysis was done to compare ratings of patients by age and by education levels.

##### **Results / Discussion**

Over 90% patients rated agree or strongly agree on customised 3D models' effectiveness in improving understanding of injury and boosting confidence in treatments and surgeons. 87% patients agreed or strongly agreed that the models enhanced patient self-efficacy. Customized 3D models help patients visualize complex pathology to facilitate patients' understanding of their condition and treatment, resulting in improved self-efficacy, confidence, and overall satisfaction. Correlations between age and ratings, and between age and overall satisfaction were statistically insignificant. Hence age does not influence patients' perceived effectiveness of customised 3D models in improving patient care. Post-secondary group had significantly higher satisfaction level than the pre-secondary group but ratings on each of the four areas evaluated were comparable between the two groups. Patients with higher education level are likely to experience higher satisfaction level due to their willingness to take responsibility for their care.

##### **Conclusion**

The use of patient specific 3D models in pre-operative counselling allows greater patient involvement and prompts patient-centred healthcare, therefore improving patient care quality.

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#### **Implications of Oligohydramnios on Hip Development: A Study on Chick Embryos and Developmental Dysplasia**

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##### **Introduction / Objection**

Our team embarked on a study to explore the impact of fetal movement restriction on the development of the hip joint and the onset of developmental dysplasia of the hip (DDH). We hypothesized that restricting fetal movement could potentially lead to DDH. Furthermore, we proposed that timely intervention to reverse oligohydramnios, a condition characterized by low amniotic fluid, could potentially prevent DDH.

## Materials & Method

To simulate the effects of oligohydramnios, we used a chicken embryo model. We aspirated varying amounts of amniotic fluid from the eggs, effectively creating a condition of low amniotic fluid and restricting the movement of the embryos. The embryos were then examined at different stages of development to assess the impact of this induced oligohydramnios on hip joint development. To evaluate whether hip development was reversible when oligohydramnios was remediated, chicken embryos in one group were reinfused with normal saline on a specific day.

## Results / Discussion

Our findings revealed that movement restriction resulted in significant morphological changes in the hip joint. Specifically, we observed a decrease in the acetabular index and an increase in the femoral head-neck angle, changes that align with the characteristics of DDH. Additionally, our study found that movement restriction influenced the perichondral microenvironment, a crucial factor in understanding the occurrence of DDH.

## Conclusion

Our study suggests that fetal movement restriction could be a potential cause of DDH. We believe that timely reversal of oligohydramnios during the fetal period could serve as a preventive measure against DDH. This finding provides valuable insights for potential intrauterine treatment of DDH in the future. We also wish to highlight the significance of the perichondral microenvironment in understanding the occurrence of DDH.

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## Enhanced Recovery After Surgery Protocol Improves Postoperative Pain and Shortens Length of Stay Among Patients Undergoing Primary Total Knee Arthroplasty

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### Introduction / Objective

Enhanced Recovery After Surgery (ERAS) is a "fast-track", perioperative, multi-disciplinary concept aimed at improving recovery time and reducing length of hospital stay. This study aims to compare the postoperative outcomes of ERAS versus non-ERAS TKA, with the primary outcomes being day 0 pain score, days 1-2 range of motion (ROM), days 1-2 distance walked and hospital length of stay (LOS).

### Materials & Method

A retrospective analysis was performed for 111 consecutive patients who had undergone primary unilateral TKA from November 2019 to October 2020 at a single tertiary hospital by fellowship-trained arthroplasty surgeons. Three independent, blinded observers extracted patient data from our institution's Electronic Medical Records. The ERAS protocol included preoperative smoking and alcohol cessation, preoperative physiotherapy, intraoperative local infiltration analgesia using a drug cocktail, postoperative multimodal analgesia and postoperative day 0 physiotherapy, while any patient who deviated from any step were classified as non-ERAS. Two-sample t-tests, Wilcoxon signed-rank tests and Chi-squared tests were used to compare the outcome variables between ERAS and non-ERAS patients.

### Results / Discussion

Patients under the ERAS protocol (n=67) reported a significantly lower postoperative day 0 pain score (p=.0480) and a shorter hospital LOS (p=.0189) than non-ERAS patients (n=44). No significant difference (p>.05) was observed for ROM and distance walked on days 1-2.

### Conclusion

Our study demonstrates that the ERAS protocol improves day 0 postoperative pain and shortens hospital LOS while being non-inferior for ROM and distance walked on days 1-2.

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## Closed reduction according to new classification of rotated lateral condyle fractures of the humerus in children

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### Introduction / Objective

In recent years, a few studies have mentioned closed reduction and percutaneous pinning (CRPP) of rotated lateral condyle fractures of the humerus in children. In this prospective investigation, the radiographic and clinical results of patients with these fractures that were initially managed with CRPP were newly classified.

### Materials & Method

We classified these fractures into two groups according to the degree and pattern of fracture displacement as identified on four radiographic images. In Type I (rotated type), the fracture is unstable with single rotation of distal fragment; In Type II (rotated and flexed type) with rotation of distal fragment and antero-proximal displacement. We also designed an algorithm for closed reduction of these fractures according to this new classification. We retrospectively analyzed the radiographic and clinical results of 17 unstable fractures (in 11 boys and 6 girls) that were treated with closed reduction.

### Results / Discussion

13 of 17 type I fractures, which could have been reduced to within 2 mm of residual displacement, were treated with closed reduction and pinning with 2 or 3 Kirschner wires (K wires). 4 of 17 (60.0%) type II fractures were treated with CRPP. There were no complications, such as nonunion, osteonecrosis of the capitellum, superficial or deep infection, malunion, or early physal arrest.

### Conclusion

This prospective study showed that lateral humeral condyle fractures with rotation can be initially treated with CRPP to achieve satisfactory recovery of the elbow. The algorithm, according to the new classification, can effectively enhance the rate of closed reduction. Kirschner wire (K wire) fixation is recommended to avoid reoperation or anesthesia for hardware removal.

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### **Is Intraoperative cell salvage and autogenic transfusion a risk factor for postoperative metastases in spinal chordoma surgery ?**

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#### **Introduction / Objection**

Chordomas are slow growing spinal tumours for which surgical excision remains the treatment of choice. This is associated with significant intra-operative blood loss and high rates of allogenic blood transfusion. Intraoperative cell salvage with a leukocyte depletion filter (IOCS-LDF) is a well-recognised adjunct to high blood loss in oncological surgery. There remains controversy regarding the use of IOCS-LDF in sarcoma surgery due to concern about dissemination of chordoma cells potentially leading to distant metastases.

#### **Materials & Method**

This is a retrospective review of surgically treated spinal chordoma patients treated between 2012-2021. Follow up was till time of death with a minimum of 1 year follow up. Patients were divided based on whether surgery was Enneking Appropriate (EA) or Enneking Inappropriate (EI) where an intraoperative breach had occurred or resection with wide margins was not performed. and whether autogenic or allogenic blood was transfused. Patient outcome studied was local recurrence, metastases and overall survival

#### **Results / Discussion**

30 patients were included, mean age was 61(17-86) years and 19/30(63.3%) were male.

20 (66.7%) patients had chordomas of the mobile spine, 10(33.3%) of the sacrum. 17/30 (56.7%) patients had EA resections and 13/30(43.3%) had EI resections.

Overall local recurrence rate was 7/30(23.3%) and Metastases rate was 6/30 (20.0%). 5/6 were EI patients of whom 4/5(80%) had received autogenic blood.

On univariate analysis EI status ( $p=0.037$ )(4.75(1.10-20.50)) was a significant risk factor for local recurrence.

EI+ Autogenic blood transfusion was a significant risk factor for metastases ( $p=0.034$ ) (11.06(1.20-101.78)) as was non-virgin (previous surgical treatment) status ( $p=0.002$ )( 6.70 (2.70-22.44) and history of previous radiotherapy ( $p=0.004$ )( 3.97 (1.57-10.04)).

#### **Conclusion**

This finding has changed our surgical practice and we no longer use cell salvage when operating on spine primary tumour patients. However a limitation is the small study size and more research is required.

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### **Surgical management of primary spinal tumours, the Oxford Spinal Sarcoma Service experience**

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#### **Introduction / Objection**

Enneking appropriate (EA) resection of primary spine tumours remains the standard of care. Inappropriate diagnostic procedures and treatment performed at non-high volume centres is associated with poorer patient outcome and survival. In England, spinal sarcoma care is uniquely centralised to 4 quaternary centres, we wish to examine the surgical outcomes of the Oxford Spinal Sarcoma Unit, which serves a population pool of over 10 million patients.

#### **Materials & Method**

Retrospective review of surgically treated primary spinal tumour patients between January 2008 to January 2022. Patient demographics, clinical data, tumour characteristics and histology was collected. An EA margin was defined as one where final pathological margins and surgical impression matched the Enneking-recommended surgical margins, an EI margin was one where EA surgical margins were not obtained or in non-virgin patients with a previous intralesional procedure. Outcomes studied included local recurrence, metastases and overall survival

#### **Results / Discussion**

119 patients were included, 96/119(80.7%) were virgin and had not received previous intralesional surgery. EA margins were achieved in 81(68.1%) patients. Mean local recurrence free (LRF) survival was 4.6 (1-13) years and local recurrence rate was 17.6%. Mortality rate was 21.0% with a mean survival of 5.1 (1-13) years post-surgery. There were 25 (21.0%) cases with distal metastases, mean Metastases Free Survival was 4.8 (1-13) years. Notably in EA patients with mobile spine tumours the local recurrence rate was 1/51(2.0%). On multivariate analysis EI ( $p=0.019$ ) and post-operative systemic treatment( $p=0.004$ ) were significant risk factors for local recurrence. Metastases ( $p=0.012$ ) and pre-operative systemic therapy ( $p=0.025$ ) were risk factors for survival.

#### **Conclusion**

Centralisation of spinal sarcoma care and a multidisciplinary approach has led to excellent surgical outcomes and our local recurrence rate in EA mobile spine is the lowest reported in the literature. We believe that our experience will be of benefit to other centres.

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### **Trends in Surgical Management of Spinal Metastases in a Singaporean Tertiary referral center: A 17 year retrospective review**

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#### **Introduction / Objection**

Surgical treatment is increasingly the treatment of choice in cancer patients with epidural spinal cord compression and spinal instability. There has also been an evolution in surgical treatment with the advent of minimally invasive surgical (MIS) techniques and separation surgery. This paper aims to investigate the changes in epidemiology, surgical technique, outcomes and complications in the last 17 years in a tertiary referral centre in Singapore.

#### **Materials & Method**

This is a retrospective study of 383 patients with surgically treated spinal metastases treated between January 2005 to January 2022. Patients were divided into 3 groups, patients treated between 2005 – 2010, 2011-2016, and 2017- 2021. Demographic, oncological, surgical, patient outcome and survival data was collected. Statistical analysis with univariate analysis was performed to compare the groups

#### **Results / Discussion**

There was an increase in surgical treatment (87 vs 105 vs 191). Lung, Breast and prostate cancer were the most common tumour types respectively. There was a significant increase in MIS( $p<0.001$ ) and Separation surgery ( $p<0.001$ ). There was also a significant decrease in mean blood loss (1061mls vs 664 mls vs 594mls) ( $p<0.001$ ) and total transfusion (562mls vs 349mls vs 239mls) ( $p<0.001$ ). Group 3 patients were more likely to have improved or normal neurology ( $p=<0.001$ ) and independent ambulatory status( $p=0.012$ ). There was no significant change in overall survival.

#### **Conclusion**

There has been a significant change in our surgical practice with decreased blood loss, transfusion and improved neurological and functional outcomes. Patients should be managed in a multidisciplinary manner and surgical treatment should be recommended when indicated.

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### **SHORT TERM OUTCOMES OF EARLY TREATMENTS OF RADIAL DYSPLASIA**

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#### **Introduction / Object**

Radial dysplasia, also termed radial club hand is an abnormality along the longitudinal axis of the hand characterized by hypoplasia or aplasia of radial structures. Surgery that centralize the wrist on the distal end of the ulna gives quite good results in terms of anatomical recovery but affecting range of motion of the wrist and fingers, limbs length. We conducted this study to evaluate the outcome of serial casting followed by centralization at our institution.

#### **Materials & Method**

This prospective study of 20 children with 25 limbs with Bayne Types III and IV with mean follow-up of 22 months. Each limb was treated by gradual soft tissue stretching using serial casting, followed by centralization. Clinical and radiography features were recorded for each case at the time of surgery and follow up examinations.

#### **Results / Discussion**

The average correction attained during the study was 60° of radial deviation. Wrist range of motion decreased from 79° to 28° during follow-up. The range of movement at fingers showed increase in stiffness. Ulnar length achieved was 57% of the contralateral normal side. The results at the final follow-up were graded on the criteria of Bayne and Klug. Twenty-four out of 25 hands (96%) showed good or satisfactory result.

#### **Conclusion**

Early treatment of radial dysplasia by gradual corrective cast followed by centralization in children is an effective method of treatment with consistently good or satisfactory results in term of anatomy restoration but with the sacrifice of wrist, finger Range of Motion and limb growth.

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### **The Axis of Motion of the Elbow: Anatomical and Biomechanical Comparison of the true Flexion-Extension Axis and Epicondylar Axis.**

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#### **Introduction / Object**

The medial and lateral epicondyles define the epicondylar axis, and commonly used as surgical landmarks, such as in elbow arthroplasty and external fixator application. We aimed to determine the true flexion-extension axis of the elbow, and compare this to the epicondylar axis. We investigated the differences between axes with regards to angular difference and positional offset (translation).

#### **Materials & Method**

CT scans of cadaveric elbow specimens were performed and digitalized to obtain 3D models. These 3D models were then used to compare the differences in angular alignment and positional offset (translation) between the epicondylar axis and the true flexion-extension axis of the elbow.

#### **Results / Discussion**

The angular difference between the epicondylar axis and the true flexion-extension axis was  $2.2^\circ \pm 4.8^\circ$  ( $p=.204$ ). The true flexion-extension axis was translated from the epicondylar axis, by  $23.0\text{mm} \pm 3.4\text{mm}$  on its medial side, and by  $16.0\text{mm} \pm 3.6\text{mm}$  on its lateral side ( $p<.001$ )

#### **Conclusion**

There is a small angular difference between the epicondylar axis and true flexion-extension axis, which did not reach significance in this study. A significant positional (translational) difference between the two axes was found. This should be taken into account during use and alignment of elbow implants, as malalignment may predispose implants to early failure.

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## **Necrotising fasciitis in the elderly: A comparison between patients aged $\geq 60$ and $< 60$**

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### **Introduction / Objection**

Increasing age is associated with increased incidence of necrotizing fasciitis. In this study, we aim to compare the clinical presentation, investigations, microbiology and clinical outcome in elderly (age  $\geq 60$ ) patients and non-elderly (age  $< 60$ ) patients with extremity necrotizing fasciitis.

### **Materials & Method**

A retrospective review of surgically treated extremity necrotizing fasciitis patients treated between January 2005 to and December 2021 was conducted. We studied the following outcomes in patients, including amputation rate and mortality rate, length of stay, performance of surgery within 24 hours, and accuracy of diagnosis at presentation.

### **Results / Discussion**

A total of 167 patients were treated. 66 (39.5%) were age  $\geq 60$  patients and 101 (60.5%) were age  $< 60$ . Elderly patients were more likely to have ischemic heart disease ( $p=0.001$ ), immunosuppression ( $p=0.019$ ) and bullae on presentation ( $p=0.025$ ). Significantly more elderly patients had mono-microbial gram-negative infections ( $p=0.006$ ). Elderly patients had a significantly higher amputation (42.4% vs 22.8%) ( $p=0.01$ ) and mortality rate (34.8% vs 18.8%) ( $p=0.02$ ).

### **Conclusion**

In patients aged  $\geq 60$  necrotising fasciitis of the extremities is associated with significantly increased risk of amputation and mortality. It is important that the treating surgeon be aware of this, and that early appropriate empirical antibiotics and radical surgical debridement be initiated and the patient appropriately counselled.

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## **Paediatric Hip Ultrasound: the interpretation of quality, geometry and morphology**

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### **Introduction / Objection**

This study focuses on agreement in interpretation of the quality of the paediatric hip ultrasound examination, reliability of the geometric and morphological assessment and the relationship between these measures

### **Materials & Method**

Graf's standard plane. They measured geometric parameters, described the morphology of the hip, and assigned the Graf grade of dysplasia. Investigators analysed one 'self-selected image and one 'randomly-selected' image from the ultrasound series, and then repeated the process four weeks later. Analysis of intra and inter-rater agreement, and correlations between various parameters were made.

### **Results / Discussion**

In the assessment of ultrasound quality there was moderate to substantive intra-observer agreement for each element investigated but between investigators it was poor. Morphological features showed weak to moderate agreement across all parameters but improved to significant when responses were reduced. Geometric measures for showed near perfect agreement and the relationship between the geometric measures and morphological features showed a dose response across all parameters with the correlations being moderate to substantial. There was strong correlations between geometric measures. The Graf classification showed a fair to moderate agreement between observers and moderate to substantial for the individual.

### **Conclusion**

This broader investigation into the reliability of interpretation of hip ultrasound has demonstrated the difficulties in defining what is a quality ultrasound. We have confirmed that geometric measures are reliably interpreted and as they are highly correlated this may be useful as a further measure of scan quality. Morphological features are generally poorly interpreted, but a simpler binary classification improves agreement substantially. As there is a clear dose response relationship between geometric and morphological measures but the importance morphology in the diagnosis of hip dysplasia should be questioned.

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## **Enoxaparin versus Direct Oral Anticoagulants for Venous Thromboembolism in Asians Undergoing Total Knee Arthroplasty: A Meta-Analysis and Systematic Review**

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### **Introduction / Objection**

The introduction of direct oral anticoagulants (DOACs) shows promise for their role as a chemoprophylaxis agent post-total knee arthroplasty (TKA) for the prevention of venous thromboembolism (VTE). However, existing studies are largely based on Western populations that do not account for the different risk profiles and lower rates of VTE in Asians. This systematic review and meta-analysis aimed to evaluate the efficacy of DOACs compared to enoxaparin in an Asian-based population study.

### **Materials & Method**

The review was conducted in accordance with PRISMA guidelines. All studies that compared outcomes between enoxaparin and DOACs as VTE prophylaxis post-TKA in the Asian population were included.

### **Results / Discussion**

Five studies with 121,153 patients were included. DOACs demonstrated a convincing benefit over enoxaparin in overall VTE prevention (OR=0.42, 95%CI: 0.24-0.74). However, while the OR trended in favour of DOACs for the reduction of DVT events (OR=0.54, 95%CI:0.20-1.48) and pulmonary embolism (PE) (OR=0.75, 95%CI:0.07-8.20) statistical significance was not reached. In terms of bleeding complications, both arms had similar rates of major (0.91% vs. 0.20%), clinically relevant non-major (CRNM) (3.28% vs. 2.94%) and minor bleeding complications (12.8 vs. 13.3%). A non-significance advantage of enoxaparin over DOACs was revealed in the OR for major bleeding (OR=3.17; 95%CI: 0.81-12.43), while DOACs were favoured to reduce risk of CRNM (OR =0.82; 95%CI: 0.01-91.51) and minor bleeding (OR=0.76; 95%CI: 0.11-5.33).

### **Conclusion**

DOACs confer a significantly reduced rate of overall VTE compared to enoxaparin in Asians post-TKA. No significant differences in DVT, PE and rates of bleeding complications exist.

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### **Surgical outcomes of Developmental Dysplasia of the Hip in the walking age**

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#### **Introduction / Objection**

The aim of this paper is to present the clinical and radiological outcomes of DDH patients who presented late and required surgical intervention, and, to assess the differences in outcomes between patients who underwent pelvic and femoral osteotomy versus pelvic or femoral osteotomy alone.

#### **Materials & Method**

This was a multi-centre study involving 2 tertiary healthcare institutions in Singapore and China. All patients with DDH who underwent surgical treatment between January 2011 to December 2019 and were 3 years and above at the time of surgery were included. Clinical outcomes- VAS, Mckay score, Severin score and complications were included. Radiological outcomes- Tonnis classification, center-edge angle and acetabular index were recorded. Sub-group analysis comparing age (3 -8 years and 8 years) and surgical type (pelvic or femoral osteotomy and pelvic femoral combined osteotomy) was performed.

#### **Results / Discussion**

A total of 43 patients with 49 hips were included. Post-operatively, there was significant pain improvement of 2.2 ( $p<0.05$ ), which was sustained at 2-years follow-up, 36 hips with good to excellent Modified Mckay grade ( $p<0.05$ ), and 37 hips with grade I-III on the Modified Severin classification ( $p<0.05$ ). All radiological parameters reported a significant improvement. 12 hips had avascular necrosis and 9 hips were complicated by repeat subluxation or dislocation. Sub-group analysis by age groups showed no significant difference in outcomes or complications. Sub-group analysis by surgical type reported a 9.7 times ( $p=0.043$ ) higher risk of re-dislocation in patient who underwent pelvic or femoral osteotomy compared to combined pelvic femoral osteotomy.

#### **Conclusion**

DDH patients who presented late and underwent surgical fixation have good outcomes. Clinical and radiological outcomes and complication rates were comparable between those who presented at 3 years old and those after 8 years old. Patients who underwent pelvic or femoral osteotomies alone had 9.7 times more risk of redislocation post-operatively as compared to patients with combined pelvic-femoral osteotomy.

## **23**

### **Functional and Quality of Life continues to be maintained beyond 1-year Post-Total Knee Arthroplasty**

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**Institution:** Lee Kong Chian School of Medicine

#### **Introduction / Objection**

Total Knee Arthroplasty (TKA) is the gold-standard treatment of end-stage knee osteoarthritis which seeks to reduce pain, improve patients' function and quality of life (QOL). This study aims to establish the temporal pattern of patient reported outcome measures (PROMs) and objective scores over a 2-year period post-TKA.

#### **Materials & Method**

A retrospective cohort study of 755 patients who underwent primary TKAs between 1st August 2017 to 31st October 2020 was performed. PROMs measured include Oxford Knee Score (OKS), Knee Society Knee Scoring System - Functional Knee Score (KSS-F), 5-level EuroQol-5D questionnaire (EQ-5D-5L), EuroQol visual analogue scale (EQVAS) and pain score at pre-operative, 3-months, 12-months, and 24-months post-operative. Objective clinical measures included degree of passive flexion and range of motion, and Knee Society Knee Scoring System - Objective Knee Score (KSS-C).

#### **Results / Discussion**

There was no improvement in all PROMs beyond 12-months, with the exception of EQVAS. KSS-C, degree of passive flexion and range of motion continued to improve up till 24-months. The greatest degree of improvement was seen in the first 3-months post-operative for OKS, EQ-5D-5L, EQVAS, KSS-F, KSS-C, and pain score. There was thereafter a consistent degree of improvement in patients' perceived QOL as determined by EQ-5D-5L and EQVAS over the 3-to-12 month and 12-to-24-month period ( $P<.001$ ). 56.6% (427/755) of patients achieved full health profile, with a score of 1 in all five EQ-5D-5L categories at the 24-month mark, as compared to 0% at pre-operative stage.

#### **Conclusion**

The results reinforce the debilitating effect that knee osteoarthritis has on patients' QOL, but reassures us that TKA remains an effective treatment. The monitoring of patients' functional recovery deserves a rethink, and how to best individualise rehabilitation programmes to optimise patients' functional outcomes. The improvements continue to be maintained 2-years post-TKA. The expected recovery course should be counselled to patients pre-operative.

## **24**

## **Is Pharmacological Thromboprophylaxis truly necessary: Predictive Factors for Venous Thromboembolic Events post-Total Knee Arthroplasty in an Asian Population**

Zavier Yongxuan Lim<sup>1</sup>, Lynn Thwin<sup>2</sup>, Kelvin Guoping Tan<sup>2</sup>

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**Name of Presenting Author:** Xavier Lim Yongxuan

**Institution:** Lee Kong Chian School of Medicine

### **Introduction / Objection**

Venous thromboembolic prophylaxis is routinely used in elective total knee arthroplasty (TKA) patients worldwide. Guidelines vary from aspirin to low molecular weight heparin in combination with mechanical prophylaxis, and direct oral anticoagulants (DOACs).

The aim of this study was to identify predictive or protective factors for VTEs in an Asian hospital and examine the efficacy of pharmacological VTE prophylaxis.

### **Materials & Method**

A retrospective cohort study of 2016 patients who underwent unilateral primary TKAs between 1st August 2017 to 31st July 2022 was performed. All patients received mechanical thromboprophylaxis in the form of calf intermittent pneumatic compression prophylaxis device (IPCD) postoperatively. Symptomatic patients were referred for radiological investigations to exclude VTE. We evaluated patient demographics, comorbidities and surgical parameters to establish the overall incidence of symptomatic VTEs and risk factors for VTEs.

### **Results / Discussion**

There were 24 (1.19%) incidences of symptomatic VTEs, of which 1 patient developed pulmonary embolism, 10 proximal deep vein thrombosis and 13 distal. VTE incidence was 0.758% (11/1452) for patients on mechanical prophylaxis only, 2.08% (9/432) for patients on aspirin, 3.67% (4/109) for clexane, 0% (0/5) for DOACs, and 0% (0/18) for clopidogrel. Multivariate logistic regression revealed length of stay ( $P < 0.001$ ) and blood transfusion ( $P = 0.020$ ) were independent risk factors for VTE. Use of tranexamic acid did not significantly affect VTE rates ( $P = 0.056$ ). Choice of thromboprophylaxis did not significantly affect VTE rates in the model ( $P = 0.086$ ). Widespread use of thromboprophylaxis significantly lowered incidence of VTE in our population as compared to studies suggesting up to 35.7 - 62.5% incidence in patients without prophylaxis.

### **Conclusion**

Chemical thromboprophylaxis may not be required post-operative in Asian population. The identification of risk factors in this study allows surgeons to individualise risk counselling for patients listed for elective TKAs and choose appropriate thromboprophylaxis methods. Further study is required for patients with asymptomatic VTE.

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## **Efficacy of periarticular tranexamic acid administration in elderly individuals with femoral neck fracture undergoing hemiarthroplasty: A randomized controlled trial**

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### **Introduction / Objection**

Tranexamic acid (TXA) is commonly used in hemiarthroplasty to reduce blood loss volume and, subsequently, the need for blood transfusion. However, there is limited evidence on the efficacy of periarticular TXA (PA-TXA). This study aimed to compare blood loss volume, postoperative hemoglobin drop, and blood transfusion rates after hemiarthroplasty in patients receiving TXA via different routes.

### **Materials & Method**

Fifty patients with femoral neck fracture undergoing hemiarthroplasty were randomly assigned to receive either PA-TXA 1,000 mg and intravenous TXA (IV-TXA) 750 mg (group I) or IV-TXA 750 mg alone (group II). The total blood loss (TBL) volume, 24- and 72-h postoperative hemoglobin drops, blood transfusion rates, and incidence of thromboembolic events between the two patient groups were compared. A p-value of  $< 0.05$  was considered statistically significant.

### **Results / Discussion**

The mean TBL volume of group I significantly decreased compared with that of group II ( $743.07 \pm 281.15$  vs  $998.74 \pm 472.19$  mL,  $p = 0.046$ ). However, there were no significant differences in terms of the 24- and 72-h postoperative hemoglobin drop ( $p = 0.711$  and  $0.749$ , respectively). The transfusion rate of the cemented implant group significantly reduced ( $p = 0.015$ ). Nevertheless, none of patients in groups I and II developed thromboembolic events.

### **Conclusion**

PA-TXA is associated with a lower TBL volume, without adverse events. Hence, the administration of combined PA-TXA and IV-TXA can be effective and safe in patients with femoral neck fracture undergoing hemiarthroplasty. Nevertheless, further studies should be conducted to determine the efficacy and optimal dosage of PA-TXA alone.

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Athip Kongklam, Natthapong Hongku

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PA-TXA is associated with a lower TBL volume, without adverse events. Hence, the administration of combined PA-TXA and IV-TXA can be effective and safe in patients with femoral neck fracture undergoing hemiarthroplasty. Nevertheless, further studies should be conducted to determine the efficacy and optimal dosage of PA-TXA alone.

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### A quantitative measure of the extent of epiphyseal avascularity correlated with quantitative measure of the outcome of the Perthes' disease

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### Introduction / Objection

Till recently the extent of epiphyseal avascularity of the femoral epiphysis in Perthes' was estimated on the categorical scale of Catterall. Similarly, the outcome of Perthes' disease was assessed on the categorical scale of Stulberg. Now both epiphyseal avascularity and the outcome can be expressed on continuous scales. Epiphyseal vascularity can be measured with MRI perfusion scans and expressed as the MR Perfusion Index and the outcome of treatment of Perthes' disease can be estimated with the Sphericity Deviation Score.

Using these new measures, we tested associations between the extent of hypo-perfusion of the femoral epiphysis with:

1. The duration of the disease
2. The shape of the femoral head at healing of the disease.

### Materials & Method

Twenty two children (19 boys and 3 girls) in the early stage of Perthes disease had Gadolinium enhanced perfusion MRI scans. Subtraction images were obtained and the extent of avascularity was estimated. All the children were treated in a similar manner with proximal femoral varus derotation osteotomy and all were followed-up till the disease healed. The interval between the initial radiograph and the first radiograph that showed complete healing was regarded as the duration of the disease.

The shape of the femoral head was measured by computing the Sphericity Deviation Score. The associations between the MR Perfusion Index and duration of the disease and the Sphericity Deviation Score were tested by computing the Pearson correlation coefficient.

### Results / Discussion

The MR Perfusion Index ranged between 51 and 90%. The Sphericity Deviation Scores ranged between 0 and 55. A positive correlation was noted between the extent of hypo-perfusion and the duration of the disease. The Sphericity Deviation Score was positively correlated with the extent of epiphyseal hypo-perfusion.

### Conclusion

MR Perfusion Index computed as soon as the diagnosis is made appears to be of prognostic significance that can help the surgeon give parents of children with Perthes' disease some information regarding the likely duration of the disease and the possible outcome of treatment.

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### Premature proximal femur physis fusion in Perthes' disease

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### Introduction / Objection

Epiphyseal growth abnormalities including early fusion of the proximal femur growth plate is common in Perthes disease. The timing and frequency of early epiphyseal closure is unknown. The specific aim of the study was 1) to evaluate the frequency and timing of early epiphyseal closure in children with Perthes' disease, 2) to compare the outcome at skeletal maturity between children with early epiphyseal closure compared to normal epiphyseal closure and 3) to assess the variables influencing the early epiphyseal closure.

### Materials & Method

Eighty-five consecutive children with unilateral Perthes' disease treated during active stage of disease were prospectively followed up till skeletal maturity. 69 operated (varus derotation osteotomy) and 16 non-operatively treated children formed the basis of the study. All serial radiographs were evaluated to assess the epiphyseal closure by two pediatric orthopedics consultants. The severity of disease in active stage of disease were be classified with Catterall and Herring classification. Outcome at skeletal maturity was assessed by Stulberg. The independent "t" test and Wilcoxon test were done to compare mean differences of continuous variables between groups. Chi-square test were done to compare the frequency distribution between two groups.

### Results / Discussion

45 children (52%) had premature epiphyseal closure in Perthes disease. Children with normal fusion had better radiological outcome at skeletal maturity. The age of onset, extent of involvement, type of the treatment did not influence the early epiphysis closure. The early fusion children had higher frequency of Herring C.

### Conclusion

The early fusion of the capital femoral physis is independent of the age of onset, severity of involvement, type of treatment. The early fusion can be expected with Herring C. The early closure of the growth plate is associated with poor outcome at skeletal maturity.



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### **Evaluating The Suitability Of The Masada and Jo Classifications For Forearm Deformity Caused By Hereditary Multiple Osteochondromas: New Classification Proposed**

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#### **Introduction / Objection**

The objective of this study was to evaluate the suitability of the Masada and Jo classifications for clinical use, and to propose a new classification system that is all-inclusive and guides clinical management.

#### **Materials & Method**

A retrospective review of 275 forearms (183 patients) was performed. Patient demographics and site of involvement were noted. Forearm radiographs were reviewed to determine the number and location of osteochondromas, the presence of radial head dislocation (RHD), and to measure radiographic parameters (proportional ulnar length (PUL), radial bowing, ulnar variance (UV), carpal slip, radioarticular angle). Univariate and multivariate logistic regression analyses were performed to identify predictors of RHD. A receiver operating characteristic (ROC) curve was generated.

#### **Results / Discussion**

According to the Masada and Jo classifications, 39 (14.2%), 16 (5.8%), 27 (9.8%), 71 (25.8%), 27 (9.8%) were types I, IIB, III, IVA and IVB respectively. Ninety-five (34.5%) forearms were unclassifiable. RHD were present in 74 patients (26.9%), of which 73 (98.6%) had distal ulna lesions. The presence of distal ulna osteochondroma was the single-most predictive factor for RHD. Univariate and multivariate analyses of this subgroup identified PUL ( $p < 0.0001$ ) and UV ( $p = 0.044$ ) to be significant predictors of RHD, qualifying as 'at-risk criteria'. The area under the ROC curve for PUL and UV was 0.89 and 0.75 respectively. The ROC-derived ideal value of PUL was  $\leq 0.905$  (sensitivity 0.91, specificity 0.71), and UV  $\leq -10.15\text{mm}$  (sensitivity 0.70, specificity 0.71).

#### **Conclusion**

We propose a new classification system that differentiates patients into 3 groups. Type 1 are patients with distal ulna osteochondromas; type 2 without. This is further divided into type 1A, where patients meet the at-risk criteria for RHD, requiring close follow-up and possibly early surgical intervention. Type 1B are patients that do not meet the at-risk criteria, at low risk of RHD. Type 2 are patients unlikely to develop RHD.

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### **Comparison of cut-out rates between cemented TFNA and uncemented PFNA in geriatric patients with inter-trochanteric hip fractures**

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**Name of Presenting Author:** Wei Lun Cheong

**Institution:** SingHealth

#### **Introduction / Objection**

The Synthes cemented TFN-Advanced (TFNA) Proximal Nailing System was introduced in Singapore in 2017. This retrospective cohort study aimed to compare the implant cut-out rates in cement-augmented TFNA intra-medullary nails with the non-cemented-augmented Synthes Proximal Femoral Nail Antirotation (PFNA) intramedullary nail to evaluate the efficiency of cement augmentation.

#### **Materials & Method**

135 patients underwent intramedullary nailing for hip inter-trochanteric fractures using cement-augmented TFNA devices in a single tertiary hospital between September 2017 and March 2020. Data from this study was compared with another set of study data consisting 370 patients who underwent intramedullary nailing with non-cement-augmented PFNA devices at the same tertiary hospital, from January 2011 to December 2014. Variables including age, gender and side of operation were collected. Patients were followed up for a minimum of one year to look for evidence of implant cut-out and re-operations. Independent t-test and Chi-squared test were then performed to identify any statistically significant differences.

#### **Results / Discussion**

The cut-out incidence in the cement-augmented TFNA treatment group was 0.8%, compared to 5.4% in the non-cement-augmented PFNA treatment group. There was a statistically significant difference between the implant cut-out rates in both groups. The proportion of re-operations was higher in the PFNA treatment group, though this was not statistically significant. No differences were reported in the side of injury, gender or age.

#### **Conclusion**

The cement-augmented TFNA intramedullary nail is a viable option to prevent implant cut-out in the surgical fixation of fragility hip inter-trochanteric fractures. However, more studies are required to investigate its long-term outcomes including safety profile.

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### **Early acute osteotomy correction with crossing pinning was recommended to treat lower limb malalignment in pseudoachondroplasia: a single center experience**

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#### **Introduction / Objection**

Hemiepiphysiodesis, acute osteotomy correction and gradual correction using external fixation have been applied to treat lower limb malalignment, but the standard treatment is controversial in Pseudoachondroplasia population.

#### **Materials & Method**

We reviewed our PSACH patients, who were operated in HKU Shenzhen Hospital during 2015-2022. Clinical information was collected. The pre- and postoperation lower limb alignment parameters (MAD and TFA) were measured by two doctors. All patients had minimal one-year of follow up postoperation.

### Results / Discussion

A total of 16 (7 Males, 9 Female) PSACH patients were included. The age ranges from 3.5-17.0 (median 5.7). All were treated with surgeries because of lower limb alignment deformities (14 genu varum, average mTFA=34, average MAD=5.3cm; 1 genu valgum, mTFA=24.5, MAD=3.6cm combining with 4 knee flexion contracture). The treatment methods included 6 cases of guided growth control with 8-plates (2 cases finally received osteotomies, 2 also received growth hormone), 9 bilateral lower limb osteotomies and k-wire fixation and casts, 2 limb lengthening with deformity correction (2 femurs and 2 tibias). Two mild patients treated with 8-plates showed alignment improvement (mTFA 21 to 9, MAD 3.6cm to 1.7cm). Patients receiving acute osteotomies achieved good postoperation alignment of lower limbs in coronal and sagittal planes, and maintained to the latest follow up (average 1.5 years, mTFA=5, MAD=0.7cm). Two patients (age 14 and 17) underwent staged operations with limb lengthening and deformity correction using external fixation followed by plate fixation due to severe deformity (mTFA=15, MAD=2.7cm). The complications included one common peroneal nerve palsy, one pin tract infection, and two cast migrations. All recovered uneventfully.

### Conclusion

Guided growth control with 8-plate has limited ability to correct the lower limb malalignment especially in severe ones. Early acute osteotomy correction with crossing pinning was recommended to treat lower limb malalignment in pseudoachondroplasia. Gradual correction with external fixation is suitable for more mature patients requiring correction for severe deformity.

## 35 Tibialis Anterior Tendon Transfer Using Suture Anchor as Novel Treatment for Relapsed Clubfoot: A Case Report

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**Institution:** St. Carolus Bone & Joint Center, St. Carolus Hospital, Jakarta, Indonesia

### Introduction / Objection

Relapsed clubfoot is defined as the recurrence of any component of deformity after a complete correction. While the Ponseti method has been known to have excellent outcomes, several relapse cases have been reported. Thus, further surgical intervention is needed to achieve a good and reliable long-term outcome.

### Materials & Method

We report a presentation of a 4.5-year-old boy who came to the clinic with a relapsed bilateral clubfoot after serial Ponseti casting. Plantar fascia release, Achilles Tendon Lengthening (ATL), and tibialis anterior tendon transfer (TATT) with suture anchor technique were performed respectively followed by an above-knee cast. The patients have gained acceptable walking balance and ability to run and playing complex sports at 1 year follow-up.

### Results / Discussion

There are several factors contributing to the relapse clubfoot including adherence to abduction brace, loss of reduction, muscle imbalance or inadequate correction of initial deformity. The current case report described a relapse clubfoot following serial Ponseti casting caused by non-adherence to foot abduction brace protocol. Further surgical interventions must be performed in the presence of relapse case of clubfoot.

### Conclusion

Surgical intervention, especially TATT procedure provides a favorable outcome in treating patients with relapse clubfoot. TATT with suture anchor provide excellent alternatives to other methods, and could be utilize in younger patient as soon as lateral cuneiform is visible on plain radiograph.

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### Oblique anterior pelvic osteotomy for Bladder extrophy/ epispadias complex: Case series of a new technique and review of literature

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### Introduction / Objection

Bladder extrophy/epispadias complex is a disorder of the mesodermal development of the anterior abdominal wall ranging from simple epispadias to devastating cloacal extrophy. In this series, we studied the results of our patients of bladder extrophy/epispadias complex treated with bilateral anterior iliac osteotomy with modification of technique.

### Materials & Method

This is a retrospective study of prospectively collected data of patients of bladder extrophy-epispadias complex performed at 2 tertiary care institutes by a similar surgical approach. All children underwent an anterior perivesical release with bladder reconstruction (by the paediatric surgical team) along with bilateral oblique innominate osteotomy fixed with a unique technique of external fixation. The children were analysed by pre-operative anterior surgical wound size, wound closure and associated wound complications, continence, pubic diastasis distance and the percentage of pubic approximation. Complication rate and need for secondary surgeries also were analysed.

### Results / Discussion

A total of 25 patients with mean age @ surgery of 8 months were analysed at a mean follow up of 1 year (6months to 18 months). The mean anterior surgical wound was 5.3 cm (4-8cm) and the anterior pubic diastasis was a mean 8.4 cm (6.8-10.2cm). All patients except one had an uneventful anterior wound healing while one patient (who had recurrent bladder extrophy) developed a sinus which healed with dressings. The fixator was removed at 4 weeks and 3 patients developed superficial pin tract infection which healed after removal of the pins. The pubic diastasis distance decreased to 1.4 cm post-op but which increased to 3cm at the last follow up. However this did not affect wound healing or function. The percentage pubic approximation was 63%.

### Conclusion

This first study from India about osteotomies for bladder extrophy shows the excellent results of the same in severe and recurrent extrophies. This should be a standard procedure for all Extrophy-epispadias reconstructions.

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### **3D printing for preoperative planning and intraoperative surgical jigs - a prospective study on surgeon perception**

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**Name of Presenting Author:** CAROL ZHAO XIAOSHU

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#### **Introduction / Objection**

Patient-specific 3D printed models have been widely used as a complement to 2D imaging for pre-op planning in orthopedic surgery. This study discusses surgeons' views on the use of custom-made 3D models for pre-op planning and intraoperative guiding.

#### **Materials & Method**

Two prospective surveys were conducted on surgeons' views on pre-operative use of patient-specific 3D models (n=64) and intraoperative jigs (n=14) respectively. The usefulness of 3D models in pre-op planning was evaluated in four areas on a scale of 1 to 5: 1) improving surgeons' understanding of patients' anatomy, 2) aiding in pre-operative planning and 3) explaining the condition to others, and 4) portraying the anatomy accurately. For intraoperative jigs, surgeons were required to rate on the ease of use, effectiveness of the jigs in improving the ease, accuracy, and outcomes of surgery, and in reducing surgery time.

#### **Results / Discussion**

Majority of the participants rated 4 and above (agree and strongly agree) for all areas evaluated on pre-operative and intraoperative use of 3D models. We opine that these full-scale individualized models allow clear visualization of complex anatomy from various angles and planes, and simulation of specific surgical procedures. Surgeons therefore can anticipate possible challenges and plan out solutions accordingly. When used intra-operatively, these guides facilitate accurate cuts and positioning of implants, therefore improving the ease and outcome of surgery. We also noted a higher rating on "aid in explaining the condition to others" by surgeons with 0-3 years of practice post exit compared to the other two groups (3-6 years and above 6 years) without significant difference in rating on "improve understanding". This could be because surgeons with more experience already knew how to explain procedures and pathology to others using other more conventional methods such as drawing or pictures.

#### **Conclusion**

Surgeons largely have optimistic views on preoperative and intraoperative use of patient specific 3D models.

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### **A 60-year review of authorship trends between specialties**

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#### **Introduction / Objection**

Authorship numbers have increased significantly over time. We aimed to determine time-dependent comparative authorship trends between major Orthopaedic, Medical, and Surgical journals.

#### **Materials & Method**

We examined metadata for all publications of 3 representative major journals (the New England Journal of Medicine (NEJM), Annals of Surgery (AS), and the Journal of Bone and Joint Surgery (JBJS)) from 1st Jan 1960 to 31st Dec 2019. We tabulated trends of the number of authors per publication, and in the number of multicenter publications, and explored correlation. We reviewed comparative trends between journals.

#### **Results / Discussion**

Over 73,000 articles were analysed. The number of multicenter trials increased significantly over time ( $p < .001$ ). Rates of increase in authorship increases differed significantly between specialties, with larger and more rapid increases in Medical and Surgical journals. Authorship numbers per publication increased significantly ( $p < 0.0001$ ) for all 3 journals.

#### **Conclusion**

Authorship numbers increased for all specialties. The rate of increase in authorship was more rapid in Medical and Surgical journals, suggesting differing authorship trends between specialties.

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### **Impact of pelvic tilt on acetabular version: A 2 Dimensional Computed tomography analysis**

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**Name of Presenting Author:** Dr Avi Shah

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#### **Introduction / Objection**

Pelvic orientation influences the acetabulum particularly in the sagittal plane, which can lead to improper interpretation of acetabular version. It is important to understand acetabular version when diagnosing and treating FAI and acetabular dysplasia. There has been a controversy regarding the method, level and accuracy for measuring acetabular version. We therefore wanted to analyze the effect of pelvic tilt on acetabular version measurement in non-pathological hips at different levels of acetabulum using 2 D CT.

#### **Materials & Method**

We analyzed 40 non pathological Hips of patients between age 10 to 18 years (mean 13.4 + 2.06 SD) who underwent CT pelvis in our institution using Phillips 2D CT Analyzer. Acetabular version was measured at different axial levels, slice 1 – cranial, slice 2 – Equatorial, slice 3 – Caudal, prior to and after correction of pelvic tilt.

#### **Results / Discussion**

Mean Acetabular version using 2D CT was 10.3 + 7.45 SD degree (uncorrected) & 12.15 + 6.5 SD degree (corrected). Mean version using slice 1 was 5.27 + 10.79 SD degree, slice 2 was 11.68 + 7.13 SD degree and in slice 3 was 14.15 + 6.81 SD degrees before correction of pelvic tilt and was 8.25 + 8.8 SD, 12.95 + 6.8 SD, and 15.21 + 6.58 SD degrees after correction of pelvic tilt. Statistical significant change was noted in acetabular version before and after correction of pelvic tilt at all levels.

#### **Conclusion**

A greater understanding of acetabular version and influence of pelvic tilt allows improvement in planning and management. Effect of pelvic tilt on the measurement of acetabular version at any level is statistically significant. Pelvic tilt should always be considered while analyzing Acetabular version in CT scan.

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#### **One-bone forearm procedure for severe forearm deformities in Masada IIB Hereditary Multiple Exostoses – Indications and short term results”**

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#### **Introduction / Objection**

Hereditary Multiple Exostoses (HME) Masada IIB has traditionally been treated by gradual ulnar lengthening with questionable efficacy in reducing the dislocated head. One Bone forearm (OBF) has been used as a reconstructive procedure in forearm deformities with very scarce literature for HME. The study aims to report short term results of OBF as a definitive procedure for severe forearm deformities in Masada IIB patients with respect to clinical and radiological parameters.

#### **Materials & Method**

Four patients with HME Masada IIB were included in this retrospective study. All patients complained of forearm and wrist deformity with an abnormal bony protrusion restricting elbow motion. Indications for OBF were ulnar shortening >3cms, dysplastic proximal radius with convex radial head and restricted prono-supination. All patients were examined pre-operatively and post-operatively clinically and radiographically using the Peterson's outcome score.

#### **Results / Discussion**

The average age was 13 years (12-14years). Preoperative ulnar shortening, carpal slip percentage and radial articular angle was 3.4 cms, 79.5% and 47.5° respectively. All radial heads were dislocated with convex articular surface restricting elbow extension and forearm prono-supination. At the latest follow-up the mean elbow flexion was 110° with forearm in 10° supination. The mean carpal slip percentage, radial articular angle and Peterson functional grade was 15%, 22.5° and 8 points respectively. The mean follow-up period was 30.25 months with no recurrence.

#### **Conclusion**

We recommend one bone forearm as a definitive procedure in HME Masada IIB patients with severe forearm deformities with ulnar shortening >3cms and dysplastic proximal radius with a dislocated radial head, for faster return to function.

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#### **When to Combine Acetabular Osteotomy in Patients With Residual Hip Dysplasia/Subluxation After Reduction of Developmental Dysplasia of the Hip**

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#### **Introduction / Objection**

After the successful reduction of developmental dysplasia of the hip, residual hip dysplasia may persist . Femoral and/or acetabular osteotomy has been used to address this problem. The purpose of this study is to determine the indication of femoral versus combined femoralacetabular osteotomy in the management of residual hip dysplasia.

#### **Materials & Method**

Fifty-five patients with unilateral dislocated-type dysplasia of the hip, who had residual hip dysplasia after reduction, underwent femoral osteotomy with or without acetabular osteotomy before 8 years of age, and were followed for more than 2 years and over 8 years of age, were the subjects of this retrospective study. Twenty-eight patients underwent femoral osteotomy only at a median age of 34 months (group F), and 27 underwent combined femoral-Dega osteotomy at a median age of 49 months (group C). Seventeen patients in group F and 4 in group C had an additional osteotomy due to persistent hip dysplasia. Acetabular index (AI), lateral center-edge angle, and center-head distance difference were measured on serial radiographs. The z-value of AI ( $Z_{AI}$ ) was calculated. At the latest follow-up, patients in group F with Severin I/II who did not have an additional osteotomy were considered satisfactory, and patients with Severin III/IV or those who had an additional osteotomy were considered unsatisfactory. Preoperative variables were tested for the difference between satisfactory and unsatisfactory cases. Receiver operating characteristic(ROC) analysis was performed to delineate a cutoff value of a significant parameter dividing the outcome.

#### **Results / Discussion**

AI and  $Z_{AI}$  before index osteotomy were significant parameters predicting a satisfactory outcome in group F. ROC analysis returned a cutoff value of  $Z_{AI}$  2.6 (Area Under the Curve= 0.86, P=0.001).

#### **Conclusion**

$Z_{AI}$  2.6 may serve as a threshold to combine acetabular osteotomy with femoral osteotomy in the management of residual hip dysplasia before 8 years of age.

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#### **Epidemiology of developmental dysplasia of the hip and selective ultrasound screening program in New Territories West Cluster in Hong Kong**

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#### **Introduction / Objection**

Developmental dysplasia of the hip (DDH) is a major paediatric musculoskeletal problem which can cause lifelong disability if left untreated. The New Territories West Cluster (NTWC) is a public hospital cluster in Hong Kong which serves around 1 million population. Hong Kong currently adopts the universal clinical assessment and selective ultrasound screening for DDH. This study aims to update the epidemiology of DDH in NTWC and to evaluate the effectiveness of current screening program.

#### **Materials & Method**

Records of children referred to orthopaedics clinic in Tuen Mun Hospital for suspected DDH with ultrasound hips performed in 2017-2019 were reviewed. Diagnosis of DDH was made on clinical examination supported by static or dynamic ultrasonography result. Late presentation of DDH is defined as DDH presenting after 6 months old.

#### **Results / Discussion**

929 patients were referred with ultrasound hips done. 12 of them were diagnosed DDH. There were 2 with late presentations. The female to male ratio was 13:1. Incidence of DDH in NTWC in 2017-2019 was 0.89/1000 live births. Failure rate of the hip screening program was 0.14/1000 live births.

91 patients had purely capsular laxity. 50(55%) had first ultrasound before 6 weeks old, 41(45%) had first ultrasound after 6 weeks old. Capsular laxity is negatively correlated to age of first ultrasound (correlation coefficient = -2.80,  $p < 0.001$ ). All patients had normal follow-up ultrasound. Successful rate of Pavlik harness in the 12 patients diagnosed DDH by the selective ultrasound screening were 67%(8/12).

#### **Conclusion**

Incidence of DDH (0.89/1000 live births) in NTWC is comparable to a local study published a decade ago. Current selective ultrasound screening program is justified and effective with a low failure rate in detecting DDH. Purely capsular laxity is a benign ultrasonographic finding. 6weeks old is an optimal time to perform first ultrasound in DDH screening to prevent overdiagnosis of capsular laxity.

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#### **Comparison of primary vertebral eosinophilic granuloma treated via free hand or robotic assisted minimally invasive surgery (RAMIS)**

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#### **Introduction / Objection**

To investigate the advantage and disadvantage of RAMIS on primary vertebral eosinophilic granuloma when compared with free hand technique.

#### **Materials & Method**

We retrospectively collected cases diagnosed as primary EG and treated in our single institution since January 2010 to September 2022. Totally, 24 consecutive patients (14 boys and 10 girls) were included. Of them, cervical vertebral was suffered in 4 cases, thoracic vertebral in 13 cases, lumbar vertebral in 7 cases, multi-segment affected was found in 3 cases. The operation was conducted at an average age of 6.9 years (2.1~12.8 years). Based on the surgery techniques, patients were divided into 2 groups, RAMIS group (17 cases) and Free hand group (7 cases). Besides, preparation time before incision, operation lasting time, blood loss, rehabilitation time, hospitalization days and junior practitioner participate degree was also collected and analyzed.

#### **Results / Discussion**

Tissue samples from all cases were adequate and identified by biopsy. Preparation time before incision in Free hand group was 27.4 min, which was dramatically less than that in RAMIS group (83.0 min). However, operation lasting time in RAMIS group (2.5 hours, range 1.55~3.65 hours) were comparable with Free hand group (2.4 hours, range 39 min~6.9 hours); Regarding to blood loss, hospitalization days and rehabilitation time, RAMIS group were significantly better than those in Free hand group. Particularly, surgical procedures in RAMIS group were mostly (85.7%, 6/7) completed independently by junior practitioner under the surveillance of experts, but in Free hand group, merely 17.6% (3/17) cases were performed by younger doctor.

#### **Conclusion**

RAMIS technique is beneficial for pediatric primary vertebral eosinophilic granuloma regarding blood loss control, hospitalization day decreasing and rapid post-operation recovery. On the other hand, despite initial piles of preparation work, it is still worthy being spread extensively due to shortening learning curve for younger doctor.

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#### **Written in the stars? Prognosticating outcomes for developmental dysplasia of the hip – 50 years' experience with average 20 years follow-up**

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#### **Introduction / Objection**

We aim to identify predictors and develop a prognostication model for hip dysplasia patients to determine long-term outcomes and guide treatment.

#### **Materials & Method**

DDH patients at 2 tertiary centres over a 53-year-period with follow up to skeletal maturity were analysed. Neuromuscular disorders and hips that underwent open reduction (with risk of iatrogenic injury) were excluded. Radiographs from early 1970s were retrieved from the Picture Archiving and Communication System with measurements made by 3 assessors. Age-specific acetabular indices, growth disturbance, Tonnis grade, gender, and age of reduction were investigated to predict risk of good (Severin grades I or II) or poor (Severin grades III or above) hip outcomes at skeletal maturity.

#### **Results / Discussion**

2217 radiographs from 107 hips (96 girls and 11 boys) with mean follow-up of 20 years (max 53.9 years) were analysed. 83% hips experienced good outcomes; growth disturbance was present in 12%. Early reduction by 3 months was associated with good outcome ( $p=0.042$ ). Children with poor hip outcomes had higher acetabular indices (AI) across all ages ( $p<0.01$ ). Using a support vector machine algorithm, we developed a clinical chart visualising risk of poor outcomes, attaining an accuracy of 84%. Cut-off values for predicting residual dysplasia at skeletal maturity were identified - AI  $\geq 28$  degrees at age 1 year (72% sensitivity and 88% specificity, AUC 0.87,  $p<0.01$ ); AI  $\geq 24$  degrees at 2 years (73% sensitivity and 67% specificity, AUC 0.84,  $p<0.01$ ), and 1 degree decrement per each subsequent year (i.e. AI  $\geq 23$  degrees at 3 years, AI  $\geq 22$  degrees at 4 years, etc.) up to age 7 years (AI  $\geq 19$  degrees).

#### **Conclusion**

Age-specific acetabular indices predicted hip outcomes at skeletal maturity. We adopted our model into a graphical clinical chart to facilitate prognostication and guide treatment.

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#### **Morphometric analysis of the popliteal artery and its implications in total knee arthroplasty: a systematic review and meta-analysis**

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#### **Introduction / Objection**

The popliteal artery (PA) is the lower extremity arterial vessel, originating from the superficial femoral artery, at the area of the distal part of adductor magnus muscle. Our purpose was to analyze the morphometry of the popliteal artery (PA) in relation to other structures both in flexion and extension of the knee, thus highlighting discrepancies in the PA's location in varying positions.

#### **Materials & Method**

Literature data regarding the morphological qualities, prevalence rates and variants of popliteal artery (PA) were pooled. Data analyses and literature searches were performed according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses and Anatomical Quality Assurance guidelines.

#### **Results / Discussion**

There were 5 cadaveric and 14 radiological studies included, which are representing the total of 1473 lower limbs. The estimated length of the popliteal artery from the adductor hiatus to the origin of the anterior tibial artery, and to the femoral condyles was 165.3mm (95% CI 115.3-215) and 170.1mm (95% CI 107.4-232.7) respectively. At joint level the diameter of the popliteal artery was estimated to be 7.2mm (95% CI 6.5-8.0) and when assessing the diameter five centimeters distal to the adductor hiatus and proximal to the PA's termination the estimated diameters were 9.3mm (95% CI 7.1-11.6) and 5.9mm (95% CI 5.2-6.5) respectively.

#### **Conclusion**

While the majority of the publications describing the relationships between vessels of popliteal area and specific landmarks are conducted with the knee in extension, our study was performed in a more dynamic manner, thus encompassing data from both knee extension and flexion. It is not only superior in providing more precise data, but also has a clinical tie-in, which is the description of diameter, length and distance changes of PA from landmarking structures, thus providing orthopedic surgeons with a precise tool in identification of this vessel.

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#### **A Novel Technique For Planning MIS Surgical Fixation of Hip Fractures**

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#### **Introduction / Objection**

Hip fractures are expected to reach 4.5 million by 2050, with Asia accounting for over half of them. Dynamic hip screw (DHS) is considered the gold standard for fracture fixation of intertrochanteric fractures. Conventional DHS (CDHS) is limited by longer surgical time and delayed recovery when compared to minimally invasive DHS (MIDHS). We propose a novel MIDHS technique which provides the exact trajectory of the guidewire for the implant on all 3 planes instead of 2 previously described - AP/lateral/axial, that the surgeon would require before he makes his first incision.

#### **Materials & Method**

A prospective double-blind case-control study conducted included 15 patients with 4-hole DHS surgical fixation of intertrochanteric hip fractures between 2019 and 2023. Cases were performed by different surgeons with similar levels of experience. Main outcome measurements were tip-apex distance (TAD), surgery duration, haemoglobin loss, and hospital stay duration. TAD was measured by two independent assessors using the post-operative anteroposterior and lateral radiographs. Fractures were categorised using Kyle's classification.

#### **Results / Discussion**

Baseline characteristics were similar between patients in the CDHS and MIDHS groups ( $p>0.05$ ) except for fracture type ( $p=0.04$ ). MIDHS group had more complex fractures (40% MIDHS Kyle 3/4 vs 10% CDHS Kyle 3/4). Mean surgical time was significantly shorter ( $p=0.019$ ) ( $43.8\pm 12.3$  minutes) compared to the CDHS group ( $73.4\pm 18.2$  minutes). There was no significant difference ( $p>0.05$ ) in postoperative hospital stay duration, haemoglobin loss, or TAD.

#### **Conclusion**

Despite having more complex fractures, MIDHS group had shorter mean surgical time than CDHS group, with no significant difference in TAD, haemoglobin loss and hospital stay duration.

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#### **Evaluating the Accuracy and Relevance of ChatGPT Responses to Frequently Asked Questions Regarding Total Knee Replacement**

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### **Introduction / Objection**

ChatGPT, a generative artificial intelligence chatbot, has the potential to transform healthcare delivery and patient education by providing informative and human-like responses to a wide range of patient queries. However, there is limited evidence regarding its ability to provide reliable and useful information on orthopaedic procedures. Our study seeks to evaluate the accuracy and relevance of responses provided by ChatGPT to frequently asked questions (FAQs) regarding Total Knee Replacement (TKR).

### **Materials & Method**

A list of 50 clinically relevant FAQs regarding TKR was collated. Each question was individually entered as a prompt to ChatGPT (version 3.5) and the first response generated was recorded. Responses were then reviewed by two independent orthopaedic surgeons and graded on a Likert scale for their factual accuracy and relevance. These responses were then classified into accurate versus inaccurate, and relevant versus irrelevant responses using thresholds on the Likert scale.

### **Results / Discussion**

Most responses were accurate while all responses were relevant. Of the 50 FAQs, 44/50 (88%) of ChatGPT responses were classified as accurate, achieving a mean Likert grade of 4.6/5 for factual accuracy. On the other hand, 50/50 (100%) of responses were classified as relevant, achieving a mean Likert grade of 4.9/5 for relevance.

### **Conclusion**

ChatGPT performed well in providing accurate and relevant responses to FAQs regarding TKR, demonstrating great potential as a tool for patient education and preoperative decision-making. However, it is not infallible and can occasionally provide inaccurate medical information. Patients and clinicians intending to utilize this technology should be mindful of its limitations and ensure adequate supervision and verification of information provided.

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### **The single-cell atlas of multiple osteochondroma and solitary osteochondroma in children**

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### **Introduction / Objection**

Although multiple osteochondroma (MO) and solitary osteochondroma (SO) differ in etiology, are easily distinguished in clinic. However, MO generally grows rapidly and is often associated with metaphyseal plasticity absence and limb deformity, suggesting that the cell map of MO is different from that of SO, which has not been reported at present.

### **Materials & Method**

The cartilage cap tissues of osteochondroma were collected from 1 MO and 1 age matched SO patients. Then, the cartilage tissues were digested into single-cell suspension, sequenced by 10×genomics, and analyzed by bioinformatics softwares.

### **Results / Discussion**

1. A total of 20191 high-quality cells (MO: 9703, SO: 10488) were acquired. The proportion of chondrocytes in MO was higher than that in SO, but the proportion of fibroblasts and immune cells was lower than that in SO. 2. Most of the chondrocytes with MO were located in the initial stage of the development trajectory, and their high-expression genes were enriched in the hypoxic response pathway. The chondrocytes of SO are located in the end stage of the developmental trajectory, and their highly expressed genes are enriched in the extracellular matrix remodeling pathway. 3. CHRDL2 and SFRP5 were highly expressed in MO, and both of which are highly expressed in naive chondrocytes. 4. Transcription factor analysis suggests that DBP may regulate CHRDL2 and SFRP5, and is highly expressed in MO. 5. In MO, proliferative chondrocytes are enriched in cell division pathways, while in SO, proliferative chondrocytes are enriched in extracellular matrix remodeling and ossification pathways.

### **Conclusion**

When compared with SO, juvenile chondrocytes expanded, whereas mature chondrocytes declined in MO. SFRP5 and CHRDL2 may inhibit the differentiation and maturation of chondrocytes through Wnt pathway and bone morphogenetic protein pathways in MO. DBP may be the critical upstream transcription factor of SFRP5 and CHRDL2. These key genes may provide potential therapeutic targets for MO.

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### **Anterior spinal reconstruction with structural femoral allograft post enbloc spinal tumour resection in the thoracolumbar spine.**

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### **Introduction / Objection**

The achievement of a stable construct with early bone fusion post en-bloc resection of spinal tumours is a key surgical goal. Structural femoral allografts possess biomechanical properties which make them an effective and less costly alternative to synthetic implants. We wish to report the long term and describe our surgical technique.

### **Materials & Method**

This is a retrospective review of patients who underwent enbloc vertebrectomy for primary spinal tumours or solitary spinal metastases of the thoracolumbar spine followed by anterior column reconstruction with fresh frozen femoral structural allograft and posterior instrumentation with pedicle screws between 1994 to 2022. Demographic, Oncological and Surgical Data was collected. Primary outcomes were fusion and time to fusion, local recurrence and duration of local recurrence free survival, and death and duration of survival.

### **Results / Discussion**

14 patients were treated, 7 females and 7 males with a mean age of 36 (range 11-63). 9/14 of the patients had primary tumours of the spine and 5/14 had solitary spinal metastases. Median follow up was 66 months (range 12-324 months). The mean time to fusion was 11 months (range 6-14). There were 2 cases of local recurrence. The mean local recurrence free survival was 106 months (range 12-324). The mean survival in the primary tumour group was 160 months (range 12-324) and 47 months (range 24-84) in the spinal metastases group. There was one case of implant failure required revision posterior instrumentation with placement of additional sacral screws and posterolateral bone grafting.

#### **Conclusion**

Structural Femoral Allografts are a cost-efficient and biomechanically suitable alternative for spinal reconstruction post spinal tumour en-bloc resection. It's compatibility with imaging modalities makes it ideal for post-operative surveillance and radiotherapy. Our technique of posterior stabilisation of the allograft with pedicle screws ensures mechanical stability and removes the need for an anterior approach and stabilisation.

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#### **Custom made connectors for carbon fibre rods in the treatment of cervical spine tumours**

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#### **Introduction / Objection**

Carbon fibre composite rods have the advantage of biocompatibility, good biomechanical characteristics and minimal interference with radiotherapy planning/delivery and imaging in spinal tumour surgery. We propose a new technique that allows the use of carbon fibre bars in the cervical and cervical-thoracic spine. A hybrid system of titanium connectors is used to link the tulips of the cervical screws and the occipital plate to the carbon fibre rods and thus exploit the advantages of using carbon fiber bars without sacrificing mechanical stability.

#### **Materials & Method**

This is a retrospective case series of patients who underwent surgery for cervical or cervical-thoracic junction spinal tumours between November 2020 to September 2022. A customised titanium connector made up of a tulip for connection to the carbon fibre rod and a rod for connection to the cervical/occipital fixation was utilised.

#### **Results / Discussion**

A total of 11 patients were enrolled for this study, 8 males and 3 females with a mean age of 59.4 (range 21-80) years. 5 patients had primary spinal tumours while 6 patients had spinal metastases. In 2/11 cases an en-bloc resection was performed, in 4/11 cases intralesional debulking, while in the remaining 5/11 cases separation surgery was performed. In 9 cases Ostapek® bars were used and in 2 cases Carbon-PEEK bars. In 2 cases anterior reconstruction was performed with non-vascularized iliac crest graft. On final follow up, 7/11 patients had no evidence of local recurrence or local progression, while 1 patient was loss to follow up. There was no evidence of loss of spinal alignment, implant pullout or breakage for all patients at final follow up.

#### **Conclusion**

In view of the decreased need for anterior reconstruction secondary to improved mechanical stability and ease of radiological surveillance and radiotherapy, we believe that our technique is a valid method to utilise the biomechanical advantages of carbon rods.

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#### **Single Position Robotic-Assisted Prone Lateral Fusion- Technical Description And Feasibility**

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#### **Introduction / Objection**

The introduction of lateral interbody fusion techniques has led to a paradigm shift for minimal invasive spinal surgery. However, while numerous benefits exist, this procedure has not been adopted by all surgeons because of the drawbacks of radiation and dual position surgery. With the advancements of Single position surgery and robotics, spine surgeons can now localize the disc space and perform endplate preparation accurately and radiation-free. In this paper, we discuss the potential synergistic benefits when integrating robotic assisted spine surgery and prone lateral single position surgery.

#### **Materials & Method**

A patient with spinal stenosis underwent an MIS spinal fusion using a simultaneous, single position, prone lateral, robotic assisted surgery.

#### **Results / Discussion**

We share our technique and provide operative nuances from preoperative planning, intraoperative set up, to neuro-localisation of lateral interbody cage insertion using the Mazor X Stealth Edition system. With the patient in prone position, subsequent direct neural decompression was performed with ease. This was done concurrently with lateral incision skin closure.

#### **Conclusion**

We highlight the potential synergistic benefits of integrating both techniques. Namely the Prone lateral and robotic surgery techniques, including the challenges encountered. This approach is not meant to replace other techniques or be used in all patients. Instead, it adds to our armamentarium for the management of spine fusion.

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#### **Lengthening over the plate in forearm deformity - A novel technique to reduce the duration of external fixation and related complications**

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### **Introduction / Objection**

Bone lengthening has been indicated in various forearm deformities of children. Most authors prefer the distraction osteogenesis using external fixator, while this technique may associate a high complication rate with a long duration wearing it. Lengthening over the plate (LOP) has been used in leg length discrepancies, which is proved to be a reliable technique with reduced external fixation duration. However, its use in forearm deformities has not been reported.

### **Materials & Method**

Six patients of forearm deformity (10~18 years old, mean: 13.6) have been treated by LOP technique, including 3 patients of posttraumatic growth arrest and 3 patients of multiple hereditary exostosis. There were five ulnar lengthening and one radial lengthening patients. Two patients needed additional corrective osteotomy of the associated radial deformity. Lengthening was performed with the aid of monolateral lengthening frame and small locking compression plate. After achieving a desired length, a second step operation was done placing 2 or 3 screws at the other side of the plate and removing the external fixator.

### **Results / Discussion**

The amount of lengthening averaged 3.0 cm (range 2.5~3.2 cm). Mean time in the fixator was 51 days, and mean external fixation index was 18.3 days/cm (range 11.6~24.8 days/cm). All patients achieved a successful healing of distraction callus. Every patient restored the preoperative level of motion in wrist and elbow. There were no major complications which needed surgical procedure. One patient suffered the superficial pin track infection, combined with contact dermatitis.

### **Conclusion**

LOP procedure of the ulna or radius may be a reliable technique for treating forearm deformities with its discrepancy in children. This technique significantly reduced the duration of external fixation and its related complications.

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## **"Which is the best prophylaxis against venous thromboembolism in Asians following total knee arthroplasty?" – A Systematic Review and Network Meta-analysis**

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### **Introduction / Objection**

Asians have a low venous thromboembolism (VTE) incidence following total knee arthroplasty (TKA). This systematic review and network meta-analysis was conducted to evaluate the best prophylaxis against VTE in Asians following total knee arthroplasty in current literature.

### **Materials & Method**

A systematic search of PUBMED, EMBASE and CINAHL was conducted in adherence to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). Prophylaxis types were separated into Low Molecular Weight Heparin (LMWH), Novel Oral Anti-coagulants (NOAC), Mechanical-only-prophylaxis (MOP) and No-prophylaxis (NP). The primary outcome was VTE incidence, grouped according to diagnosis modality (Ultrasound, Venography, Clinical). The secondary outcome was bleeding incidence, grouped into minor and major bleeding.

### **Results / Discussion**

14 eligible articles, totalling 4259 patients were pooled with the following significant results: NOACs had lower venography-diagnosed VTE incidence than LMWH (12.77%, $p=0.02$ ) and NP (20.64, $p<0.001$ ). MOP had lower venography-diagnosed VTE incidence than LMWH (23.72%, $p<0.001$ ), NOACs (10.95%, $p<0.001$ ) and NP (31.59%, $p<0.001$ ) but interestingly a statistically higher ultrasound-diagnosed VTE incidence than LMWH(6.56%,  $p=0.024$ ) and NP(4.88%,  $p=0.026$ ). No significant differences were observed between prophylaxis types for symptomatic VTEs, PEs or deaths. LMWH and NOACs had a higher minor-bleeding incidence than NP (11.71%, $p<0.001$  and 6.33%, $p<0.02$  respectively). No significant differences were observed between prophylaxis types for major-bleeding incidence.

### **Conclusion**

NOACs are a superior form of chemoprophylaxis than LMWH in reducing venography-diagnosed VTE incidence with no added bleeding incidence. However, routine chemoprophylaxis may not be required as LMWH and NOACs do not appear to reduce symptomatic VTE incidence compared to MOP and NP with an increased minor bleeding incidence. Mechanical prophylaxis in the form of graduated compression stockings or intermittent pneumatic compression should be routinely considered with significantly lower rates of venography-diagnosed VTEs compared to NP. Based on current evidence, we recommend an individualized approach to select the most appropriate prophylaxis type.

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## **Targeted 4D-CT Scans For Dynamic Elbow Disorders: A Literature Review and Refinement of Existing Technique With Two Exemplar Cases**

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**Institution:** Sengkang General Hospital

### **Introduction / Objection**

4D-CTs or motion CTs in elbow disorders have several potential advantages over conventional static imaging such as a reduction of misdiagnoses, a more targeted surgical approach, better patient understanding of their condition and potentially faster operative times. However, the radiation dose is higher than conventional static CT scans so this should be used judiciously. This study aims to examine existing literature on 4D-CTs in dynamic elbow disorders and present a technical note for radiation-reduced targeted elbow 4D-CTs (te4D-CTs), supported by two illustrative cases.

### **Materials & Method**

te4D-CTs are performed with the patient in a lateral decubitus elbow-above-the head position. Preliminary static source axial CT images are acquired, followed by subsequent reconstruction of sagittal and axial planes, as well as a 3D reconstruction. A motion scan is then conducted forming the 4D component. te4D-CTs are

captured during either flexion and extension (FE) or pronation and supination (PS) motions, depending on the suspected clinical pathology identified through thorough clinical examination.

#### **Results / Discussion**

4D-CTs for elbow pathologies is still relatively novel, however initial data suggests a potential misdiagnosis rate exceeding 50% when relying solely on conventional imaging methods, as opposed to incorporating 4D-CTs. Despite the improved diagnostic accuracy provided by 4D-CTs, certain obstacles have hindered broader adoption including the necessity for specialized software, trained radiographers, longer scan durations, and radiation exposure.

te4D-CTs for PS and FE protocol scans exhibited effective radiation exposure doses of 0.53 mSv and 0.95 mSv, respectively, compared to 1.13-1.83 mSv in conventional elbow 4D-CTs. Additionally, te4D-CTs demonstrate good diagnostic accuracy, provided that FE or PS pathology is meticulously identified by the ordering physician.

#### **Conclusion**

te4D-CT using isolated pronation and supination, or flexion and extension protocols does come with a significantly reduced radiation dose and can be of equal clinical yield compared with 4D-CTs. However further studies are required to compare te4D-CTs and a 4D-CTs.

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#### **Minimal invasive modified Woodward procedure for treatment Sprengel's deformity**

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University of Medicine and Pharmacy at HCM city, Ho Chi Minh, Vietnam

**Name of Presenting Author:** LÊ VIẾT CẦN

**Institution:** University of Medicine and Pharmacy at Ho Chi Minh city

#### **Introduction / Objection**

Sprengel's deformity is a congenital high scapula with main concerns regarding cosmetic deformity and restricted function of the shoulder. The aim of this study was to evaluate the results of minimal invasive modified Woodward procedure for treating 5 patients with Spengel's deformity.

#### **Materials & Method**

We reviewed the results of 5 shoulders operated in 5 patients (3 males and 2 females). We evaluated the improvement of abduction movement of the shoulder, cosmetic appearance by Cavendish grading.

#### **Results / Discussion**

Mean age at the time of surgery was 5 years and 9 months. Mean follow-up was 18 months. Mean increase in abduction shoulder was 42 degree. Mean scapular lowering was 2.5 cm. Postoperatively, Cavendish grade I was in 4 (80%), Cavendish grade II was in 1 (20%). All parents were satisfied with the cosmetic appearance.

#### **Conclusion**

The minimal invasive modified Woodward procedure was associated with significant improvement in shoulder abduction and cosmetic appearance.

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#### **A new capsuloplasty technique in open reduction of developmental dislocation of the hip**

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**Name of Presenting Author:** LÊ VIẾT CẦN

**Institution:** University of Medicine and Pharmacy at Ho Chi Minh city

#### **Introduction / Objection**

Capsuloplasty is one of the most critical steps during the process of open reduction of developmental dislocation of the hip (DDH). The author present a simple and new capsuloplasty technique.

#### **Materials & Method**

We reviewed the results of 36 dislocated hips in 34 patients who were treated by new capsuloplasty technique (with or without additional pelvic or femoral procedures). We evaluated both clinical and radiological follow-up.

#### **Results / Discussion**

Mean age at the time surgery was 3 years and 7 months. Mean time follow-up was 17 months. Based on the modified McKay score, good and excellent outcomes were 92%. Redislocation was not observed in any case.

#### **Conclusion**

Using this new capsuloplasty technique in DDH surgery is safe, reliable and simple.

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#### **Distal Femur Fractures in the Elderly - Does Surgical Delay Affect Morbidity and Mortality?**

Joel Xue Yi Lim, Choon Chiet Hong, Diarmuid Murphy

National University Hospital, Singapore, Singapore

**Name of Presenting Author:** Joel Lim Xue Yi

**Institution:** National University Hospital

#### **Introduction / Objection**

Distal femur fractures present a pertinent orthopaedic issue being the second most common fragility fracture of the femur after hip fractures. Whilst it is well established that early surgery confers morbidity and mortality benefits for elderly patients who sustain hip fractures, there is less consensus on the timing of surgery for distal femur fractures. This study aims to characterise the outcomes of surgically treated distal femur fractures in the elderly in terms of morbidity and mortality and evaluate if these are affected by surgical delay for >48 hours.

#### **Materials & Method**

A retrospective study of all surgically treated distal femur fractures at a single institution from 2007-2016 was performed. Patients of age 60 and above and a minimum of 1-year follow-up were included. Data on demographics, injury and surgery details, morbidity and mortality were collected and analysed.

#### **Results / Discussion**

79 patients with a mean age of  $75.4 \pm 10.4$  years were included. 1-year mortality was 8.9%, with ASA grade 4 the only independent predictor,  $p = 0.039$ . Delay in surgery >48 hours did not influence 1-year mortality rates. Thirty-two (40.5%) patients developed at least 1 medical complication and 17 (21.5%) patients had venous thromboembolism. Infection, non-union and re-operation rates were 7.6%, 5.1% and 13.9% respectively. The number of independent ambulators at final follow up decreased from 45 (57.0%) to 9 (11.4%) patients,  $p < 0.001$ .

#### **Conclusion**

Distal femur fractures in the elderly have a 1-year mortality rate of 8.9% in our study. Early surgery within 48 hours did not confer any survival benefit, with ASA 4 status being the only independent predictor for mortality. Whilst the mortality rate was relatively lower compared to other studies, our patients experienced notable morbidity and had significant decline in ambulatory status at final follow up.

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#### **Epidemiology of Back Pain and Its Impact on Quality-of-Life – A Population-Based, Cross Sectional Study in Singapore**

Hwee Weng Dennis Hey<sup>1</sup>, Joel Xue Yi Lim<sup>1</sup>, Jing Zhi Ong<sup>1</sup>, Nan Luo<sup>2</sup>

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**Name of Presenting Author:** Joel Lim

**Institution:** National University Hospital

#### **Introduction / Objective**

Back pain is an exceedingly common symptom with increasing prevalence worldwide that impacts both the individual and society. This study aims to describe the epidemiology of back pain in Singapore, its risk factors and impact on disability and quality-of-life.

#### **Materials & Method**

A cross-sectional, questionnaire-based study was conducted in Singapore on individuals aged 21 years and above. Data analysis was performed to determine the prevalence and characteristics of back pain, its relationship with socio-demographic factors, and its association on quality-of-life (QOL) and disability via validated questionnaires: EQ5D questionnaire and Oswestry Disability Index (ODI) respectively.

#### **Results / Discussion**

The overall prevalence of back pain was 16.0% (100/626). The prevalence of chronic and severe back pain was 2.1% and 1.8% respectively. BMI  $\geq 27.5$  (RR 1.79, 95%CI 1.01-3.19,  $p = 0.048$ ) and Indian ethnicity (RR 2.05, 95%CI 1.05-4.00,  $p = 0.036$ ) were the only identifiable risk factors for back pain. Individuals with back pain had mean raw ODI scores of  $8.83 \pm 8.48$ , with higher disability seen with increasing pain intensity ( $p < 0.001$ ). Individuals with back pain had poorer QoL with lower EQ5D-Index scores ( $0.84 \pm 0.22$  vs  $0.93 \pm 0.17$ ; 95%CI 0.04-0.13,  $p < 0.001$ ) and EQ5D-VAS scores ( $68.50 \pm 15.22$  vs  $73.50 \pm 13.65$ ; 95%CI 1.90-7.86,  $p < 0.001$ ) compared to those without back pain.

#### **Conclusion**

Our findings show that back pain is a prevalent condition associated with significant disability and poorer quality-of-life. Population sample health scores can serve as potential reference targets in disease management and aid national healthcare policy-making.

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#### **Clinical and Patient Reported Outcomes of Vitamin E Diffused HXLPE Liner vs. Moderately XLPE in Total Hip Arthroplasty: A Meta-Analysis**

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University of Santo Tomas, Department of Orthopaedics, Manila, Philippines

**Name of Presenting Author:** Diovince S. Tan

**Institution:** University of Santo Tomas Hospital, Department of Orthopaedics

#### **Introduction / Objective**

In the modern era of Medicine, Total hip arthroplasty (THA) is found to last longer than ever before due to the fact that there has been an improved bearing surfaces and materials available. Despite these modern approaches, failure caused by polyethylene wear, aseptic loosening, instability and mispositioning and even infection could affect the THA survival. In the course of addressing the anti-wear characteristics of the conventional polyethylene surface, various approaches have been made. The main objective of this study is to compare the effects of VEPE versus MXLPE liner in total hip arthroplasty. In terms of Incidence of Migration, Head Penetration and Wear by Radioisometric Analysis (RSA) and Patient and Clinical reported Outcomes namely VAS Score, Harris Hip Score (HHS), EuroQoL five-dimension three-level (EQ-5D) and University of California, Los Angeles (UCLA) activity score.

#### **Materials & Method**

Meta-Analysis research design was used. The investigators conducted a comprehensive literature search from Medline, Cochrane Library, PubMed, Elsevier, Google scholar, Embase and ClinicalTrial.gov as electronic data base. All RCT comparing effects of Vitamin E diffused XLPE liner versus moderately XLPE. liner in THA were included.

#### **Results / Discussion**

Results showed no statistical difference between the two in terms of migration, head penetration and wear on X, Y, and Z axis by RSA. Also showed no difference in terms of patient and clinical reported outcomes (VAS, HHS, EQ-5D, UCLA)

#### **Conclusion**

This indicates that VEPE liner is comparable with the conventional MXLPE liner. It also showed similar stability as regards it wear rates and that the component showed similar stability with that of the MXLPE liner.

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#### **Clinical and Patient Reported Outcomes of Vitamin E Diffused HXLPE Liner vs. Moderately XLPE in Total Hip Arthroplasty: A Meta-Analysis**

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University of Santo Tomas Hospital, Department of Orthopaedics, Manila, Philippines

**Name of Presenting Author:** Diovince S. Tan

**Institution:** University of Santo Tomas Hospital, Department of Orthopaedics

#### **Introduction / Objection**

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Results showed no statistical difference between the two in terms of migration, head penetration and wear on X, Y, and Z axis by RSA. Also showed no difference in terms of patient and clinical reported outcomes (VAS, HHS, EQ-5D, UCLA)

#### **Conclusion**

This indicates that VEPE liner is comparable with the conventional MXLPE liner. It also showed similar stability as regards it wear rates and that the component showed similar stability with that of the MXLPE liner.

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### **Prosthetic Joint Infection Risk in Patients Receiving Intra – articular Injection Prior to Total Knee Arthroplasty: A Systematic Review**

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**Institution:** University of Santo Tomas Hospital

#### **Introduction / Objection**

The use of corticosteroid injections remains popular for the nonoperative management of osteoarthritis of the knee, particularly among nonsurgical providers. Most interventions are associated with some risks, especially if the treatment is invasive. The relationship between intra – articular injections and infection rates following total knee arthroplasty (TKA) remains controversial. This study's purpose was to determine the relationship between having the injections prior to TKA and the point in time to which it was given

#### **Materials & Method**

Following the PRISMA protocol search through PubMed, Medline, and Cochrane databases was carried out in February 2021. A multistring search strategy was conducted by combining keywords ("Intra articular injection", "Steroid injection" "Total knee arthroplasty", "Infection") related to the intervention, outcomes, and type of arthroplasty. The search terms were used in google scholar to search the grey literature, or identify studies available online, but not published in peer reviewed journals. Ultimately doing, systematic review

#### **Results / Discussion**

In this systematic review of 8, 3 out of 4 cohort studies show no significant increase in risk of prosthetic joint infection in patients who receive intra – articular injection prior to TKA. 2 case control studies conferred the same results as the latter. For the 3 retrospective cohorts reviewing timing, 2 showed significant increase in risk in patients receiving the injection < 3 months prior to TKA.

#### **Conclusion**

The evidence of increased risk of post-operative infection in patients who receive intra - articular injections prior to TKA is weak. Even after controlling for compounding variables, the evidence agrees with the latter finding. Although the study is not without limitations, PJI is a devastating complication and should not be taken lightly. With that in mind, this study can provide surgeons with compelling evidence that intra – articular injection < 3 months prior to a knee replacement that possibly puts the patient at increased risk of postoperative infection.

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### **PIK3CA Related Overgrowth Syndrome (PROS) in a 5 year Old Male in the Philippines: A Case Report and Literature Review**

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#### **Introduction / Objection**

PIK3CA related overgrowth spectrums (PROS) include a variety of clinical presentations that are associated with hypertrophy of different parts of the body. These are rare entities that are caused by mutation in the PIK3CA gene that leads to a gain of function in the PI3K. It is a lipid kinase that controls signaling pathways participating in cell proliferation, motility, survival, and metabolism. Patients usually have complex tissue malformations, including abnormal vessels, excess adipose tissue, muscle hypertrophy, and bone deformation. The primary goal of the surgery was for shoe fitting of the affected foot as well as gait correction

#### **Materials & Method**

We report a 5 year old male presenting with right lower limb hemihypertrophy with associated polydactyly and macrodactyly of the 3rd and 4th toe and macrodactyly of the 5th toe. The diagnosis was based on clinical presentation, imaging studies, and genetic sequencing. He was subsequently treated with surgical debulking, disarticulation of the 3rd and 4th toe, and ray amputation of the 5th toe with epiphysiodesis

## Results / Discussion

In our case, we performed surgical interventions like debulking, disarticulation, ray amputation, and epiphysiodesis to address hemihypertrophy, polydactyly, and macrodactyly, aiming for proper shoe fitting and normal gait. Similar procedures have been documented in previous studies. Other systematic reviews highlighted the surgical focus for PROS hypertrophy reduction, mostly yielding localized effects. Patients with cosmetic and functional impairments underwent treatments including debulking, ray resection, epiphysiodesis, and phalangeal resection.

## Conclusion

Clinical presentations of these disorders are diverse, with overlapping features, requiring deep phenotyping. Despite variations, sharing traits across entities within the broad PROS spectrum is observed. Diagnosing rare diseases is complex due to low prevalence and clinical variability, compounded by limited experience at single sites. Sharing cases like ours is crucial in managing these challenges and advancing rare disease understanding.

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## Prosthetic Joint Infection Risk in Patients Receiving Intra – articular Injection Prior to Total Knee Arthroplasty: A Systematic Review

Cesar Paolo Zaballero, Carmelo Braganza

University of Santo Tomas Hospital, Sampaloc Manila, Philippines

**Name of Presenting Author:** Cesar Paolo L. Zaballero III

**Institution:** University of Santo Tomas Hospital

### Introduction / Objection

The use of corticosteroid injections remains popular for the nonoperative management of osteoarthritis of the knee, particularly among nonsurgical providers. Most interventions are associated with some risks, especially if the treatment is invasive. The relationship between intra – articular injections and infection rates following total knee arthroplasty (TKA) remains controversial. This study's purpose was to determine the relationship between having the injections prior to TKA and the point in time to which it was given

### Materials & Method

Following the PRISMA protocol search through PubMed, Medline, and Cochrane databases was carried out in February 2021. A multistring search strategy was conducted by combining keywords ("Intra articular injection", "Steroid injection" "Total knee arthroplasty", "Infection") related to the intervention, outcomes, and type of arthroplasty. The search terms were used in google scholar to search the grey literature, or identify studies available online, but not published in peer reviewed journals. Ultimately doing, systematic review

### Results / Discussion

In this systematic review of 8, 3 out of 4 cohort studies show no significant increase in risk of prosthetic joint infection in patients who receive intra – articular injection prior to TKA. 2 case control studies conferred the same results as the latter. For the 3 retrospective cohorts reviewing timing, 2 showed significant increase in risk in patients receiving the injection < 3 months prior to TKA.

### Conclusion

The evidence of increased risk of post-operative infection in patients who receive intra - articular injections prior to TKA is weak. Even after controlling for compounding variables, the evidence agrees with the latter finding. Although the study is not without limitations, PJI is a devastating complication and should not be taken lightly. With that in mind, this study can provide surgeons with compelling evidence that intra – articular injection < 3 months prior to a knee replacement that possibly puts the patient at increased risk of postoperative infection.

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## The Normal Value of Anterior-Center-Edge-Angle on False-Profile Radiographs in children and validation of accurate pelvic rotation angle of False-Profile Radiographs

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**Institution:** St. Vincent's Hospital, The Catholic University of Korea

### Introduction / Objection

Anterior-center-edge-angle (ACEA) measured in the false-profile radiograph represents the anterior coverage of the femoral head. Reference value of ACEA is not well established. Moreover, false-profile radiograph should be taken with 65° rotation of pelvis, but accurate positioning is not easy, leading to incorrect ACEA. The purpose of this study is to 1) determine the reference value of ACEA in children, 2) validate a known equation confirming correct rotation, and 3) delineate the change of measured ACEA according to pelvic rotation.

### Materials & Method

292 patients before skeletal maturity without hip deformity were selected. Reconstructed 3D-image of the pelvis was 65° rotated from the anatomical position, and ACEA was measured. Mean and standard deviation were calculated according to age-gender and laterality. Distances between the femur head centers on the anterior view (a) and 65° rotated view (a') were measured. The previously reported trigonometric equation ( $a' = a * \cos \alpha$ ) was validated. Thirty-four DDH patients who underwent pelvic-CT were selected. 3D-image of the pelvis was rotated from 40°-80° in 5° increment, and ACEA was measured at each position. Change of the measured ACEA in different rotational position with reference to that in 65° rotation were calculated as  $\Delta$ ACEA. Hips were also divided in two groups (ACEA<40° and ACEA≥40°), and  $\Delta$ ACEA was analyzed between the groups.

### Results / Discussion

ACEA was 39.5°±6.7° on the right, 40.0°±6.6° on the left in boys, and 41.8°±7.5° on the right, 41.9°±7.4° on the left in girls. ACEA increased with age. The known equation showed good correlation. ACEA was smaller with less pelvic rotation, and vice versa.  $\Delta$ ACEA was larger in ACEA≥40° group than in ACEA<40° group.

### Conclusion

We present the age-gender-laterality matched reference value of ACEA. More attention should be paid to take accurate false-profile radiographs. Less pelvic rotation would underestimate anterior coverage, especially in dysplastic hip.

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### **Outcomes and complications of surgery for symptomatic spinal metastases; a comparison between patients aged $\geq 70$ and $< 70$ .**

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**Institution:** Lee Kong Chian School of Medicine

#### **Introduction / Objection**

Advances in oncological treatment and an aging population have led to an increase in elderly patients with spinal metastases. Physicians may be deterred from operating on elderly patients due to fears of poorer outcomes and increased complications. The aim of our study is to compare the outcomes of surgical treatment of spinal metastases in patients aged  $\geq 70$ -years and  $< 70$ -years.

#### **Materials & Method**

This is a retrospective study of patients who underwent surgical treatment for spinal metastases between January-2005 to December-2021. Inclusion criteria included surgical treatment for spinal metastases with metastatic spinal cord compression or spinal instability. Patients  $< 18$ -years, with intradural tumors, primary spinal tumours, previous spine surgery/radiotherapy operations or who had undergone en-bloc spondylectomy or vertebroplasty/kyphoplasty only were excluded. Patients were followed up till death or minimum 1-year post-surgery. Patients were divided into two groups aged  $< 70$ -years and  $\geq 70$ -years. Outcomes studied included post-operative neurological status, ambulatory status, medical and surgical complications and the need for readmission post-surgery.

#### **Results / Discussion**

412 patients were identified of which 383 (92.9%) met the inclusion criteria. Of these 383 patients, 79 (20.6%) were  $\geq 70$ -years. Age  $\geq 70$ -years patients had significantly poorer ECOG scores 3-4 ( $p=0.0017$ ) and Charlson Comorbidity Index ( $p<0.001$ ). There was no significant difference in modified Tokuhashi score ( $p=0.393$ ), but there were significantly more  $\geq 70$ -years patients with prostate ( $p<0.001$ ) and liver ( $p=0.029$ ) cancer. Post-operative neurology (improved or maintained normal neurology) ( $\geq 70$  vs  $< 70$ ) (71.4% vs 73.4%) ( $p=0.934$ ), ambulatory status ( $\geq 70$  vs  $< 70$ ) (52.0% vs 41.8%) ( $p=0.171$ ), and survival at 6 months ( $p=0.119$ ) and 12 months ( $p=0.659$ ) was not significantly different. There was no significant difference in medical ( $p=0.528$ ), surgical ( $p=0.446$ ) complications and readmission ( $p=0.800$ ) rates.

#### **Conclusion**

$\geq 70$ -years patients have comparable improvement in neurological & ambulatory status to younger patients with no significant difference in complication rates. Age should not be a factor in deciding surgical management of spinal metastases.

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### **Are conventional interlocking nails safe to stabilize adolescent femoral shaft fractures? – an analysis of 105 fractures treated over 15 years**

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Ganga Hospital, Coimbatore, India

**Name of Presenting Author:** Venkatadass Krishnamoorthy

**Institution:** Ganga Hospital

#### **Introduction / Objection**

Trochanteric entry nails are the standard of care for adolescents with femoral shaft fractures where flexible nails cannot be used. This implant was introduced in the last decade and is not widely available across all the centers. We have been using the conventional adult intramedullary interlocking nails to stabilize the adolescent femoral shaft fractures for the past 15 years and this study was done to analyze their outcomes.

#### **Materials & Method**

We retrospectively collected the data of all femoral shaft fractures in children less than 18 years treated with intramedullary interlocking nail between 2010 and 2018, in our institution. The time to union, union rates and complications including avascular necrosis (AVN) were analyzed based on the serial radiographs. The final functional and radiological outcomes were also analysed for difference between trochanteric entry and piriformis fossa entry.

#### **Results / Discussion**

We had 103 children with 105 femoral fractures with an average age of 16.5 years (range 13-18 years) included in the study. Piriformis entry was used in 38 and greater trochanteric (GT) entry was done in 62. The average follow up was 18.7 months. No osteonecrosis was seen in either group. There was no significant difference in the rate of union in both groups. The incidence of heterotopic ossification was slightly higher in the trochanteric entry nailing, but not statistically significant. There was no difference in the final functional and radiological outcomes.

#### **Conclusion**

This is the first study to report the safety of usage of conventional femoral interlocking nails to treat femoral fractures in adolescents. We found that conventional interlocking nail can be safely used in adolescents and there is no increased risk of AVN with either the trochanteric entry or piriformis entry point. The union rates, functional and radiological outcomes were similar in both the groups.

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### **Does Prophylactic Pinning Affect the Proximal Femur Morphology in Slipped Capital Femoral Epiphysis?**

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Ganga Hospital, Coimbatore, India

**Name of Presenting Author:** Venkatadass Krishnamoorthy

**Institution:** Ganga Hospital

## **Introduction / Objection**

The role of prophylactic pinning of the contralateral hip in unilateral SCFE is well established in patients with risk factors. The effect of prophylactic pinning on the growth and morphology of the hip is not well documented in the literature. We aimed to study the effect of prophylactic pinning on the residual growth and morphology of the proximal femur.

## **Materials & Method**

The institutional database was searched for all unilateral SCFE cases for the period 2011 to 2020. A total of 171 unilateral SCFE cases were identified. All the radiographs were scanned and those patients who had follow-up X-rays till skeletal maturity were included in the study. Prophylactic pinning was performed using 6.5mm fully threaded cancellous screws. The following radiological parameters measured on the post-operative X-rays and at skeletal maturity: i) Neck length (NL), ii) Neck shaft angle (NSA), iii) Head neck offset (HNO), iv) articulo-trochanteric distance (ATD) and iv) tip-apex distance (TAD) by two different observers.

## **Results / Discussion**

The mean age of the cohort was 13.7 years. ATD decreased from the mean value of 25.67 mm in post-operative radiographs to 20.84 mm at final follow-up radiographs. The NL, HNO, TAD was found to be increasing with age with mean final follow-up values of 55.35 mm, 41.41 mm, 6.19 mm respectively compared to post-operative mean values of 50.95 mm, 37.4 mm, 4.69 mm. There was no significant change in the neck shaft angle. The mean post-operative NSA was 132.9° and it was 131.8° at final follow-up radiographs.

## **Conclusion**

Prophylactic pinning in unilateral SCFE does not stop the growth of the proximal femur completely. The articulo-trochanteric distance decreases in all the patients with prophylactic screw fixation probably due to the discrepancy in growth between the trochanteric apophysis and proximal femoral physis. The clinical effects of this subtle change in the morphology of proximal femur needs further investigation.

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## **Lower limb lengthening and deformity correction in children with Ollier's disease**

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**Name of Presenting Author:** Chunxing Wu

**Institution:** Children's Hospital of Fudan University

## **Introduction / Objection**

Osteotomy and limb lengthening with external fixation can correct the lower limb deformity caused by Ollier's disease. There may be lesions in the part of the bone where the wires and half-pins of the external fixator are inserted(PWH). This study evaluated: (1) how many intact sides of the lengthened segments are necessary to provide enough stability, and (2) whether the duration of external fixation can be reduced.

## **Materials & Method**

Group 1 (Ollier's disease) comprised 11 lower limb lengthenings; Group 2 (normal lengthened bone) comprised 29 lengthenings. Two groups were compared with respect to number of intact sides of the lengthened segments, angular correction(AC), lengthening gap(LG), distraction index(DI), lengthening length percentage(L%), lengthening index(LI), bone healing index(BHI), and external fixation index(EFI).

## **Results / Discussion**

There were lesions in nine PWH, and at least one of the four sides at the PWH remained intact. Full correction of the deformities were achieved in all cases. In the femur, the mean AC(15.97 vs. 6.72°) and DI(1.11 vs. 0.78 mm/d) were significantly larger, while the LI(9.71 vs. 13.49 days/cm), BHI(27.00 vs. 42.09 days/cm), and EFI(37.86 vs. 56.97 days/cm) were all significantly shorter in Group1 than in Group2 ( $p < 0.05$ ). In the tibia, the mean AC, L% were all larger, while the LG, LI, BHI and EFI were all shorter in Group1 than in Group2.

## **Conclusion**

In children with Ollier's disease, full restoration of the lower limb deformities could be achieved, even when half-pins were performed intralesionally, and new bone formation accelerated throughout the whole lengthening period.

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## **Functional paraspinal muscle area in the diagnosis of sarcopenia: establishing normative Asian data and proposing surrogate measurements of muscle mass**

Julia Ng

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**Name of Presenting Author:** Julia Ng

**Institution:** Tan Tock Seng Hospital

## **Introduction / Objection**

Low back pain and sarcopenia are highly prevalent conditions in the elderly with significant correlations. Our study sought to investigate two potential estimates of sarcopenia of paraspinal muscles from routine imaging and to establish normative data for these indices for the Asian population.

## **Materials & Method**

250 consecutive non-reformatted magnetic resonance imaging lumbosacral spine studies of patients in the last quarter of 2018 were reviewed in the axial slice of the lumbar three (L3) superior end plate. Bilateral multifidus and erector spinae muscles were each measured for functional and total muscle area. Two ratios relevant to functional muscle area were obtained: functional-to-total muscle area (fCSA:tCSA), and intramuscular fat-to-functional muscle area (IFA:fCSA; i.e. Goutallier staging). Multiple regression analysis was done to analyse the correlation between low back pain and the ratios of functional muscle area for each of the 4 muscle groups.

## **Results / Discussion**

166 patients were included in the study, with 63 aged  $\geq 65$  years old and 110 having low back pain. Gender distribution was equal. After adjusting for age and gender, our study found no significant correlation between low back pain and neither of the two functional muscle ratios calculated ( $p$  values  $> 0.05$ ). Both age and gender were significantly correlated to both ratios for all 4 paraspinal muscles ( $p < 0.05$ ), except for the left ES Goutallier staging, where the effect of gender was not significant ( $p = 0.295$ ). Age- and gender-specific normative data were further obtained.

## Conclusion

Our study is the first to describe normative functional paraspinal muscle area data at the L3 level for the Asian population. Functional paraspinal muscle area is poorly correlated with the presence of low back pain, but is inverse for both age and gender. We propose a new measurement incorporating the extent of myosteatosis as a surrogate for muscle area in the diagnosis of sarcopenia.

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### Non-surgical interventions for isolated Salter-Harris Type I distal fibula fractures: a systematic review

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**Name of Presenting Author:** Tay Jun Yu

**Institution:** Lee Kong Chian School of Medicine

#### Introduction / Objection

Salter-Harris Type I (SH1) fractures of the distal fibula are inherently stable and can be managed conservatively with immobilisation. Numerous immobilisation techniques are used in clinical practice, with no gold standard currently established. This systematic review aims to evaluate the functional and patient-reported outcomes of traditional, rigid immobilisation techniques compared to less restrictive ones that allow earlier mobilisation.

#### Materials & Method

The PubMed, MEDLINE Ovid, Embase, and Cochrane Library databases were searched systematically for studies on skeletally immature children and adolescents with isolated distal fibula SH1 fractures. Those with polytrauma or pre-existing musculoskeletal or developmental conditions were excluded. Quality assessment was conducted using Cochrane risk-of-bias and JBI tools. Narrative analysis was employed in conjunction with Synthesis Without Meta-analysis (SWiM).

#### Results / Discussion

Six studies involving 349 participants were included, of which four were randomised controlled trials (RCTs) and two were observational studies. Within the RCT group, three compared casting to bracing or controlled ankle motion (CAM) boot wearing, while one compared posterior splinting to bracing. Both observational studies only reported outcomes of one immobilisation technique – one on casting and the other on bracing. Nine outcomes were reported, with less restrictive immobilisation having more favourable results in six – time to return to normal levels of activity, functional scores, satisfaction, complications, cost-effectiveness and hours of school missed. The remaining three outcomes – pain, duration of analgesia and weight-bearing – were comparable in both immobilisation groups. Limitations of this review include reporting biases and lack of certainty of evidence from small sample sizes.

#### Conclusion

Collectively, the findings underscore the adequacy and benefits of using less restrictive immobilisation for SH1 distal fibula fractures, which is in keeping with the current trend towards less rigid immobilisation techniques in clinical practice.

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### Predictive factors of failed conservative treatment in pediatric diaphyseal forearm fractures

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**Institution:** Ramathibodi hospital, Mahidol University

#### Introduction / Objection

Diaphyseal forearm fracture is the third most common fracture in children.

Nowadays, standard treatment for most of the patients are conservative treatments. However, the most common complication of conservative treatment is re-displacement of the fracture, which is defined as failed conservative treatment and leads to surgery. Many factors contribute to failed conservative treatment. The objective of this study was to identify risk factors of failed conservative treatment of pediatric diaphyseal forearm fracture.

#### Materials & Method

We conducted a retrospective study including patients aged between 1-12 years old, who suffered from diaphyseal forearm fracture. We excluded patients with an open fracture, pathological fracture, concurrent with vascular injury, and etc. We used STATA program version 16.0 to analyze data with logistic regression analysis.

#### Results / Discussion

Thirty-nine patients were included in this study. Twenty-six were male (66.67%). The average age at injury was 8.4 years in failed group and 7.4 years in the success group. Baseline demographic data was not significant difference between groups. In univariate analysis, the odd ratio of initial complete displacement was 20.83 ( $p = 0.003$ ). An odd ratio of initial shortening was 1.41 ( $p = 0.020$ ). An odd ratio of initial apposition was 0.98 ( $p = 0.014$ ). An odd ratio of poor quality of reduction was 45.5 ( $p = 0.001$ ). We used four factors that showed significant differences in univariate analysis ( $p < 0.05$ ) to perform multivariate analysis. The adjusted odd ratio for poor quality of reduction was 33.91 ( $p = 0.017$ ).

#### Conclusion

Initial shortening, initial apposition, and quality of reduction could help physicians identify patients at high risk for failed conservative treatment.

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### Improved productivity using deep learning assisted Cobb angle measurement on scoliosis radiographs.

Xi Zhen Low<sup>1</sup>, Shaheryar Mohammad 2. Furqan<sup>2</sup>, Andrew Makmur<sup>1,2</sup>, Noah Lim<sup>3</sup>, Hien Anh Tran<sup>3</sup>, Desmond Lim<sup>1</sup>, Kian Wei Ng<sup>1</sup>, Tricia Kuah<sup>1</sup>, Aric Lee<sup>1</sup>, You Jun Lee<sup>1</sup>, Ren Wei Liu<sup>1</sup>, Natalie Tan<sup>4</sup>, Si Jian Hui<sup>4</sup>, Xin Yi Lim<sup>4</sup>, Dexter Seow<sup>4</sup>, Yiong Huak Chan<sup>2</sup>, Premila Hirubalan<sup>5</sup>, Lakshmi Kumar<sup>5</sup>, Jonathan Tan<sup>4</sup>, Leok Lim Lau<sup>4</sup>, Xin Yi Lim<sup>4</sup>, Si Jian Hui<sup>4</sup>, James Hallinan<sup>1,2</sup>

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**Name of Presenting Author:** Noah Lim

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#### Introduction / Objection



Background: Radiographic analysis of scoliosis using the Cobb's angle is time-consuming and repetitive. Deep learning (DL) could provide more consistent and faster interpretation. Purpose: Assess the interpretation time and accuracy of clinicians for Cobb's angle assessment with and without DL-assistance.

#### **Materials & Method**

A DL model was developed to assist Cobb's angle interpretation on spine radiographs. Consecutive radiographs in patients 10—18 years with scoliosis and no instrumentation from January 2018—January 2019 were included. Eight clinicians, four radiologists in-training (R1—R4, no experience) and four orthopedists in-training (O1—O4, 6-months-experience) performed retrospective assessment with and without DL-assistance with a 6-week washout. Interpretation time and mean angle differences were assessed with and without DL-assistance with a spine surgeon (6-years-experience) as the reference standard.

#### **Results / Discussion**

Overall, 640 patients (mean±SD, 12.6 years±2;465 girls) were split into 580 patients for training (73%) and validation (18%), and 60 (9%) for testing. DL-assisted clinicians had reduced or equivalent mean angle differences versus unassisted reads; Radiologist-R4 showed the largest reduction in mean-angle difference from -3.20°(95%CI:-4.21—-2.12°) unassisted to 1.03°(95%CI:-0.5—2.57°)with DL-assistance. Despite different prior experience in-training radiologists and orthopedists showed equivalent mean angle differences with and without DLmodel assistance. For DL-assisted reads, radiologists had a mean time saving of 13.25 seconds(95%CI:-19.6—6.91) versus a time increase of 3.85 seconds(95%CI:-2.94—10.63) for orthopedists in-training(p=0.005).

#### **Conclusion**

Conclusion: DL assistance for Cobb's angle on spine radiographs provided superior or equivalent mean angle differences. There was reduction in interpretation time for radiologists in-training (novices), with no reduction in time for orthopedists in-training (experienced). Clinical Relevance Statement Radiologists in-training assisted by deep learning for Cobb angle measurement on scoliosis radiographs showed marked reduction in interpretation time and reduced or equivalent mean angle differences.

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#### **Improved productivity using deep learning assisted Cobb angle measurement on scoliosis radiographs.**

Xi Zhen Low<sup>1</sup>, Shaheryar Mohammad Furqan<sup>2</sup>, Andrew Makmur<sup>1,2</sup>, Noah Lim<sup>3</sup>, Hien Anh Tran<sup>3</sup>, Desmond Limi<sup>1</sup>, Kian Wei Ng<sup>4</sup>, Tricia Kuah<sup>1</sup>, Aric Lee<sup>1</sup>, You Jun Lee<sup>1</sup>, Ren Wei Liu<sup>1</sup>, Natalie Tan<sup>4</sup>, Si Jian Hui<sup>4</sup>, Xinyi Lim<sup>4</sup>, Dexter Seow<sup>4</sup>, Yiong Huak Chan<sup>2</sup>, Premila Hirubalan<sup>5</sup>, Lakshmi Kumar<sup>5</sup>, Leok Lim<sup>4</sup>, Xin Yi Lim<sup>4</sup>, Si Jian Hui<sup>4</sup>, Jonathan Tan<sup>4</sup>, James Hallinan<sup>2,1</sup>

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**Name of Presenting Author:** Noah Lim

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#### **Introduction / Objection**

Background: Radiographic analysis of scoliosis using the Cobb's angle is time-consuming and repetitive. Deep learning (DL) could provide more consistent and faster interpretation.

Purpose: Assess the interpretation time and accuracy of clinicians for Cobb's angle assessment with and without DL-assistance.

#### **Materials & Method**

A DL model was developed to assist Cobb's angle interpretation on spine radiographs. Consecutive radiographs in patients 10—18 years with scoliosis and no instrumentation from January 2018—January 2019 were included. Eight clinicians, four radiologists in-training (R1—R4, no experience) and four orthopedists in-training (O1—O4, 6-months-experience) performed retrospective assessment with and without DL-assistance with a 6-week washout. Interpretation time and mean angle differences were assessed with and without DL-assistance with a spine surgeon (6-years-experience) as the reference standard.

#### **Results / Discussion**

: Overall, 640 patients (mean±SD, 12.6 years±2;465 girls) were split into 580 patients for training (73%) and validation (18%), and 60 (9%) for testing. DL-assisted clinicians had reduced or equivalent mean angle differences versus unassisted reads; Radiologist-R4 showed the largest reduction in mean-angle difference from -3.20°(95%CI:-4.21—-2.12°) unassisted to 1.03°(95%CI:-0.5—2.57°)with DL-assistance. Despite different prior experience in-training radiologists and orthopedists showed equivalent mean angle differences with and without DLmodel assistance. For DL-assisted reads, radiologists had a mean time saving of 13.25 seconds(95%CI:-19.6—6.91) versus a time increase of 3.85 seconds(95%CI:-2.94—10.63) for orthopedists in-training(p=0.005).

#### **Conclusion**

DL assistance for Cobb's angle on spine radiographs provided superior or equivalent mean angle differences. There was reduction in interpretation time for radiologists in-training (novices), with no reduction in time for orthopedists in-training (experienced).

Clinical Relevance Statement: Radiologists in-training assisted by deep learning for Cobb angle measurement on scoliosis radiographs showed marked reduction in interpretation time and reduced or equivalent mean angle differences.

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#### **Chronic Bilateral Patellar Tendon Rupture in a patient with Chronic Kidney Disease: A Case Report**

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#### **Introduction / Objection**

Bilateral patellar tendon rupture is considered uncommon and rare musculoskeletal entity. It commonly involves the knee extensor mechanism which generates major functional disability and gait disturbances. Patellar ligament injuries in patients over the age of 40 signifies a systemic disease and should warn the possibility of injuring the middle portion of the tendon. The exact mechanism is unclear. However, according to literatures, secondary hyperparathyroidism or hormonal imbalance caused by chronic hemodialysis has an impact on the pathogenesis of tendon ruptures.

#### **Materials & Method**

We report a case of a 41-year old male with Chronic Kidney Disease undergoing hemodialysis for 7 years who presented with inability to ambulate for 6 months due to patellar tendon rupture of both knees who underwent Patellar Tendon Reconstruction using Semitendinosus- Gracilis tendons based on a technique published by Takazawa et. al.

### **Results / Discussion**

In our case, we repaired both patellar tendon on both knees using both semitendinosus and gracilis tendons and passed it thru the tibial and quadriceps tunnel in a figure-of-eight fashion then anchored the grafts using Ethibond® 2. This operative technique was based on a published journal by Takazawa et. al. in which they used semitendinosus-gracilis tendons with preserved distal insertions. Patient was placed on a knee immobilizer for 6 weeks advised to do partial weight bearing as tolerated with crutches or walker. The patient was later referred to Rehabilitation Medicine for further strengthening exercises and mobilization.

### **Conclusion**

The bilateral rupture of the patellar tendon remains a rare pathologic entity and prompt diagnosis of patellar tendon injuries is necessary to allow early treatment and prevention of extensor mechanism disfunction sequelae. Poor outcomes, complications, and failures are typically associated with missed or delayed diagnosis, delayed treatment, or technical errors during surgery. To prevent this kind of injury, patients with long-term hemodialysis should pay more attention to their daily activities.

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### **Implant Failure and Malunion of Subtrochanteric Femoral Fracture in a Child which Treated with Elastic Intramedullary Nail: A Case Report**

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**Institution:** Ulin General Hospital Banjarmasin

### **Introduction / Objection**

Subtrochanteric fractures in children are very rare, account for less than 1% of all fractures in children. There is currently no consensus on the best treatment for subtrochanteric femoral fracture, especially for malunion case.

### **Materials & Method**

A 14-years-old boy came to our hospital with an implant protruding in his left thigh for the last 3 weeks. He had a history of closed fracture in the left subtrochanteric femur 2 years before, after a motorcycle accident with high-energy trauma. At that time, he underwent open reduction and plate-screw fixation, but never returned for a follow-up. His current fracture was malunion, and the plate fixation failed due to early mobilization. The plate was protruding outside the skin. We treated him with 3 intramedullary elastic nails with distal entry, and additional k-wires to stabilize rotational motion. 2 months follow-up shows promising excellent result. He had full hip range of motion and painless ambulation.

### **Results / Discussion**

Correct fracture reduction in malunion of subtrochanteric femur is harder to be obtained or maintained due to their special anatomical position and deforming forces of the muscles in this region. Intramedullary elastic nail provides good stability with low rate of complications in children. Most author used 2 elastic nails to stabilize femoral shaft fracture. We used an additional 3rd nail, directed to the femoral neck, to achieve extra stabilization due to strong deforming muscle force in subtrochanteric region. The malunion also had made the femur cortical contour change, making it harder to achieve good reduction.

### **Conclusion**

Elastic nail for subtrochanteric femoral fracture in children is a safe and effective choice of treatment procedure after a failed plate and screw fixation. The third nail is recommended for additional stability.

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### **Systematic review of paediatric pulseless pink humerus supracondylar fractures**

Wei Chong Keith Goh<sup>1</sup>, Eric Ong<sup>2</sup>, Nicole Luan Kim<sup>3</sup>, Arjandas Mahadev<sup>3</sup>, Kenneth Wong<sup>3</sup>

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**Name of Presenting Author:** Goh Wei Chong Keith

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### **Introduction / Objection**

The supracondylar humeral fracture (SCHF) is the most common fracture seen in children, forming up to 70% of all paediatric elbow fractures. The decision to surgically explore the brachial artery in a well-perfused, pulseless arm remains a controversial one among vascular and orthopaedic surgeons and is something we seek to explore in this paper.

### **Materials & Method**

We reviewed the literature from electronic databases PubMed as well as Embase for studies focusing on the management of the pink pulseless hand (PPH) following SCHF. We gathered a total of 23 articles to be analysed in this review.

### **Results / Discussion**

We found 335 PPH post-reduction, and evaluated the management as well as the follow-up and complications of the PPH involved. Most recent articles cited the close observation strategy as the most reliable strategy.

### **Conclusion**

It is clear that the management of a SCHF is immediate reduction and fixation. In the management of a post-operatively pulseless pink humerus, we do agree with the latest conclusion of Delionitis et al. However, the outcome of this study also advocates for the monitoring of up to 24-48hrs post-reduction and the use of non-invasive tools such as US doppler, CFDU, and pulse oximetry to monitor perfusion as they all have had good outcomes in the articles cited in this review. Still, in the event of vascular deterioration or development of complications of the hand, immediate vascular exploration is still indicated.

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### **Using the distal radius ulna classification system in predicting final limb length**

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#### **Introduction / Objection**

Accurately predicting final limb length discrepancy (LLD) is crucial in the treatment of leg length discrepancies. Current methods relying on chronological age are inaccurate compared with predictions using bone age, but traditional bone age schemes are difficult to use in clinical settings. We studied the accuracy of using distal radius ulna (DRU) classification in predicting final limb length, which has been shown to be accurate in predicting peak growth and growth cessation in scoliosis patients.

#### **Materials & Method**

This is a retrospective study of patients who received epiphysodesis for LLD between 2000-2018 with follow-up until skeletal maturity. X-rays of the non-operated femoral or tibial segments were reviewed. Segments that were normal or congenitally short were included. Segments were excluded if there was evidence of physal insult or pathologies causing inconstant growth inhibition rate. Linear regression was performed with prediction models for final limb segment length using the SPSS programme. DRU classification, chronological age, sex and present limb segment length were included as independent variables. Statistical significance was defined as  $p < 0.05$ .

#### **Results / Discussion**

867 observations were made. The most significant predictor for final limb length in girls for both femora and tibiae is the distal radius classification, whereas that in boys was the distal ulnar classification. Sex and bone-specific prediction models for final limb segment length using the DRU classification were accurate in predicting final limb segment length (mean absolute difference 1.3+/-1.5cm).

#### **Conclusion**

The DRU classification system is an accurate alternative in the prediction of final limb segment length. It is easier to utilise in clinical setting compared with traditional bone age schemes, while also enhancing accuracy as it integrates skeletal maturity in the prediction.

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#### **Severity of Knee Osteoarthritis does not affect clinical and radiological outcomes following PFO – A systematic review and pooled analysis**

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**Name of Presenting Author:** Liang Zhen, Jonathan

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#### **Introduction / Objection**

Knee osteoarthritis is a progressive degenerative disease of chronic nature with a growing prevalence globally. The current mainstay of surgical management for knee osteoarthritis would be total knee arthroplasty. Joint preserving options like High Tibial Osteotomy (HTO) have been offered to certain patient populations as an alternative. Recently, Proximal Fibular Osteotomy (PFO) has been offered as an inexpensive option by knee preservation surgeons. Current literature on PFO outcomes have been abundant in clinical case series with multiple published systematic reviews and narrative reviews. However, there is a lack of clarity for specific indications for offering PFO based on degree of severity of knee OA. Therefore, this systematic review aims to critically evaluate clinical and radiological outcomes of PFO stratified by severity of knee OA.

#### **Materials & Method**

PubMed, Scopus, CINAHL and Google Scholar databases were searched. Eligible studies included those published up till August 2023. A total of 271 studies were obtained from database screening. After removal of duplicates, title abstract screening, and a full text screen based on inclusion and exclusion criteria, 11 papers were included. Additionally, a further 46 papers were identified from snowballing of 7 existing systematic reviews, following which 2 additional papers were included.

#### **Results / Discussion**

13 articles included in this systematic review analysed a total of 788 knees. Our study found that indications based on KL grading of OA do not seem to differ in terms of post-operative clinical outcomes (VAS score) and radiological measures also found that hip knee alignment was improved regardless of KL grading of OA. Additionally the most common post-operative complication reported was deep peroneal nerve palsy.

#### **Conclusion**

PFO is a viable knee joint preserving surgery for medial compartment knee OA, however given the high risk for complications reported in the literature, surgeons should pay close attention to the neuroanatomical landmarks and techniques to avoid neurovascular injury.

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#### **Short-term quality of life outcome after hip displacement surgeries in children with spastic cerebral palsy: hip reconstruction versus soft-tissue release**

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#### **Introduction / Objection**

Hip displacement is a common musculoskeletal disorder in patients with spastic cerebral palsy. Two common surgical treatments are hip reconstruction and soft-tissue release. This study aims to compare the impact on health-related quality of life (HRQOL) among the two interventions.

#### **Materials & Method**

This was a prospective study to compare the HRQOL after hip reconstruction surgery (REC) and soft tissue release (STR). The inclusion criteria were spastic cerebral palsy, aged 6-14 years old, hip displacement with MP 40%-60%, and Gross Motor Function Classification System (GMFCS) level III-IV. Decision of treatment was made by the caregivers and participants after orthopedic surgeons offered evidence of present treatments. The HRQOL was measured with the Caregiver Priorities and Child

Health Index of Life with Disabilities (CPCHILD) pre-operatively and 6 weeks, 3 months, and 6 months after the surgery. The MP of the more severe side was compared by paired t test or t test and The CPCHILD scores were compared by Wilcoxon rank-sum test.

#### **Results / Discussion**

Nine patients underwent STR with guided growth and the other seven underwent REC from 2021 to 2023. The MP was improved from 53.2% to 30.2% after REC ( $p < 0.05$ ) and from 44.4% to 40% after STR. Patients in the REC group had a significant decrease in the CPCHILD scores 6 weeks postoperatively and increase afterward. Patients in the STR group had a gradual increase postoperatively.

For patient with moderate hip displacement (MP 40-60%), both surgical treatments improved hip displacement and quality of life. REC resulted in greater MP improvement and a temporary decline in CPCHILD scores that might be related to postoperative pain and immobilization.

#### **Conclusion**

Caregivers and patients with spastic hip displacement can be informed of the greater improvement of hip displacement and short-term decline of CPCHILD after REC when they are faced with the decision of choosing surgical procedures.

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#### **Clinical outcome in total hip arthroplasty for septic sequelae in childhood : a retrospective study**

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#### **Introduction / Objection**

Adult patients with history of childhood infection pose a surgical challenge for total hip arthroplasty (THA) due to distorted bony anatomy, soft-tissue contractures, risk of reinfection, and relatively younger age. Therefore, the purpose of the present study was to determine clinical outcome, reinfection rate, and complications in patients with septic sequelae after THA

#### **Materials & Method**

A retrospective analysis was conducted of 91 cementless THAs (57 male and 34 female) performed between 2008 and 2017 in patients who had history of hip infection during childhood. Clinical outcome was measured using Harris Hip Score (HHS) and Modified Merle d'Aubigne and Postel (MAP) score, and quality of life (QOL) using 12-Item Short Form Health Survey Questionnaire (SF-12) components: Physical Component Score (PCS) and Mental Component Score (MCS); limb length discrepancy (LLD) and radiological assessment of the prosthesis was performed at the latest follow-up. Reinfection and revision surgery after THA for any reason was documented.

#### **Results / Discussion**

There was significant improvement in HHS, Modified Merle d'Aubigne Postel hip score, and QOL index SF 12-PCS and MCS ( $p < 0.001$ ) and there was no case of reinfection reported during the follow-up. The minimum follow-up for the study was three years with a mean of 6.5 (SD 2.3; 3 to 12). LLD decreased from a mean of 3.3 cm (SD 1) to 0.9 cm (SD 0.8) during follow-up. One patient required revision surgery for femoral component loosening. Kaplan-Meier survival analysis estimated revision-free survivorship of 100% at the end of five years and 96.9% (95% confidence interval 79.8 to 99.6) at the end of ten years.

#### **Conclusion**

We found that cementless THA results in good to excellent functional outcomes in patients with a prior history of childhood infection. There is an exceedingly low rate of risk of reinfection in these patients, even though complications are not uncommon.

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#### **Beyond Traditional Approaches: An In-depth Network Meta-Analysis on Idiopathic Clubfoot Treatment.**

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**Institution:** National Cheng Kung University Hospital

#### **Introduction / Objection**

Congenital talipes equinovarus (clubfoot) is a common foot deformity in neonates. The efficacy of diverse therapeutic approaches, especially modifications of the Ponseti method, remains a subject of contention. This research aims to assess the clinical results of multiple interventions for idiopathic clubfoot.

#### **Materials & Method**

Comprehensive searches were conducted across databases such as CENTRAL, MEDLINE, Embase, Scopus, and CINAHL EBSCO. We incorporated RCTs that juxtaposed treatments, including the conventional Ponseti technique, its accelerated variant, Ponseti combined with Botulinum toxin type A injection, Ponseti augmented with early tibialis anterior tendon transfer (TATT), the Kite method, and surgical procedures. A network meta-analysis (NMA) was performed in adherence to the Preferred Reporting Items for Systematic Reviews and Meta-analyses standards. Primary outcomes were alterations in the Pirani score (PS) and maximal ankle dorsiflexion, while secondary outcomes covered cast numbers, duration in casts, tenotomy frequencies, complications, recurrence rates, adverse occurrences, and ensuing significant surgeries.

#### **Results / Discussion**

Our review encompassed eleven RCTs, totaling 740 feet. As per the SUCRA rankings, the conventional Ponseti technique emerged as superior in terms of PS alterations, maximal ankle dorsiflexion, number of casts, adverse events, and overall complications. The hastened Ponseti variant was prime for cast duration and tenotomy frequency. Early TATT showcased the minimal recurrence rate, whereas the Ponseti combined with Botox injection had the diminished necessity for subsequent major surgeries.

#### **Conclusion**

The NMA suggests that the conventional Ponseti method stands out as the preeminent treatment. Nonetheless, it possesses certain drawbacks, including prolonged cast periods and elevated recurrence rates. Hence, therapeutic choices ought to be customized to individual requirements.

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### **Does the pattern of fracture healing in cerebral fat embolism syndrome (CFES) resemble traumatic brain injury (TBI)?**

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#### **Introduction / Objection**

Traumatic brain injury(TBI) leading to excessive bone formation and enhanced fracture healing is well documented. However, the effect cerebral fat embolism syndrome(CFES) on fracture healing is not studied. We aimed to compare the pattern of fracture healing in long bones amongst patients with CFES and TBI.

#### **Materials & Method**

In this retrospective study we included all patients treated between 2012 and 2019 with either CFES or TBI and femoral/tibial shaft fracture stabilised with Interlocking nail(ILN). There were 32 fractures in CFES(Group 1) and 74 fractures in TBI(Group 2). We randomly selected age and sex matched 200 fractures formed the control group(Group 3). The volume of callus formed was measured using callus index(CI) and fracture union time in weeks(FUT) was calculated, statistically analyzed and compared between the groups.

#### **Results / Discussion**

Fracture union in femur: The mean value of CI was  $1.84 \pm 0.3$ ,  $1.63 \pm 0.2$  and  $1.34 \pm 0.2$  in Group-1, 2 & 3 respectively. The CI in both Group-1 and Group-2 were significantly higher than Group-3( $p = 0.000$ ). The mean value of FUT in Group-1 was  $14.72 \pm 2.9$  comparable to  $15.12 \pm 2.9$  in Group-2, however both were significantly lower than Group-3( $17.86 \pm 3.8$ ). Fracture union in tibia: The mean value of CI in Group-1 was  $1.45 \pm 0.1$ , Group 2 was  $1.35 \pm 0.1$  which was significantly higher than Group-3( $1.19 \pm 0.2$ ). The mean FUT in Group-1 was  $13.21 \pm 2.4$  which was significantly shorter than Group-2( $17.22 \pm 3.6$ ) and Group-3( $18.33 \pm 4.9$ ).

#### **Conclusion**

Fracture healing in CFES had excessive callus formation similar to that of TBI, both in femur and tibia. The fracture union time in CFES was significantly shorter than control in both femur and tibia fractures. In TBI, femur has comparable union time as CFES but in tibia union time did not show any statistical difference between TBI and CFES.

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### **Evaluating 5 year outcomes of interlaminar device as an adjunct to decompression for symptomatic lumbar spinal stenosis**

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#### **Introduction / Objection**

1. To assess and compare 5 year outcomes following uninstrumented spinal decompression and decompression with interlaminar device
2. To determine whether improvement in radiological clinical outcomes correlated with changes in radiological indices studied

This is relevant as comparative literature between the above two procedures is limited past the 2 year timeframe.

#### **Materials & Method**

Retrospective review of prospectively collected data from a single surgeon series was used with patients with symptomatic lumbar spinal stenosis categorised into the decompression only control arm or the decompression with interlaminar device study arm.

#### **Results / Discussion**

Both groups showed statistically significant improvement in all clinical outcome indicators at all time points as compared to their pre operative state.

In the decompression with interlaminar device group, there was a statically significant improvement in some radiological parameters that was maintained at the different post op time points which was absent in the decompression alone group.

#### **Conclusion**

Our study found that in the management of lumbar spinal stenosis, clinical outcomes between those underwent decompression alone as compared to decompression with an interlaminar device insertion, showed statistically significant improvement in both patient reported clinical outcome measures and radiological parameters.

Also, it was noted that the presence of an interlaminar device does not predispose to increased reoperation rates.

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### **Pre-operative planning of High Tibial Osteotomy with ChatGPT. Are we there yet?**

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#### **Introduction / Objection**

ChatGPT (Chat Generative Pre-trained Transformer) developed by OpenAI, has gained attention in the medical field. It has the potential to enhance and simplify tasks, such as preoperative planning in orthopedic surgery. We aimed to test ChatGPT's accuracy in measuring the angle of correction for high tibial osteotomy for cases planned and performed at a tertiary teaching hospitals in Singapore.

#### **Materials & Method**

Peri-operative angular parameters from 114 consecutive patients who underwent medial opening wedge high tibial osteotomy (MOWHTO) were used to query ChatGPT 3.0. First ChatGPT 3.0 was queried on what information it required to plan a MOWHTO. Based on its response, pre-operative medial proximal tibial angle (MPTA) and joint line congruence angle (JLCA) were provided. ChatGPT 3.0 then responded with its recommended angle of correction. This was compared against the manually planned surgical correction by our fellowship-trained surgeon. A root mean square analysis was then performed to compare ChatGPT 3.0 and manual planning.

#### **Results / Discussion**

The root mean square error (RMSE) of ChatGPT 3.0 in predicting correction angle in MWHTO was 2.96, suggesting a very poor model fit.

## Conclusion

Although ChatGPT 3.0 represents a significant breakthrough in large language models with extensive capabilities, it is not currently optimized to effectively perform complex pre-operative planning in orthopedic surgery, specifically in the context of MOWHTO. Further refinement and consideration of specific factors are necessary to enhance its accuracy and suitability for such applications.

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## Medial Closing Wedge High Tibial Osteotomies for valgus knees – Clinical Outcomes

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### Introduction / Objection

Lateral knee osteoarthritis, while only prevalent in 10% of patients with knee osteoarthritis, greatly affects quality of life and is mainly seen in post-traumatic secondary osteoarthritis. Osteotomies for lateral knee osteoarthritis are usually performed for more active patients, classically involving a lateral opening wedge distal femur osteotomy. However, there is a paucity of literature regarding medial closing wedge high tibial osteotomies (MCWHTO) for tibial valgus deformity, particularly in an Asian population.

### Materials & Method

A retrospective review of prospectively collected data was performed in a tertiary institution in Singapore. Patients with lateral knee osteoarthritis and had undergone MCWHTO from 2021 to 2023 were included. Pre- and post-operative radiographic measurements, as well as clinical scores (Knee Society Clinical Rating System (KSCRS), Oxford score and Short Form 36 (SF-36) taken pre-operatively and at 6 months were analysed. A statistical significance of  $p < 0.05$  was taken.

### Results / Discussion

Thirteen cases from eleven patients were included, with an average age of 37.6 years and BMI of 29.6. The mechanical medial proximal tibial angle (mMPTA) was reduced by an average of  $6.08^\circ$  ( $p < 0.01$ ) with minimal change in the joint line convergence angle (JLCA) (pre-op  $2.54^\circ$  vs post-op  $2.31^\circ$ ,  $p = 0.337$ ). Patients were able to resume walking unaided by a mean of 11 weeks. At 6 months, the KSCRS function score improved from a mean of 39 to 75 at 6 months ( $p = 0.021$ ), while the knee score increased from 44.3 to 69.4 ( $p = 0.303$ ). Improvements in pain ( $p = 0.029$ ) were reported on the SF-36. One patient underwent plate removal due to prominence, while another had removal of implant due to wound infection. There were no cases of hinge fracture.

### Conclusion

For lateral knee osteoarthritis with tibial valgus deformity, MCWHTO can be used to reduce the mMPTA without changing the JLCA. It is a viable treatment option for young patients, and can have good early clinical outcomes.

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## Two year outcomes of internal fixation with Femoral Neck System in patients with femoral neck fracture

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### Introduction / Objection

Neck of femur (NOF) fractures are one of the most common fractures, with a projected increase in incidence with population growth and ageing. The Femoral Neck System (FNS) launched in 2019 was developed specifically for fixation of NOF fractures with the purported advantages of providing both angular and rotational stability. We report our experience with the FNS and evaluate its effectiveness and associated complications.

### Materials & Method

A retrospective case series of 50 patients who underwent surgical fixation for NOF fractures from August 2020 to October 2021 using the FNS in two Singapore tertiary institutions with at least 24-months follow-up were included. Clinical data (patients' demographics, fracture classification, intra-operative and post-operative complications) were reviewed. Radiological analysis assessed the pre- and immediate post-operative garden alignment index (GAI) and presence of femoral neck shortening at 3 months.

### Results / Discussion

The mean age was 63.5 years (SD 16.9, range 26-92). Five (10%), 34 (68%) and 11 (22%) were ASA 1, 2 and 3 respectively. Twenty (40%), 15 (30%), 5 (10%), and 10 (20%) patients sustained Garden's 1, 2, 3 and 4 NOF fractures respectively. The mean operative duration was 66.2 minutes (SD 20.5) and length of stay was 6.9 days (SD 4.6).

The post-operative improvement in GAI was a mean of  $2.2^\circ$  ( $p = 0.12$ ) on AP view, and  $9.1^\circ$  ( $p < 0.001$ ) on lateral view. The mean femoral neck shortening was 1.97mm (SD 5.3) at 3 months. There were no intra-operative complications. Post-operatively, 1 (2%) patient required blood transfusion, 1 (2%) patient had implant cut-out and non-union managed non-operatively, 2 (4%) patients developed avascular necrosis and required revision to total hip replacements. There were two (4%) cases of 1-year mortality.

### Conclusion

The FNS achieved good outcomes with low rates of complications. The promising results justify its continued use and further evaluation in comparison to other devices.

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## Does cement augmentation of the Trochanteric Femoral Nail-Advanced (TFNA) reduce fixation failure in patients with extracapsular proximal femoral fractures?

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### **Introduction / Objection**

Cephalomedullary devices are common options for surgical fixation of extracapsular proximal femoral fractures. The Trochanteric Fixation Nail-Advanced (TFNA) system was designed with the advantages of reducing undesired risks of cut-out and implant failure, with the fenestrated spiral blade / screw for cement augmentation. This comparative study aims to evaluate the effect of cement augmentation on complications including fixation failure.

### **Materials & Method**

A retrospective study of patients who sustained extracapsular proximal femoral fractures from low energy trauma and underwent surgical fixation using the TFNA from January 2018 to August 2021 were included. The patients were categorized into cement augmentation (CA) and non-cement augmentation (NCA) groups. Patients' demographics, fracture classification, fracture reduction quality according to the Baumgaertner method, intra-operative and post-operative complications were compared.

### **Results / Discussion**

205 patients (44 cemented, 161 non-cemented) were included. The mean age was  $78.4 \pm 10$  years, and predominantly females (63.9%). There were no significant differences between groups in terms of patient demographics, ASA or AO/OTA classification. However, reduction quality was significantly better in the NCA group – good (CA 25% vs NCA 58.4%;  $p < 0.001$ ), acceptable (CA 65.9% vs NCA 39.8%;  $p = 0.002$ ), poor (CA 9.1% vs NCA 1.9%;  $p = 0.04$ ). There were no differences in the Parker's ratio (AP, lateral) and tip-apex-distance (TAD). However, the calcar referenced TAD was significantly better in the NCA group ( $CA 25.4^\circ \pm 5.1^\circ$  vs  $NCA 23.2^\circ \pm 5.5^\circ$ ;  $p = 0.016$ ). The fixation failure rate was higher in the NCA group (3 cut-outs, 1 implant breakage, 2 loss of reduction) compared to the CA group (1 loss of reduction). No cut-out, cut-through or cement-related complications was observed in the CA group. There were no differences in intra-operative adverse events and post-operative complications.

### **Conclusion**

Cement augmentation of TFNA achieved good outcomes given our mid-term results with minimal adverse effects. These results justify its use especially in patients with higher risk of fixation failure.

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### **Using an external elbow stabilizer for treating complex elbow instability - Biomechanical assessment and clinical outcomes**

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### **Introduction / Objection**

This study aimed to evaluate the outcome of using a hinged external elbow stabilizer for complex instability of the elbow based on biomechanical experiments and analysis of clinical results.

### **Materials & Method**

A hinged external elbow stabilizer was used in 17 complex elbow instability patients. The mean follow-up was 26.4 months (range 12-42 months). We evaluated the flexion-extension and pronation-supination movement arcs, visual analog scale (VAS) score, Mayo Elbow Performance Score (MEPS), Broberg and Morrey classification system, and occurrence of complications in these patients. Moreover, construct stiffness and maximum strength tests were performed to evaluate the strength of the fixation techniques.

### **Results / Discussion**

The final average range of the extension-to-flexion and pronation-to-supination arcs of the elbow was  $133.2^\circ$  ( $110^\circ$ - $150^\circ$ ) and  $162.1^\circ$  ( $125^\circ$ - $180^\circ$ ), respectively. The VAS pain scores were  $> 3$  in two patients. The mean MEPS was 90.6 (range, 80-100 points). Five patients showed signs of grade I post-traumatic osteoarthritis, according to the Broberg and Morrey radiographic classification system, while grade II changes were observed in three patients. Complications, including axis pin loosening with pin-tract infection in two patients, transient ulnar nerve in two, heterotopic ossification in two, and suture anchors infection in one, were noted. Based on the biomechanical testing result, the hinged external elbow stabilizer exhibited higher stiffness and resisting force in varus loading. It was 153% stiffer and 128% stronger than the shaped Steinmann pin. The statistical results showed that the axial stiffness was significantly different among the groups ( $p < 0.05$ ).

### **Conclusion**

Biomechanical and clinical outcomes show that hinged external stabilizer is an alternative for complex elbow instability patients. However, the current study included a small sample size and a retrospective design. Biomechanical studies and prospective clinical trials are required to evaluate the validity of the hinged external joint stabilizer for the treatment of these challenging injuries.

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### **The Impact of Pediatric Orthopedic Surgery on Postoperative Outcomes within 90 Days Amidst the Coronavirus Pandemic**

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### **Introduction / Objection**

This study was conducted to compare the risk of complications in patients below age 18 who had been diagnosed with COVID-19 within one year and underwent orthopedic procedures, with those who had not been recently diagnosed.

### **Materials & Method**

The study utilized the TriNetX Research Network database to examine the outcomes of pediatric orthopedic surgeries performed between January 1, 2020 and June 30, 2023. Two cohorts were identified based on the patients' COVID-19 diagnosis status: one consisted of patients who were diagnosed with COVID-19 within 7 days to 1 year before surgery, and the other consisted of patients with no COVID-19 diagnosis within 0 day to 1 year before surgery. The matched cohorts were then subjected to an analysis that measured associations between COVID-19 diagnosis and complications, emergency department (ER) visits, as well as readmissions occurring within 90 days postoperatively. As for subgroup analysis, we categorized the preoperative COVID-19 diagnosis group based on the timing of diagnosis: those diagnosed at

the time of surgery, 3 months prior to surgery, and 3 months to 1 year before surgery. This division allows us to examine and analyze the connection between post-operative complications and the effects of COVID-19 following surgery.

#### **Results / Discussion**

Patient with COVID-19 within one year preoperatively were more likely to experience post-operation infection ( $p=0.001$ ), pneumonia ( $p<0.001$ ), emergent room (ER) visit ( $P<0.001$ ), and readmission or prolong admission ( $p<0.001$ ). As for the association between recent COVID-19 and 3-month to 1-year preoperative infection. There was no significance in post-operation infection ( $p=0.897$ ), pneumonia ( $p=0.425$ ), ER visit ( $p=0.366$ )

#### **Conclusion**

This study highlighted the increased risk of postoperative complications in patients below age 18 who were infected with COVID-19 and underwent orthopedic surgery whether the recent COVID-19 diagnosis or the long COVID-19 outcome.

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#### **Selective hip ultrasound screening for developmental dysplasia of the hip (DDH) in newborns**

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#### **Introduction / Objection**

Background: Universal ultrasound screening for early diagnosis of developmental hip dysplasia (DDH) may not benefit in low incidence context.

Objective: To externally validate the new established criteria for selective ultrasound screening for DDH in newborns.

#### **Materials & Method**

A cross-sectional study was undertaken at Ramathibodi Hospital between October 2021 and July 2022. After informed consent, screening clinical examination and ultrasound in all eligible newborns at the obstetric ward were performed by two certified pediatric orthopedists. Dynamic screening hip ultrasound (Harcke's technique) was used to identify a positive case. The enrolled newborns were categorized into low-risk and high-risk group via the new established criteria (breech presentation, positive Ortolani's test, positive Barlow's test, and limited hip abduction). The accuracy and the concordance index of the screening criteria were analyzed.

#### **Results / Discussion**

A total of 81 newborns (162 hips) were included. Seven hips (4.3%) were positive; 4 dysplastic and 3 unstable hips. Regarding the criteria with cutoff value 15.02, 13 hips were classified as high risk given sensitivity 71.4%, specificity 94.8%, positive predictive value 38.5%, negative predictive value 98.7%, likelihood ratio of positive test 13.8, likelihood ratio of negative test 0.3, area under receiver operating characteristic curve = 0.83, and concordance index = 0.7142 (95% confidence interval: 0.52, 0.91).

#### **Conclusion**

The new established criteria has promising external validity to discriminate abnormal hip ultrasound for DDH. This model would benefit for selective ultrasound screening protocol in Thai newborns.

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#### **Comparison of open, tubular, and bi-portal endoscopic decompression for lumbar spine degenerative disorders – a regional hospital experience**

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#### **Introduction / Objection**

Endoscopic spine surgery has received increased prominence in the treatment of lumbar spinal degenerative disorders, and is postulated to offer advantages over existing techniques. We aim to review the results of lumbar spine decompression surgeries across open discectomy/decompression (OD), tubular microdiscectomy/decompression(TM), and biportal endoscopic discectomy/decompression (BE) in our hospital.

#### **Materials & Method**

Retrospective analysis was performed for 129 patients who had undergone decompression surgeries for lumbar spine degenerative disorders at our hospital from January 2021 to February 2023. Metrics evaluated included operative time, pain scores using VAS scale, post-operative length of stay, and incidence of complications including dural tears, wound complications, recurrence of symptoms and instability.

#### **Results / Discussion**

129 patients were included, with a mean age of 54.3, 52.9, and 52.9 years in those who underwent OD, TM and BE respectively. Most of the 28 OD (50%) were performed for single-level decompression, while 44.7% of 38 TM and 39.7% of BE were performed for discectomies. Duration of surgery for discectomies averaged 2h 49m, 2h 12m, and 2h 39m for OD, TM and BE respectively. Average operating time for single-level decompression was 2h 41m, 3h 20m, and 3h 2m, while for double-level decompression it was 3h 47m, 4h 4m, and 4h 39m for OD, TM, and BE respectively. Average post-operative length of stay was 3.0 days for BE, as compared to 4.2 days for TM and 5.8 days for OD, with statistical significance ( $p=0.003$ ). Differences in change of pain score for back and leg pain, and surgical complications, across the 3 techniques were not statistically significant.

#### **Conclusion**

There was no significant difference in clinical outcomes, including pain control and complication rates, between the 3 different surgical techniques to address lumbar degenerative disorders. BE spine surgery had the shortest post-operative length of stay and may offer potential advantages compared to currently established surgical techniques.

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#### **Learning curve for biportal endoscopic spinal surgery in the treatment of lumbar spinal degenerative disorders**

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#### **Introduction / Objection**

Biportal endoscopic spinal surgery (BESS) has gained increased prominence in the treatment of lumbar spinal degenerative disorders. While early clinical outcomes appear promising, steep learning curves and higher initial complication rates have deterred overall uptake. We aim to evaluate the initial learning curve, in terms of operative time and complication rate, for lumbar spinal surgeries performed with BESS at our hospital.

#### **Materials & Method**

A retrospective cohort analysis was performed for 55 consecutive patients who had undergone BESS with discectomy, single-level, or double-level decompression, by a single orthopaedic surgeon at our hospital. Operative time was evaluated using cumulative average analysis, and incidence of complications including dural tears, wound complications, recurrence of symptoms or instability, and DVT were recorded.

#### **Results / Discussion**

55 patients were included, out of which 21 (38.1%) underwent single-level discectomy, 20 (36.3%) single-level decompression, and 14 (25.5%) double-level decompression. After the initial 30 cases, (comprising 10 cases for each category), average operating times were 2h 54m, 3h 19m, and 4h 50m for discectomy, single-level, and double-level decompression respectively, with complications noted in a total of 14 patients (46.7%), including 5 patients with dural tears. After completion of the subsequent 25 cases including 11 discectomies, 10 single level decompressions, and 4 double-level decompressions, average operating times were 2h 38m, 3h 4m, and 4h 36m respectively. Complications were noted in 2 patients (8%) in this second group, both of whom had dural tears.

#### **Conclusion**

Preliminary results suggest that operative time and complication rates for BESS are likely to be relatively high during the initial learning phase, but steadily improve with increased surgical experience to reach levels comparable to other surgical techniques.

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#### **Evaluation of the efficacy of posterior hemivertebrectomy combined with two or more segments fusion**

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#### **Introduction / Objection**

Early hemivertebra (HV) resection and short fusion (within 4 segments) have been effective in treating congenital HV, but limited research has compared outcomes between the shortest segment fusion (2 segments) and 3 or 4-segment fusion, especially in young children. This study aims to assess the efficacy of posterior hemivertebrectomy combined with two or more segments fusion in children under 10 years old with congenital scoliosis caused by a solitary simple lower thoracic or lumbar HV (T8-L5).

#### **Materials & Method**

This retrospective study included patients under 10 years old with T8-L5 solitary simple HV who underwent hemivertebra resection (HVR) and transpedicular short fusion. They were divided into two groups: HV±1 (2-segment fusion) and HV±2 (3 or 4-segment fusion). Preoperative, postoperative (1-week), and latest follow-up radiographic parameters and complications were recorded. Results on the coronal and sagittal planes and postoperative complications were analyzed.

#### **Results / Discussion**

The study included 35 patients (15 in HV±1 group and 20 in HV±2 group), with an average age of  $5.26 \pm 2.31$  years and an average follow-up of 22.54 months (range: 12-68). The mean preoperative Cobb angle was  $32.66^\circ \pm 7.339^\circ$  (HV±1) and  $29.31^\circ \pm 6.642^\circ$  (HV±2). The final Cobb angle was  $10.99^\circ \pm 7.837^\circ$  (HV±1) and  $8.22^\circ \pm 4.295^\circ$  (HV±2). The main curve was corrected by 72% (HV±1), 75% (HV±2) postoperatively and 67% (HV±1), 72% (HV±2) at the last follow-up ( $P > 0.05$ ). There were no significant differences in the sagittal plane balance as well as the unplanned reoperation rate ( $P > 0.05$ ). The unplanned reoperation rate is significantly higher in the thoracolumbar region ( $P = 0.038$ ).

#### **Conclusion**

For solitary simple lower thoracic or lumbar HV (T8-L5), HV±1 fusion suffices and yields similar midterm correction results as HV±2. The thoracolumbar region (T11-L2) requires special attention to the issue of reoperation.

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#### **Closed reduction and percutaneous pinning for Jakob type 3 displaced lateral condyle fracture of elbow in children using new technique**

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#### **Introduction / Objection**

The treatment of Jacob stage 3 displaced lateral condyle of elbow in children with open reduction is usually needed. It is difficult to reduce by closed method because of rotation of the displaced fracture fragment to location anteriorly to distal humeral metaphyseal area. We present our cases using new surgical technique involved for closed reduction.

#### **Materials & Method**

There were 5 cases of displaced Jakob type 3 (all Song type 5) lateral condyle fracture of humerus treated from August 2021 to February 2023. There were four boys and one girl, the average age was 5.4 years of age (2.1 ~6.8). There were 2 left elbows and 3 right elbows. All patients received new reduction technique in closed manipulation by extension-varus fragment shifting posteriorly and flexion maneuver reduction under fluoroscopic monitoring and then fixated with percutaneous lateral parallel or angled pinning with 2-3 K-wires and additional long arm splint protection till two weeks after K-wires removal.

## Results / Discussion

All displaced fracture were reduced within 2 mm of residual gap using the closed method with average operation time around 53 minutes (30 ~85 minutes) and five children had bony union of the lateral condyle and K-wires removed at 4~5 weeks. The range of motion of elbow joint returned to normal 3~6 months after surgery. There was no osteonecrosis found. The key to reduction is to relocate the fragment to location behind the distal end of humerus by placing the elbow in extension and some varus alignment which will allow unlocking of the locked rotated fragment and turned the fracture from stage 3 to stage 2.

## Conclusion

Closed reduction and percutaneous pinning can be a treatment mode for completely displaced and rotated lateral condyle fractures of the humerus in children.

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## Vertebral body morphology in neuromuscular scoliosis with spastic quadriplegic cerebral palsy

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## Introduction / Objection

The distorted vertebral body has been studied in scoliosis; however, there is little knowledge about the difference between neuromuscular and idiopathic scoliosis. We investigated the vertebral body and pedicle morphology in patients with spastic quadriplegic cerebral palsy and scoliosis (CP scoliosis) and compared them with those of apex- and Cobb-angle-matched patients with adolescent idiopathic scoliosis (AIS).

## Materials & Method

Thirty-four patients with CP scoliosis were included. The pedicle diameter, chord length, and vertebral body rotation were evaluated at one level above the apex, one level below the apex, and at the apex using a reconstructed computed tomography scan.

## Results / Discussion

In the comparison between CP scoliosis and apex- and Cobb-angle-matched AIS, patients with CP scoliosis are younger (12.7±2.5years vs 14.6±2.4years, p=0.001), but there was no difference in vertebral body rotation or pedicle diameters. However, the chord length was shorter in patients with CP scoliosis on the convex (38.0±5.0mm vs 40.4±4.9mm, p=0.025) and concave (37.7±5.2mm vs 40.3±4.7mm, p=0.014) sides.

## Conclusion

With a similar Cobb angle, the vertebral body rotation and pedicle diameter in CP scoliosis were comparable with those in AIS; however, the chord length was shorter in CP scoliosis. Skeletal immaturity and osteoporosis in patients with CP scoliosis would be related to vertebral body morphology.

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## Ultrasonography-guided closed reduction technique for pediatric radial neck fractures

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## Introduction / Objection

This study aimed to evaluate the feasibility of reduction under ultrasonographic (US) guidance with Freer elevator and fixation with retrograde transphyseal Kirschner wire (Kwire) in the treatment of radial neck fractures (RNFs).

## Materials & Method

This retrospective study included 35 children treated for Judet types III and IV RNFs at our hospital from September 2019 to November 2021. All 35 patients underwent US-guided Freer elevator reduction and retrograde transphyseal fixation with Kirschner wire and follow-up for more than 6 months. US was used to monitor the angulation and reduction of the radial neck. Fluoroscopy was applied to confirm the fixation with Kirschner wire. Dose area product (DAP; mGy/cm<sup>2</sup>) was measured to assess per-procedure radiation dose. The operation times, fluoroscopy times and postoperative complications were recorded. Radiological and clinical results were evaluated at the last follow up. Mayo Elbow Function Score (MEPS) was used to evaluate the functional results, and Metaizeau classification was used to evaluate the imaging results.

## Results / Discussion

All 35 cases were followed up for an average of 14.2 months (range, 8– 22 months). The mean fluoroscopy time was 5.4 s (range: 3.1–7.7 s), and the mean DAP was 0.09μGy/cm<sup>2</sup> (range: 0.05–0.13 μGy/cm<sup>2</sup>). The mean follow-up period was 18.3 months (range, 8– 24 months). There were no postoperative complications such as infection, necrosis of radial head, ectopic ossification, radial nerve injury, and fracture redisplacement. Of the 35 patients with successful reduction of elbow joint function according to Mayo criteria at the last follow-up, 32 (91.4%) were "excellent" and 2 (8.6%) were "good". The radiographic prognostic criteria for Metaizeau were "excellent" in 26 cases (74.3%) and "good" in 9 cases (25.7%).

## Conclusion

US-guided reduction with Freer elevator and fixation with retrograde transphyseal Kirschner wires is safe and reliable option to treat displaced radial neck fractures in children.

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## Pre-injury Parker Mobility Score, EuroQoL-5 Dimension and 36-item Short Form are correlated with 5-year mortality rate of fragility hip fractures.

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## Introduction / Objection

This study aims to investigate the influence of pre-injury Parker mobility scores(PMS), EuroQol-5 Dimension(EQ-5D) and 36-Item short form survey(SF-36) on 5-year survival after surgically treated hip fractures.

#### **Materials & Method**

Patients undergoing hemiarthroplasty or fixation of proximal femur fractures from 2015 to 2016 were included and their pre-morbid PMS, EQ5D and SF-36 scores were recorded. Patient demographics, fracture type, surgery and death dates or last follow-up were extracted from the electronic medical records system. Univariate and binary logistic regression analysis was performed to identify independent correlators of 5-year survival.

#### **Results / Discussion**

A total of 538 patients were included in this study (149 male,389 female). Median age of patients was 78.3 (range:47.3–102.2, SD:9.0). 5-year survival was 65.8%, averaging 83.8 months (median:84, SD:10.3). There were 263 patients (48.9%) with neck of femur fractures who underwent hemiarthroplasty and 215 patients (40.0%) with extracapsular fractures who underwent surgical fixation. A binary logistic regression model was constructed with gender, age, PMS, EQ-5D and SF-36 components on the 5-year mortality outcomes. This demonstrated a significant relationship between pre-injury PMS (P-value<0.001), EQ-5D total score (P-value<0.001), and the specific components of the SF-36 scores, specifically physical functioning (P-value<0.001), physical role functioning (P-value=0.015), general health (P-value<0.001), and mental health (P-value<0.001) and 5-year mortality. The study demonstrates that the pre-injury PMS, EQ-5D and SF-36 scores are correlated with the 5-year mortality of post-surgical fragility fracture hip patients. This places importance on the collection of these scores to support the counselling of patients and decisions made by the healthcare team, underscoring the importance of physical function and emotional health on improving mid-term survival after hip fractures.

#### **Conclusion**

Pre-injury parker Mobility Score, EQ-5D and SF-36 is correlated with the 5-year mortality of patients who underwent surgery for fragility hip fractures.

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#### **Normal Development of the Secondary Ossification Centers of the Acetabulum and Their Effects on Acetabular Coverage of the Femoral Head**

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#### **Introduction / Object**

This study aimed to identify the normal development of the secondary ossification centers of the acetabulum, focusing on their location and the amount of acetabular coverage increased by them.

#### **Materials & Method**

One hundred and thirty-two patients who showed one or more of three secondary ossification centers of the acetabulum on abdominal/pelvic computed tomography (CT) taken between 8 and 14 years of age and had no pelvic deformity became the subjects. The location of the ossification centers on the acetabulum was evaluated using a clock-face method on a reconstructed 3D-CT image. Left-side images were reversed horizontally for measuring. The increased acetabular coverage by os ischium, os ilium, and os pubis was defined as the difference in posterior, superior, and anterior acetabular sector angles ( $\Delta$ PASA,  $\Delta$ SASA, and  $\Delta$ AASA, respectively) measured with and without each secondary ossification center. The location of the ossification centers and the increased coverage by the ossification centers were compared between 9-year-old group (male: 9-10 years old; female: 8-9 years old) and 13-year-old group (male: 13-14 years old, female: 12-13 years old).

#### **Results / Discussion**

The mean start-to-end positions of right os ischium, os ilium, and os pubis were 9:00-10:30, 11:30-12:00, and 2:40-3:15 o'clock in 9-year-old group, which increased to 8:25-11:00, 11:15-1:20, and 2:25-3:30 o'clock in 13-year-old group ( $p < 0.001$ ,  $p = 0.005$ , and  $p = 0.049$ ). The mean  $\Delta$ PASA,  $\Delta$ SASA, and  $\Delta$ AASA on the right hips were 8°, 10°, and 4° in 9-year-old group, and 11°, 8°, and 6° in 13-year-old group. Only the mean  $\Delta$ PASA increased over time ( $p = 0.03$ ). Left hips showed similar results to right hips.

#### **Conclusion**

The areas where secondary ossification centers appear along the acetabular rim extend over time. The increment of acetabular coverage of the femoral head by the secondary ossification centers does not increase over time in the anterior and superior areas but posterior area.

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#### **An Increased Tibial Slope on Radiographs is Not Observed in Pediatric Patients with Tibial Spine Fractures**

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#### **Introduction / Object**

A recent study has reported that the radiographic measurement of posterior tibial slope (PTS) is larger in pediatric males with tibial spine fractures (TSF) than in controls. However, they found no difference in PTS between female patients and controls. This study aimed to identify whether the PTS is larger in both male and female pediatric patients with TSF than in controls.

#### **Materials & Method**

After a priori power analysis, 84 patients (50 females and 34 males) and 84 age- and sex-matched controls were enrolled as study subjects. Thirty-six of 50 female patients and all male patients visited a single large pediatric center between March 2009 and April 2023 for TSF that occurred at < 18 years of age. The remaining 14 female patients were randomly selected from a prospectively collected multicenter database for pediatric TSF. All controls visited the same institution during the same period for anterior knee pain. They had no medical conditions affecting bony morphology. Demographic information was recorded. Skeletal maturity and PTS were determined on knee radiographs.

#### **Results / Discussion**

The mean age was  $11.2 \pm 2.7$  years for females and  $12.9 \pm 2.5$  years for males when the TSF occurred. There was no significant difference in skeletal maturity between female patients and female controls or between male patients and male controls. The mean PTS was not significantly different between female patients ( $8.8^\circ \pm 2.8^\circ$ ) and female controls ( $8.3^\circ \pm 3.1^\circ$ ) ( $P = .366$ ) or between male patients ( $9.0^\circ \pm 2.8^\circ$ ) and male controls ( $9.3^\circ \pm 2.6^\circ$ ) ( $P = .675$ ). Those with a PTS  $> 1$  standard deviation ( $2.9^\circ$ ) above the mean ( $8.8^\circ$ ) had no greater odds (1.0 [95% confidence interval = 0.4–2.5];  $P = 1.000$ ) of having a TSF than others.

#### **Conclusion**

PTS on radiographs is not a risk factor for pediatric TSF in females or males.

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#### **Incidence and associated complications of acute retention of urine in patients with osteoporotic hip fracture**

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#### **Introduction / Objection**

Hip fracture is a major health concern in the aging population and acute urinary retention (ARU) is a prevalent inpatient complication. 90% of them have had an indwelling urinary catheter (IDC) inserted (Sobhi et al., 2021) and have an increased risk of urinary tract infection (UTI). We assess the incidence and associated complications of ARU in patients with osteoporotic hip fractures in a tertiary hospital in Singapore.

#### **Materials & Method**

A prospective cohort study of 154 low-energy, isolated hip fracture patients admitted between July and December 2020 were assessed for ARU and UTI. ARU was defined as a residual urine of  $> 400$  mls on bladder scan while UTI as dysuria with positive urinary cultures. Patients with high-energy injuries, polytrauma, and pathological fractures were excluded. Patient demographics, comorbidities, pre-morbid status, type of fracture, surgical factors, and inpatient complications including UTI were correlated with the presence or absence of ARU. Multivariate analysis was performed to identify the independent effects of these factors on the incidence of ARU.

#### **Results / Discussion**

39% of the patients had ARU during admission requiring IDC insertion. Patients with ARU were more likely to show documented urinary tract infections ( $p < 0.001$ ). No relationships were observed in terms of co-morbidities, pre-morbid status, types of fracture, frequency of bowel movement, and surgical factors.

#### **Conclusion**

The study highlights the high incidence of ARU in patients with osteoporotic hip fractures during their stay in the tertiary hospital. Additionally, patients with ARU have an increased risk of UTI. The findings highlight the necessity of proactive efforts to prevent ARU among hip fracture patients via early mobilization and adequate pain relief.

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#### **Acute Varus and Rotational Correction of Severe Blount: Is it a Safe and Effective Technique?**

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#### **Introduction / Objection**

Acute correction emerges as a different approach that provides simpler procedures, can correct both varus and rotational deformities, provides a shorter course of treatment, and has simpler post-operative monitoring compared to gradual corrections, especially in severe cases. The concerns for acute correction are adequacy of correction and possible neurovascular complications. This study aims to determine the safety and efficacy of the acute varus and rotational correction technique in severe Blount disease.

#### **Materials & Method**

Nineteen patients (31 extremities) were enrolled and divided into two groups based on their tibiofemoral angle (TFA): less than  $40^\circ$  (Group A) and greater than  $40^\circ$  (Group B). An S-design osteotomy was done for multiplanar acute correction, followed by internal fixation. The effectiveness of the procedure was determined by comparing the pre- and post-operative TFA and Metaphyseal-Diaphyseal Angle (MDA). The number of neurological impairments and compartment syndromes seen after surgery was used to measure safety. The Lower Extremity Functional Scale (LEFS) was used to measure functional outcomes. After surgery, all patients had a one-year follow-up.

#### **Results / Discussion**

There was no neurological impairment or compartment syndrome in any group. Regardless of the degree of the pre-operative deformity, both groups improved significantly. There was no significant difference between TFA in Group A and Group B after surgery (1.70 and 3.00 respectively  $p = 0.147$ ) and MDA (4.60 and 6.0, respectively,  $p = 0.327$ ). This indicates that there is no relationship between preoperative deformity and postoperative outcomes. LEFS scores in Group A and Group B ( $73.85 \pm 2.73$ , respectively,  $p = 0.293$ ) showed equally good results in both groups.

#### **Conclusion**

Acute correction is a safe and effective treatment option for severe Blount's disease.

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#### **Comparison Between Posterior Hamstring Harvest Versus Anterior Hamstring Harvest: A Meta-analysis**

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### **Introduction / Objection**

The hamstring graft is the most commonly used graft for reconstruction procedures. Most surgeons harvest the hamstrings through the anterior approach but the posterior approach has shown favorable outcomes compared the anterior. The posterior approach has gained attention due to the popularity of the all-inside technique of anterior cruciate ligament (ACL) reconstruction.

### **Materials & Method**

A systematic literature search of the PubMed, Embase, MEDLINE, Google Scholar and the Cochrane Library was performed to identify comparative studies investigating outcomes of posterior versus anterior technique for harvesting the hamstring tendons. Primary outcomes for this study are the operative time of total procedure, sensory deficits, and graft length. Secondary outcomes include incision length, post operative range of motion, and infection rates. Pooled risk ratio was utilized as the summary effect measure for categorical outcomes. Statistical heterogeneity between studies were scrutinized using Q statistics test, I2 statistics, and tau squared ( $\tau^2$ ) statistics.

### **Results / Discussion**

One (1) randomized control trial and four (4) cohort studies were included in this study. 405 patients, across all studies, were included in this meta-analysis. 238 were in the posterior group and 167 were in the anterior group. The operative time and saphenous nerve injury were lower in the posterior group ( $P = 0.007$ ,  $Z = 2.70$ , Std. Mean Difference = -0.72, CI = -1.24, -0.20;  $P = 0.004$ ,  $Z = 2.88$ , Risk Ratio = 0.12, CI = 0.03, 0.51). The graft length was significantly shorter in the posterior group ( $P = 0.001$ ,  $Z = 3.23$ , Std. Mean Difference = -0.52, CI = -0.83, -0.20). No difference were found in infection rate, ROM and incision length.

### **Conclusion**

The posterior approach offers better cosmesis, theoretically faster and easier procedure, and with less nerve injury but produces a consistently shorter graft length. It is highly enticing option especially for an all-inside technique for reconstructive procedures.

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### **Subtalar Arthroereisis as a Reliable Option for Flexible Flatfoot in Children: A Prospective Study of Radiological and Functional Outcome**

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### **Introduction / Objection**

Conservative treatment in the flexible flat foot (FFF) is preferred in most cases with satisfying results; only in rare, selected, symptomatic, and conservative-refractory cases is surgical treatment proposed. Subtalar arthroereisis (STA) is a simple technique with rapid recovery that has been advantageous for patients. There remains a paucity of information surrounding the effectiveness and outcome. This study aimed to evaluate the radiological and functional outcome of STA in presented cases of FFF.

### **Materials & Method**

This is a prospective analytical study with comprehensive sample data collecting. The subjects were all patients with symptomatic FFF treated by STA from a period of 2018-2023. Complications, radiological, and functional results were monitored for at least one year.

### **Results / Discussion**

This study involved eight children (15 feet), with a mean age at the time of surgery of  $10.1 \pm 0.83$  years. Subjective scores for the American Orthopaedic Foot & Ankle Society (AOFAS) and The Oxford Ankle Foot Questionnaire for Children (OxAFQ-C) both increased significantly with a p-value of  $<0.001$ . The AOFAS score showed a "good" level of satisfaction after surgery (mean  $87.0 \pm 2.29$ ) compared to a "fair" result before surgery (mean  $59.1 \pm 1.83$ ). The OxAFAQ-C score improved in all domains including physical, school and play, and emotional (mean  $21.7 \pm 0.81$  vs  $42.6 \pm 2.59$ ). The degree of valgus correction was statistically significant ( $p=0.001$ ). There were significant differences between pre-and postoperative lateral radiographic measurements in this study with a p-value of 0.002,  $p=0.003$ ,  $p<0.001$ , and  $p=0.002$  of meary's angle (MA), calcaneal pitch angle (CPA), talar declination angle (TDA), and navicular index (NAV) respectively. There was an increase in radiographic outcomes from anteroposterior view [Anteroposterior Meary's Angle (APMA), Anteroposterior Talonavicular Coverage Angle (APTN), Talocalcaneal angle (TCA)], although, only TCA was statistically significant ( $p=0.034$ ).

### **Conclusion**

STA is a reliable option for surgical treatment in symptomatic FFF patients with or without other accompanying conditions.

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### **CLINICAL, FUNCTIONAL, AND RADIOLOGICAL OUTCOMES FOLLOWING ANTERIOR AND LATERAL CLOSE WEDGED RECONSTRUCTIVE OSTEOTOMY OF MALUNION SUPRACONDYLAR HUMERAL FRACTURE**

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### **Introduction / Objection**

This study investigates the management of supracondylar humeral malunion. Corrective osteotomy, specifically anterior and lateral closed wedged osteotomy technique, is commonly used for treatment due to its simplicity. The research evaluates clinical, functional, and radiological outcomes post-surgery.

### **Materials & Method**

This is a retrospective cohort study involving 15 patients who underwent corrective osteotomy between 2013 and 2018 at Cipto Mangunkusumo National Hospital Indonesia. Carrying angle, range of motion, Baumann Angle, metaphyseal-diaphyseal angle, humero-ulnar angle, humero-capitellar angle, and anterior humeral line were evaluated pre and post operatively. Mean interval follow-up is 24,9 months. Mitchel and Adams criteria and Mayo Elbow Performance Score is evaluated on the final follow up.

### **Results / Discussion**

Clinical and radiological improvements were significant, as demonstrated by changes in the carrying angle, range of movement, baumann angle, metaphyseal-diaphyseal angle, humero-ulnar angle, humero-capitellar angle, and anterior humeral line. Mitchel and Adams criteria, showed 14 patients (93,3%) achieved good to excellent results, while only one patient (6,7%) had an unsatisfactory outcome. Mayo Elbow Performance Score, indicated excellent outcomes for 13 patients (86,7%), good for one patient (6,7%), and fair for one patient (6,7%). Notably, a strong correlation was observed between clinical improvements and changes in the Baumann angle. Moreover, improvements in functional outcomes were also correlated with changes in the metaphyseal-diaphyseal angle.

#### **Conclusion**

Corrective osteotomy with the anterior and lateral closed wedged osteotomy technique effectively addressed supracondylar humeral malunion, yielding satisfactory clinical, functional, and radiological outcomes.

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#### **Relationship between timing of treatment and amount of hidden blood loss in pertrochanteric fractures treated with proximal femoral anti-rotation nailing**

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#### **Introduction / Objection**

Pertrochanteric fractures, commonly seen in the elderly from low-energy falls, require surgical management. Minimal blood loss in the perioperative period is not consistent with the big drop in hemoglobin seen in these patients post-operatively. This discrepancy is attributed to the hidden blood loss (HBL), which must be anticipated in anemia management. This study aimed to determine if the amount of HBL in patients with pertrochanteric femur fractures treated with short proximal femoral anti-rotation nailing (PFNa) is affected by the delay in time to surgery.

#### **Materials & Method**

This is a detailed cross-sectional study from a single institution. Two hundred and ten patients admitted and operated on from January 2017 to December 2019 at an orthopedic specialty hospital were included in the study. Patient's age, sex, AO classification, weight, height, operative time, hematocrit levels on admission, within 7 days pre-op and immediately post-op; visual blood loss and blood transfused were reviewed and retrieved from medical records. Cases were grouped into early (<30 days) or late ( $\geq 30$  days) surgery groups based on the time from injury to surgery. Total blood loss and subsequently hidden blood loss were computed based on the data.

#### **Results / Discussion**

There was no significant difference in the demographic and clinical characteristic of patients in both groups. Mean HBL was  $113.65 \pm 99.25$ mL in the early surgery group, and  $95.32 \pm 111.79$ mL in the late surgery group. Mean HBLs were 31.47% and 27.88% of the total blood loss computed for the early and late surgery groups, respectively. Using an independent t-test, we noted no significant difference in the HBLs (p-value 0.22).

#### **Conclusion**

Delay in treatment of pertrochanteric fractures fixed with short proximal femoral anti-rotation nailing does not significantly affect the amount of HBLs. However, the computed HBLs, which comprise of a large percentage of total blood loss, should be considered in the post-operative management of anemia.

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#### **Kinematic Change During Gait in Children with Treated Unilateral Developmental Dysplasia of the Hip With Avascular Necrosis**

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#### **Introduction / Objection**

Avascular necrosis of the hip (AVN) is one of the most severe complications of DDH surgery. It remains unclear, however, whether AVN would lead to a residual change in the gait of these patients. The purpose of this study was to evaluate residual changes in joint kinematics during level walking of juveniles with AVN resulting from surgery for unilateral DDH at an early age.

#### **Materials & Method**

18 female juveniles who had undergone surgery for unilateral DDH during toddlerhood participated in the current study. Nine of them developed Kalamchi type II AVN while the others did not develop AVN. The frontal-plane acetabular coverages of all the patients were all within normal range. Ten healthy controls were also recruited to match with the non-AVN and AVN groups by sex, age, height and body weight. Each subject walked at a self-selected pace on an 8m walkway. Marker trajectories were then measured with a VICON motion capture system (240Hz) for later kinematics analysis.

#### **Results / Discussion**

Most temporal-spatial parameters were not statistically different between AVN, non-AVN and healthy control groups, including gait speed, stride length, step width. However, compared to the control group, small cadence and longer stride time were noted in the AVN group. Compared to the control group, major residual gait deviation in DDH patients was noted in motions of the transverse and frontal planes. During the entire gait cycle, the AVN group walked with a significant pelvic upward hiking motion and a hip external rotation in the affected side.

#### **Conclusion**

DDH children with AVN showed a compromised gait pattern with longer stride times compared to the control group. They also displayed more asymmetrical residual gait deviations than DDH patients without AVN. Future studies may be dedicated to evaluating the efficacy of further corrective surgery to improve gait patterns and reduce the risk of premature osteoarthritis.

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#### **Platelet Rich Plasma versus Steroid Injection in the treatment of Carpal Tunnel Syndrome: A Meta – Analysis**

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#### **Introduction / Objection**

Recently Platelet Rich plasma has been a topic of numerous studies highlighting its regenerative and reparative effect on neural tissues suggesting its potential value for therapeutic application. In Carpal Tunnel syndrome, it is proven that several factors that are released and activated after a PRP injection might lead to median nerve regeneration. Therefore it has been proposed that PRP might counteract the "microischemia" and "miniature closed compartment syndrome" that are developed in Carpal Tunnel Syndrome.

#### **Materials & Method**

We conducted a comprehensive literature search using PubMed, Chochrane Library, Embase, and Google Scholar from inception to October 2019. All randomized controlled trials comparing platelet rich plasma and steroid injection were included. The primary outcome used is the Visual analogue scale and secondary the Boston Carpal Tunnel questionnaire. We calculated mean differences (MDs) with 95% CIs for the primary outcomes (VAS) and standardized mean differences (SMDs) with 95% CIs for the secondary outcomes (BCTQ)

#### **Results / Discussion**

Results of both studies show that, at the 5% significance level, there is no difference between the Steroid injection and PRP injection (VAS), In terms of Functional status scale, 1 month results shows no significant difference while the 3 month shows significant difference favoring PRP. Similar results as that of Symptom Severity scale wherein there are different results. 1month results showed no significant difference while the third month showed significant difference favoring PRP.

#### **Conclusion**

PRP and corticosteroid is comparable in terms of lowering the pain scores and functional outcome in the 1st month post-Injection. In longer follow-up period, PRP has better patient satisfaction and functional outcome compared with the conventional group.

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#### **Full-endoscopic versus microscopic spinal decompression for lumbar spinal stenosis: a systematic review & meta-analysis**

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#### **Introduction / Objection**

Symptomatic lumbar spinal stenosis is routinely treated with spinal decompression surgery, with an increasing trend towards minimally invasive techniques. Endoscopic decompression has emerged as a technique which minimises approach-related morbidity whilst achieving similar clinical outcomes to conventional open or microscopic approaches. We aimed to assess the safety and efficacy of endoscopic versus microscopic decompression for treatment of lumbar spinal stenosis by conducting a systematic review and meta-analysis.

#### **Materials & Method**

A systematic review on randomized and non-randomized studies comparing endoscopic versus microscopic decompression was conducted, in accordance with PRISMA guidelines. Treatment effects were computed using pairwise random-effects meta-analysis. Risk of bias was assessed using the Cochrane Risk-of-bias and ROBINS-I tools for randomized and non-randomized trials respectively. Quality of the overall body of evidence was appraised using the GRADE system.

#### **Results / Discussion**

A total of 19 primary references comprising 1997 patients and 2132 spinal levels were included. Endoscopic decompression was associated with significantly reduced intraoperative blood-loss (WMD = -33.29 mLs, 95% CI: -51.80 to -14.78, p = 0.0032), shorter duration of hospital stay (WMD = -1.79 days, 95% CI: -2.63 to -0.95, p = 0.001), rates of incidental durotomy (RR = 0.63, 95% CI: 0.43 to 0.91, p = 0.0184) and surgical site infections (RR = 0.23, 95% CI: 0.10 to 0.51, p = 0.001), and a non-significant trend towards lesser back pain, leg pain, and better functional outcomes compared to its microscopic counterpart up to 2-year follow up.

#### **Conclusion**

Endoscopic and microscopic decompression are safe and effective techniques for treatment of symptomatic lumbar spinal stenosis. Prospective studies of larger power considering medium to long-term outcomes and rates of iatrogenic instability are warranted to compare potential alignment changes and destabilization from either techniques.

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#### **Oblique Sliding Ulna Osteotomy for Treatment of Paediatric Neglected Monteggia Fracture Dislocation**

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#### **Introduction / Objection**

There have been a few methods of osteotomy to achieve correction or over-correction of ulna as part of surgical treatment for chronic radial head dislocation. We reviewed the outcome of our cases of neglected Monteggia treated with open reduction of radiocapitellar joint and oblique sliding ulna osteotomy that create acute lengthening as well as correction or over-correction of the deformity.

#### **Materials & Method**

There were 4 cases of neglected Monteggia fracture dislocation treated with this approach between 2007 until 2023.

#### **Results / Discussion**

Patients age range from 3-12 years old with duration of trauma from 4 weeks to 3 years. Two patients had Bado type I and the other two had Bado type III injury. There was no acute nerve injury. All patients achieved union at 4 weeks with final follow up limitation in rotation range of motion arch were less than 20 degrees. There was

no recurrent dislocation of radial head. Our technique of open reduction of radial head and proximal oblique sliding ulna osteotomy immediately provide lengthening and angulation to stabilised the radial head reduction, without requiring bone graft. The use of temporary radiocapitellum transfixation before fixing the ulna osteotomy is to allow adequate lengthening and deformity correction as well as avoiding excessive over-correction

#### **Conclusion**

This case series showed ability of oblique ulna sliding osteotomy in providing immediate ulnar angular correction and lengthening without requiring bone graft as a safe approach to treat neglected Monteggia fracture dislocation. It is in combination with open reduction of radiocapitellar joint.

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#### **Inadequate Helical Blade Locking Increases Cut-in Risk In Cephalomedullary Nailing Of Unstable Intertrochanteric Hip Fractures**

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#### **Introduction / Objection**

Femoral head cut-in is a recently recognized form of cut-out in cephalomedullary nailing different to the well-known superolateral cut-out due to varus collapse. This is associated with the paradoxical migration of the cephalic component superomedially against gravity leading to consequent axial cut-out, and is predisposed to occur with the helical blade with reasons unknown. Despite earlier biomechanical findings of increased axial migration resistance over the lag screw, clinical findings have shown discordant outcomes of increased overall helical blade cut-outs with substantial contributions from cut-ins. We hypothesize that inadequate helical blade locking decreases resistance to axial migration leading to an increased cut-in risk, and aim to investigate our hypothesis in a synthetic osteoporotic femur model.

#### **Materials & Method**

Ten validated osteoporotic synthetic femurs (Sawbones) with unstable intertrochanteric fractures were divided into 2 groups (n=5 per group). Fracture fixation was performed using the Proximal Femoral Nail Antirotation (PFNA, Synthes) with fully locked helical blades in Group 1, and inadequately locked helical blades in Group 2. Both groups were subjected to bidirectional cyclic loading (600N compression loading, 120N tensile loading) at 2 Hz for 5000 cycles. The cumulative superomedial axial migration distances (SAMD) of the helical blades were recorded at the end of the testing cycles, along with any cut-out that occurred.

#### **Results / Discussion**

3 of the 5 inadequately locked helical blades demonstrated superomedial migration of the helical blades against gravity with consequent femoral head axial cut-in (SAMD 11.1mm, 6.2mm and 4.3mm). No cut-out occurred in the fully locked helical blades group. Mean SAMD was higher in the inadequately locked helical blades group at 5.0mm (SD 3.5mm) compared to the fully locked helical blades group at 2.3mm (SD 0.9mm)(p=0.0459).

#### **Conclusion**

Inadequate helical blade locking in cephalomedullary nailing reduces its resistance to axial migration and increases the risk of femoral head cut-in.

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#### **Inadequate Helical Blade Locking Significantly Increases Cut-in Risk To Cause Overall Loss Of Anchorage Benefits Over The Lag Screw**

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#### **Introduction / Objection**

The helical blade and the lag screw are established anchorage modalities used in hip fracture fixation. Despite bone compaction and biomechanically proven increased helical blade cut-out resistance over the lag screw, recent clinical findings have shown discordant outcomes of increased fixation failure rates with the helical blade over the lag screw with higher overall cut-out rates contributed substantially by axial cut-ins.

Our study aims investigate the effect of inadequate helical blade locking on axial cut-in and varus cut-out in a synthetic bone block model with comparisons made to the lag screw to assess their relative risk.

#### **Materials & Method**

Helical blades from the Proximal Femoral Nail Antirotation (PFNA) and lag screws from the Gamma 3 Nail were tested using synthetic bone blocks representative of osteoporotic bone. 3 groups were tested (n=6 per group): fully locked helical blades (Group 1), inadequately locked helical blades (Group 2), and lag screws (Group 3). Bidirectional loading was performed at 2Hz for 10000 cycles to test (i) resistance to axial migration (600N compression, 120N tension), and (ii) resistance to varus collapse (700N compression, 140N tension). The cumulative implant axial migration distance (AMD) and magnitude of the angle due to varus collapse ( $\alpha$ varus) were recorded, along with any cut-in or cut-out that occurred.

#### **Results / Discussion**

Group 2 had the highest mean AMD at 4.07mm, compared to 1.40mm in Group 1 (p<0.01), and 2.12mm in Group 3 (p<0.05). 2 axial cut-ins and 3 impending axial cut-ins (cortical analogue breached without implant extrusion) occurred, all from Group 2.

No varus cut-out occurred. Mean  $\alpha$ varus angles were similar across all 3 groups (p=1.0).

#### **Conclusion**

Inadequate helical blade locking increases femoral head cut-outs by decreasing resistance to axial migration to cause cut-in instead of cut-out failure through varus collapse.

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#### **Optimal age selection for posterior hemivertebra resection and short fusion of a solitary simple lower thoracic or lumbar hemivertebra**

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### **Introduction / Objection**

Hemivertebra(HV) is a leading cause of congenital scoliosis. Yet, the ideal surgical intervention timing remains uncertain. To address this, our study aimed to compare surgical outcomes in children under 10 years old with scoliosis caused by a solitary simple lower thoracic or lumbar HV (T8-L5).

### **Materials & Method**

From January 2015 to January 2022, we retrospectively studied 35 consecutive congenital scoliosis cases treated using posterior hemivertebra resection, fusion, and pedicle screw fixation. Minimum 12-month follow-ups were conducted. We calculated the age at which unplanned reoperation occurred using ROC curve analysis, and the cutoff age was determined to be 5.07 years. Based on this criterion, we divided the pediatric population into two groups: the younger age group (<5 years) and the older age group (≥5 years).

### **Results / Discussion**

Both groups exhibited no significant statistical differences in correction rates in coronal and sagittal planes. The results of the multivariate logistic regression analysis indicate a significant increase in the unplanned reoperation rate in the younger age group ( $P < 0.001$ ).

### **Conclusion**

Our study indicates that delaying surgery until between five and ten years of age, coupled with thorough follow-up, yields satisfactory outcomes with a reduced reoperation rate.

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## **E-Jet Printing of Polycaprolactone with Strontium Substituted Mesoporous Bioactive Glass Nanoparticles for Bone Tissue Engineering**

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### **Introduction / Objection**

Osteoporosis has become epidemically prevalent with ageing population. In osteoporotic fractures, the treatment strategy is surgical fixation and often coupled with systemic anti-osteoporosis medication to improve on fixation stability. Systemic treatments have various side effects such as atypical fractures and increased cardiovascular risks. By using a localized delivery system, we can reduce a widespread adverse reaction.

### **Materials & Method**

Here, we have fabricated a 3D printed polycaprolactone based constructs blended with osteo-inductive strontium embedded in mesoporous bioactive glass nanoparticles particles. Icarin, known for its osteoinductive properties, is also delivered with this nano construct.

### **Results / Discussion**

It can overcome the systemic adverse effects while promoting desirable biological effects locally. Using our scaffold, the presence of strontium and icarini stimulated osteoblast proliferation and differentiation synergistically, whereas osteoclast development was hindered.

### **Conclusion**

The dual effects of our scaffolds offer a promising strategy to support bone regeneration in osteoporotic conditions.

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## **INDICATION OF ARTHROSCOPY IN TREATMENT OF PATELLAR DISLOCATION IN CHILDREN**

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### **Introduction / Objection**

Understanding of the relevant risk factors for patellar instability and the clinical and radiographic tests is necessary to determine optimal treatment. Despite arthroscopy is not strongly mentioned lately, it shows role in lateral release, medial reefing, avoiding bad scar. So, this study is to evaluate arthroscopic indications in treatment of patellar instability in children.

### **Materials & Method**

From 2013 to 2021, 33 patients (7-16yrs of age) with 35 knees were arthroscopically operated according to flow chart including first dislocations with loose body, recurrent dislocations, and habitual dislocations. Periods of follow-up were 2-10yrs (avg. 5.5yrs). The arthroscopic procedures comprised medial reefing ± lateral release, reconstruction of medial patellofemoral ligament ± lateral release, quadriceps lengthening. Results of follow-up were relapse, complication, and functional result according to Kujala score.

### **Results / Discussion**

Among 35 knees, there were 2 (5.7%) first dislocations, 30 (85.7%) recurrent dislocations, and 3 (8.6%) habitual dislocations; lateral release 27/35 (77.1%), medial reefing 23/35 (65.7%), reconstruction of medial patellofemoral ligament 12/35 (34.3%). The essential complication was a knee of extensive stiffness after medial reefing + lateral release. Relapses were in 4/35 (11.4%) of knees; not correlated to lateral release ( $p = 0.21$ ), medial reefing or reconstruction of medial patellofemoral ligament ( $p = 0.07$ ); About 23 knees of medial reefing, relapses were correlated to number of knots ( $p = 0.045$ ). The final functional results according to Kujala were 88-100 (avg. 95.5).

### **Conclusion**

Besides popularity of reconstruction of medial patellofemoral ligament, this study showed role of arthroscopy in both medial reefing and reconstruction of medial patellofemoral ligament. Our flow chart can be applied but needs numerous data and long-term follow-up.

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## **Sternoclavicular Joint Osteoarthritis in a Young Patient- Case Report**

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### **Introduction / Objection**

This report presents a case of sternoclavicular joint (SCJ) swelling, later diagnosed as SCJ osteoarthritis (OA) in a young patient with no previous trauma or pre-existing joint abnormality, a rare case with limited literature.

### **Materials & Method**

This report discusses initial presentation and physical examination of a young patient who presented to our institution's Orthopaedic Surgery Specialist Outpatient Clinic for a painless lump over her right sternoclavicular joint. Lump was atraumatic with no red flag symptoms of malignancy and on examination the 2-3 centimeter bony prominence was hard and non fluctuant with no skin changes and no change to shoulder range of motion.

### **Results / Discussion**

Laboratory investigations targeting inflammatory and infective conditions showed no abnormalities. X-ray of the sternoclavicular joint demonstrated an expansive clavicle lump with loculated lytic components seen within. A contrasted MRI demonstrated degenerative changes with capsular thickening, synovitis and effusion. No suspicious mass or focal marrow replacement was seen. SCJ swelling is an uncommon presentation of SCJ OA in young patients- in previous studies, SCJ OA has predominance at age 48. Other causes of SCJ swelling include infection, primary tumour and metastasis. There is limited literature regarding the role of serial imaging of bone lumps and CT guided biopsies may be used to exclude infection and malignancy. Management tends to be conservative with rest, physiotherapy and medication, failure of which indicates surgical intervention such as excision, arthroscopic procedures, and arthroplasties.

### **Conclusion**

To the best of our knowledge, primary SCJ OA in a young patient is a rare condition for which there is limited literature available. The case takes note of the different differentials of SCJ lumps in young people with their respective investigations and management as well as the common presentations and causes of SCJ arthritis. Treatment options may vary depending on symptomology and patient preference.

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## **Functional scores in post-surgery periprosthetic and peri-implant fractures of the femur**

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### **Introduction / Objection**

Peri-implant (PIFs) and periprosthetic fractures (PPFs) of the femur are becoming more commonplace in parallel with rising age of the population. The literature is sparse on post-surgery functional outcomes in these two groups. In this study, we compare the Modified Barthel's Index (MBI) scores of PIFs and PPFs from pre-morbid to 12-months after surgery. Charlson Comorbidity Index (CCI), Bone Mineral Density (BMD) and mortality at 24 months were also measured.

### **Materials & Method**

A sample size of 33 patients with PIFs (n = 16) and PPFs (n = 17) over the course of 3 years were collected. MBI at pre-morbid, 6 months, and 12 months were collected. Return to function was assessed as return to the same level of independence as pre-morbid. Student's t-test was used for statistical significance. CCI, BMD, and mortality at 48 months were measured.

### **Results / Discussion**

PIFs and PPFs patients have similar independence scores from pre-morbid to the 12-month mark. The MBI scores did not show any statistical significance. 61% of patients were noted to return to their pre-morbid function with only 3% falling by two levels of independence. Both groups were comparable in terms of frailty, BMD readings and mortality at 48 months.

### **Conclusion**

Both PIFs and PPFs have similar functional scores and recovery from the pre-morbid to 12-month post-surgery. Pre-morbid function is a stronger predictor of scores at the 12-month mark than age. The groups share common risk factors such as frailty, age, gender and low bone density. PPFs confer a similar mortality to hip fractures. PIFs with a strong similarity to PPFs may also carry significant mortality by extension.

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## **The novel use of needle arthroscopy in the diagnosis and management of paediatric orthopaedic patients**

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### **Introduction / Objection**

Advances in technology has paved the way for needle arthroscopy to be part of the management of paediatric orthopaedic patients. Due to the size of this patient population, the novel introduction of a 1.9mm Nanoscope (Arthrex, Naples FL) can aid management of paediatric patients with septic arthritis, osteomyelitis and accurate intra-articular fracture fixation more so than conventional tools.

### **Materials & Method**

During a pilot period, needle arthroscopy was employed in the management of skeletally immature patients with native joint infection, Brodie's abscess or intra-articular fracture reductions. We performed a case note review of each patient to determine success of the procedure. Success was defined as a clearance of infection or improved articular congruency in fracture patients.

### **Results / Discussion**

Infection: Three children under the age of two were treated. This included culture confirmed septic arthritis in two shoulders and an ankle in children aged 3-weeks, 20-months and 18-months respectively. Each patient underwent arthroscopic tissue sampling and lavage using needle arthroscopy. The ankle septic arthritis child was found to have a concomitant Brodie's abscess which also underwent drill decompression and curettage under arthroscopic guidance. All three children recovered with no functional impairment or recurrence with up to 18-month follow-up. Fracture: Two children with intra-articular fractures (Knee Ogden 3a and Ankle Salter-Harris 4) underwent assisted needle arthroscopy to visualise and confirm accurate articular fracture reduction during fixation using conventional fluoroscopy. Both children made a full recovery with no functional impairment or malunion at follow-up.

### Conclusion

Needle arthroscopy is safe and effective in younger children. This technology can be used in various contexts including the management of septic arthritis, Brodie's abscesses and intra-articular fracture reductions. Future uses of the needle arthroscopy may include patients with hip avascular necrosis (to determine status of chondral surface and direct delivery of steroid) or targeted epiphysiodesis.

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### 2-year serial radiographs of adult native hip septic arthritis with good functional outcome: a case report

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### Introduction / Objection

The hip joint is the second most common large joint involved in adult native septic arthritis, second to the knee joint and accounting for 9-17% of cases. The radiological sequelae of these cases are unknown.

### Materials & Method

We present a case study on a 31-year-old man presents to the emergency department with a 2-week history of left groin pain and fever. Clinical examination demonstrated left iliac fossa pain with guarding and inability to rotate the left lower limb. There was a fullness of the left proximal thigh but no skin erythema or sinuses in the abdomen or left thigh. Investigations revealed raised inflammatory markers.

### Results / Discussion

- Serial radiographs at 9 weeks and 4 months showing complete destruction of left hip joint with flattening of the femoral head
- One year radiographs shows early avascular necrosis of femoral head and cystic changes at the acetabulum. Femoral head had re-molded against the acetabular socket
- 2 year follow up showing no further collapse of the femoral head however with increase in cystic changes at the acetabulum
- At the 2 year follow up the patient had returned to work as a private hire vehicle driver with no pain or difficulties in his daily activities.
- Adult native hip joint septic arthritis has a yearly incidence of 4 - 10 per 100000 patients
- Risk factors include rheumatoid arthritis, diabetes mellitus, joint surgery and intravenous drug use
- Treatment may include antibiotics, serial aspiration, arthroscopic or open joint washout, resection arthroplasty and joint replacement
- With joint destruction, some patients are offered joint replacement with a 91-93% success rate

### Conclusion

We present an interesting series of radiographs of an adult with native hip septic arthritis over a period of 2 years with good functional outcome. Surgeons need not rush into performing arthroplasty despite radiographic changes if infection appears to be eradicated with good clinical function.

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### Glass injuries seen in a paediatric tertiary hospital in Singapore: An epidemiology study

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### Introduction / Objection

Lacerations rank as the most common paediatric injury that requires a physician evaluation. Glass is a frequent cause of such lacerations, however there is currently little to no information on this. Hence this paper aims to describe the burden and characteristics of such injuries in Singapore.

### Materials & Method

This study is a retrospective review of glass-related trauma presented to paediatric hospital KKH Emergency Department between 1st January 2017 and 4th July 2023. Data on patient and injury characteristics, as well as treatment plans were collected.

### Results / Discussion

Demographics: 680 patients up to 18 years old (average 6.93) were included in the study. 420 (62%) were male. The number of glass-related injuries were stable at about 100 per year from 2017 to 2023. Injury characteristics: 649 (95%) cases were unintentional. 528 (78%) injuries occurred indoors. 159 (23%) children had adult supervision at time of injury. A majority of 458 (67%) injuries occurred during the weekday. Primary blunt injuries were the highest at 414 (61%), followed by 230 (34%) penetrating injuries. 317 (37%) injuries occurred at the lower limb, 305 (36%) at the upper limb, and 105 (12%) at the face. 596 (88%) patients had "None to mild" injuries, 26 (4%) with "Moderate" injuries, and 58 (9%) with "Severe" injuries. Glass doors led to 315 (46%) cases, with glass shards and glass panels causing 85 (12.5%) and 84 (12.5%) cases respectively. Treatment: 555 (82%) of patients received definitive treatment in the Emergency Department and 74 (11%) required surgery. The average

duration of hospitalisation of all patients is 0.36 days. 430 patients averaged 3.66 weeks of follow-up, while 247 were discharged immediately. 85 (13%) patients required inpatient care. Only 1 patient required fluid resuscitation in the Emergency Department.

#### **Conclusion**

Most glass injuries are unintentional, caused by glass doors, occur indoors and are, fortunately, mild cases.

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#### **OSTEOPERIOSTEAL FIBULAR STRUT GRAFTING – A NOVEL TECHNIQUE TO IMPROVE UNION RATES IN NON-VASCULARISED FIBULAR GRAFTING**

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#### **Introduction / Objection**

Gap non-union of long bones are challenging problems in orthopaedic patients. Non-vascularized fibular grafting is a simple, cost effective, single stage procedure and is an accepted method of reconstruction for gap non unions in children. However, there is a risk of non-union when a long avascular strut of fibula is used. The periosteum, by itself has high biological activity and is helpful in osteointegration. Harvesting the fibula with the periosteum gives the advantage of mechanical and biological support in a gap non-union.

#### **Materials & Method**

During 2020 to 2022, 13 patients presented to us with gap nonunion of long bones due to various etiology. The mean age of the patients was 6 years with a mean bone gap of 4.2cm. A modified technique of harvesting the fibula with the periosteum is described. The graft was stabilized with the recipient bone by intra medullary or extra medullary implants.

#### **Results / Discussion**

Union occurred in average 12.7 weeks in all except 1 patient with congenital pseudoarthrosis of tibia. The fibula on the harvest site regenerated completely in all other patients. One patient had a superficial infection. One patient with pseudoarthrosis tibia required subcutaneous plating for additional support. Children were followed were an average of 17.5 months and there was no incidence of graft resorption or fracture.

#### **Conclusion**

Osteoperiosteal fibula graft is a simple, effective and cost-effective procedure for the treatment of gap non-unions in children. It offers the advantage of both biological and mechanical support, with high union rates and low complication rates.

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#### **When can the surgeon be in respite after fixing a SCFE? - analysis on the onset of Avascular Necrosis following surgery**

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#### **Introduction / Objection**

Avascular necrosis of femoral head (AVN) is the most dreadful complication following surgical intervention of slipped capital femoral epiphysis (SCFE). The exact duration of onset of AVN is not extensively analysed, though it is speculated to occur within one year. This study was conducted to analyse the onset of AVN following surgery in SCFE and to predict the minimum follow-up period after which it is safe to declare AVN is a 'never say never event'.

#### **Materials & Method**

Between 2011 and 2021, 227 patients were treated for SCFE, of which 142 patients who have completed radiological follow-up for at least one year were included. The serial post-operative radiographs were analysed on medsynapse PACS. Fisher exact test was done to compare means and  $p < 0.05$  was considered significant.

#### **Results / Discussion**

The AVN rate in our series was 13.4% (19/142; 13 males, 6 females). Majority of AVN (17/19, 89.5%) were following modified Dunn's procedure and 2 (10.5%) were following controlled repositioning for unstable slips. The mean time for diagnosis of AVN from surgery was 23.5 weeks (6–64 weeks). In 84% (16/19) the AVN was detected by 24 weeks and in 2 by 32 weeks. One patient who was lost to follow-up came at 16 months when AVN was detected. There was no significant difference in the incidence of AVN between stable and unstable SCFE ( $p > 0.05$ ) and between acute, chronic and acute-on-chronic SCFEs.

#### **Conclusion**

Based on our data, if AVN is not detected on radiographs at 32 weeks post-surgery, it is highly unlikely the patient develops it later. Eighty four percent of our AVN was detected by 24 weeks and we recommend 2 monthly follow-ups after 6 months till 1 year as a meagre percentage of AVN could develop during this time interval.

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#### **Late Presenting Radial Translocation of the Elbow: A Rare Case Report**

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**Institution:** Ganga medical centre and hospital

#### **Introduction / Objection**

Proximal radioulnar translocation also described as convergent dislocation, is a rare injury where the radius articulates with the trochlea and the ulna with capitellum. Missed diagnosis of this rare condition poses significant disability to the patient.

#### **Materials & Method**

We present an 11-year boy who reported to us 6 weeks following injury to his left elbow. The patient was initially managed conservatively at a local hospital. On presentation to us, he complained of deformity of his left elbow, little and ring finger associated with stiffness of the forearm. On examination there were signs suggestive

of ulnar nerve palsy. His radial head was palpable on the anteromedial aspect of elbow, and he had a 30 degree of fixed supination deformity of the forearm. Plain radiographs on presentation to us was suggestive of radial translocation. He underwent open reduction of the radial translocation with annular ligament repair and ulnar nerve neurolysis.

#### **Results / Discussion**

Post-operatively the patient had gradual return to routine activities with recovery of ulnar nerve symptoms.

#### **Conclusion**

This case highlights the importance of diagnosing this rare condition and its appropriate management to avoid significant disability.

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### **NONUNION OF NAVICULAR: A SILENT KILLER IN AN ADOLESCENT ATHLETES DREAM**

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#### **Introduction / Objection**

Stress fractures of the navicular in adolescent athletes are not uncommon. They are amenable to conservative management in most cases. Osteonecrosis and nonunion are devastating complications of this fracture and its management poses a significant dilemma to the treating clinician.

#### **Materials & Method**

We present nonunion of the navicular in two adolescent athletes. Both our patients presented with significant midfoot pain preventing them from participating in sports activities. Plain radiographs revealed non-union of navicular with sclerosis of the fracture ends. CT scan confirmed non-union of the navicular. The patients were managed with open reduction, internal fixation and bone grafting.

#### **Results / Discussion**

Post-operatively the patients were put on a below knee cast and mobilized non-weight bearing for 6 weeks followed by gradual resumption to normal activities. Satisfactory healing was confirmed postoperatively using plain radiographs and CT scan.

#### **Conclusion**

We report two cases of navicular non-union in adolescent athletes, its clinical significance, and an appropriate management protocol to help the patients to return to their sporting career at the earliest.

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### **The Cork-screwed humerus leading to a spiralling arm– A Case Report**

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#### **Introduction / Objection**

Case: A 14-year-old boy presented with a 10-year history of progressively worsening deformity of the right arm. He had a circumferential crease extending from posterior aspect of proximal arm and going around obliquely to the anterior aspect of middle third of the arm and ending on the anterolateral aspect and this progressively increasing crease was his main complaint. He also had a 4 cm shortening of the right arm. He had a run-over injury to the right arm 10 years ago which was managed elsewhere. Radiological evaluation of the right arm showed gross shortening of the humerus with varus (NSA - 54 degrees of the humeral head). Computerized tomography showed flattening, broadening, and mild irregularity with gross retroversion of the humeral head. There was an irregularity of the growth plate with physeal bar formation along the posterior aspect of the growth plate.

#### **Materials & Method**

He was planned for corrective osteotomy to restore the anatomy. The normal anatomy was completely distorted and the triceps and ulnar nerve was seen anteriorly. The arm was gradually de-rotated upto 360 degrees which restored the normal orientation of the muscles and nerves of the arm. The osteotomy was stabilized with a proximal humerus locking plate after correcting varus and retroversion.

#### **Results / Discussion**

At 1 year follow-up, the patient was pain-free with Abduction of shoulder upto 100°. The osteotomy has healed well and there was an excellent radiological and functional. Currently, the child has 10cm shortening with some residual varus and is advised corrective osteotomy and lengthening for the same.

#### **Conclusion**

We report a complex rare case of post-traumatic physeal arrest of the humerus leading to varus, retroversion, and 360° torsional deformity of the humerus leading to a spiralling arm. This case highlights the fact that physeal arrest can lead to rotational abnormalities which could result in torsional mal-alignment of the limb.

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### **Mesenchymal stem cell exosomes: A promising therapeutic strategy for tendon regeneration**

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#### **Introduction / Objection**

Chronic tendon injuries pose a substantial clinical challenge, necessitating innovative therapeutic interventions. This study elucidates a novel paradigm for tendon repair, centering on the therapeutic efficacy of mesenchymal stem cell (MSC) exosomes. MSC exosomes are small vesicles that contain a variety of bioactive molecules, including proteins, lipids, and nucleic acids. They have been shown to promote cell proliferation, migration, and differentiation.

## Materials & Method

Our investigation initiates with a meticulous preparation and characterization of MSC exosomes, adhering to International Society of Extracellular Vesicles (ISEV) standards. These nanoscopic entities emerge as dynamic orchestrators of cellular processes, showcased in comprehensive in vitro assays using primary rat tenocytes.

## Results / Discussion

We found that MSC exosomes significantly optimises tendon healing compared to the control group. This was associated with increased tenocyte proliferation and migration.

## Conclusion

Our findings suggest that MSC exosomes have the potential to be a new and effective treatment for tendon injuries. They are a cell-free therapeutic approach that is easy to administer and has a low risk of adverse effects. Further studies are needed to evaluate the safety and efficacy of MSC exosomes in clinical trials.

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## Outcome of Chronic Monteggia fracture treated with ulna lengthening and angulation with and without open reduction of radial head.

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## Introduction / Objection

Radial head dislocation is commonly missed in patients with Monteggia fracture. A dislocated unreduced radiocapitellar joint that is present after 4 weeks of injury is labeled as chronic Monteggia injury. Treatment of chronic radial head dislocation is controversial and redislocation and high rates of complications have been reported.

**Aim:** To evaluate the outcome of chronic Monteggia fracture treated with ulna lengthening and angulation with or without open reduction of radial head.

## Materials & Method

A descriptive study comprising of total 11 cases were included in this study presented to Hayatabad medical complex Peshawar from January 2020 to June 2021. Patients presented with chronic Monteggia fracture after 4 weeks of injury were included in the study. All the cases were done by same surgeon in same setup and environment by lengthening and angulation of ulna with z osteotomy and plating with and without open reduction of radial head. Patients were evaluated at 2 weeks, 6 weeks, 3 months, 06 months and 1 year follow ups.

## Results / Discussion

Out of 11 cases 63.63% (n=07) were boys and 36.36% (n= 04) were girls. Mean age of 07±2.32 years (range, 04 to 11 years). Radial head reduction was achieved in all cases by doing ulnar lengthening with z osteotomy and plating including 03 cases which needed further open reduction or annular ligament reconstruction for radial head reduction. On follow ups out of 11, 10 patients had excellent range of movement and good functional outcomes while, 01 case had subluxated radial head.

## Conclusion

Lengthening and angulation of ulna with z osteotomy and plating is best procedure for chronic Monteggia fracture, with low complication rate and excellent functional outcome.

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## Can a deep learning model achieve earlier diagnosis of high grade metastatic epidural spinal cord compression and reduce treatment delay

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## Introduction / Objection

Diagnostic and treatment delay has been found to be associated with poorer surgical and functional outcomes in patients with symptomatic metastatic epidural spinal cord compression (MESCC). MESCC is often underdiagnosed in routinely performed staging CT scans. In this study we aim to assess the utility of a Deep Learning Model (DLM) in detecting high grade MESCC (Bilsky 2/Bilsky 3) and potential reduction in diagnostic delays.

## Materials & Method

This is a retrospective review of 140 patients who had underwent surgical decompression and stabilization for MESCC between Jan 2015 to Jan 2022. All patients had high grade MESCC (Bilsky 2-3) between C7 to L2. Prior staging CT Thorax Abdomen and Pelvis up to 4 months prior to diagnostic MRI was reviewed by a consultant musculoskeletal radiologist (JH) and consultant spinal surgeon (JT) and classified into cases with and without high grade MESCC. A previously validated deep learning model (DLM) was then used to classify these scans. Their findings were then compared to the original radiologist (OR) reports. Inter-rater agreement was assessed. Potential decrease in diagnostic delay was calculated in days from screening CT to first diagnosis of high grade MESCC

## Results / Discussion

95/140 (67.8%) of patients had available pre-operative CT scans. High grade MESCC was identified in 84/95 (88.4%) of the pre-operative CT scans by JH, this was reported in only 32/95 (33.7%) of pre-operative scans by OR. There was almost perfect agreement between JH vs JT kappa=0.947 (CI 0.893-1.000)(p<0.001), JH vs DLM kappa=0.891 (0.816-0.967)(p<0.001) and JT vs DLM kappa = 0.891(0.816-0.067) (p<0.001). There was poor interobserver agreement between the OR and other readers (kappa (0.021 to 0.125)). Mean potential reduction in diagnostic delay was 19 days.

## Conclusion

The DLM had an almost perfect interobserver agreement with both reviewers and this is the first clinical study to demonstrate its potential for reducing diagnostic delays.

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## Correlated templated Total Knee Replacement (TKR) Implant Sizes to those used Intra-Operatively: Factors determining accuracy of templated planning for TKRs

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### **Introduction / Objection**

In view of increasing usage of pre-operative templating in Total Knee Replacement (TKR) surgeries, the study aims to determine the impact of surgical and patient factors on the accuracy of pre-operative templating in sizing of femoral and tibial components used intra-operatively in TKRs.

### **Materials & Method**

A retrospective medical records review of 217 patients who underwent unilateral TKRs from 1 February 2022 to 31 January 2023 by different Orthopaedic surgeons in a single institution was conducted. Pre-operative templating for component sizes were done using TraumaCad on anterior-posterior and lateral views of patients' knee radiographs. Chi-square tests were used for categorical factors like gender, race, weight, surgeon seniority and implant brand while logistic regression was used to investigate if radiographic magnification predicts for templating accuracy, and receiver operative characteristic curves were used to find the magnification threshold allowing for accurate templating with the highest specificity and sensitivity.

### **Results / Discussion**

The accuracy of pre-operative templating using the TraumaCad programme was found to be exact for 37.4% and 41.9% of the femoral and tibial components respectively, and within one size for 81.5% and 83.3% of the femoral and tibial components respectively. Tibial components were more accurately templated if patients were lighter than 70kg ( $p=0.000686$ ) or if Persona implants (from Zimmer Biomet) utilising smaller size increments were used ( $p=0.0250$ ). AP magnification significantly predicts for templating accuracy of tibial components ( $p=0.000208$ ) with good discrimination ( $AUC=0.666$ ), while lateral magnification significantly predicts for templating accuracy of femoral components ( $p=0.0316$ ) with good discrimination ( $AUC=0.655$ ). AP magnification was found to be greater than 108.0% for accurate templating of tibial components (48.5% specificity, 84.7 sensitivity). Lateral magnification was found to be greater than 104.2% for accurate templating of femoral components (66.6% specificity, 66.0% sensitivity).

### **Conclusion**

Accuracy of pre-operative templating is dependent on multiple factors such as patient weight, brand of implant and magnification level on TraumaCad.

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### **3D Visualization Improves Assessment of the Anterior Humeral Cortex's Distance to the Ulnohumeral Joint's Flexion-Extension Axis**

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### **Introduction / Objection**

2D CT scans are standard procedures for fracture assessment and surgical planning, such as in determining the flexion-extension axis in relation the anterior cortex of the distal humerus in total elbow arthroplasty. We hypothesize that 3D imaging provides improved accuracy in determining the distance of the anterior humeral cortex to the flexion-extension axis of the ulnohumeral joint on lateral view. This study compares this distance obtained from 2D CT, 3D-reconstructed cuts (at the same location) and the true-lateral projection.

### **Materials & Method**

3D models were created from segmentation of CT scans of three cadaveric specimens using Materialise Mimics 25.0.

The anterior humeral line was projected distally and the shortest distance to the flexion-extension axis—assumed to be the center of the trochlear—was obtained on seven 2mm interval cuts. This data was analysed by comparing:

1. 2D vs 3D-reconstructed lateral cuts at the same location, eliminating factor of patient position
2. All 2D and 3D-reconstructed data against the true-lateral projection of the reconstructed model

### **Results / Discussion**

3D-reconstructed cuts consistently showed smaller average absolute differences from the true-lateral value compared to 2D CT in all specimens, with the discrepancy between 2D and 3D-reconstructed averages ranging from 0.95 to 3 mm. The largest distance measured on 2D was 15.28mm, which reduced to 8.65mm on a 3D-reconstructed cut at the same location. Despite correction for patient positioning, 3D-reconstructed cuts also exhibited deviation from the reconstructed true-lateral value, due to the anterior cortex line traversing multiple cuts.

### **Conclusion**

This study elucidates the impact of imaging dimensionality and the role of 3D imaging in orthopaedic assessments, as 3D imaging more accurately defines the distance of the anterior humeral line to the flexion-extension axis of the elbow. Patient positioning in strict orthogonal planes during CT is clinically impractical and 3D imaging can mitigate this problem.

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### **Design and 3D printing of novel titanium spine rods with lower flexural modulus and stiffness profile to optimise imaging compatibility**

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### **Introduction / Objection**

Standard titanium rods have higher flexural modulus and stiffness than cortical bone resulting in stress shielding/implant loosening/artefacts created. Hence the aim of this study was to manufacture and test 3d printed titanium rods for use in conditions where construct rigidity is required without compromising future management plans such as in metastatic spine tumour and osteoporosis.

### **Materials & Method**

Novel titanium spine rods were designed and 3d printed before evaluating its mechanical performance via a three point bending test. These rods were also printed and tested for CT and MRI compatibility

#### **Results / Discussion**

Multiple 3D printed titanium rods with varying cross sectional surfaces were printed and tested. All 3D printed rods improved advanced imaging comparability with reduced artefacts as compared to a standard rod. In addition to that, 3d printed rods were more malleable and easier to contour as compared to the standard rods without compromising rod stiffness.

#### **Conclusion**

By utilising a novel design approach, it has been possible to generate a spine rod design with lower flexural modulus and better advanced imaging compatibility. This allows for exploration of newer rod designs in the future that can enhance treatment outcome and improve the patient's quality of life.

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#### **Mid-term Results of Cast-Brace Rotation Treatment for Early-onset Scoliosis**

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#### **Introduction / Object**

As repeated general anesthesia (required by casting) has been questioned for possible brain damage, interest in bracing is growing in conservative early-onset scoliosis treatment. We aimed to analyze the mid-term clinical results of cast-brace rotation treatment for early-onset scoliosis (EOS).

#### **Materials & Method**

We performed a retrospective study in a consecutive cohort. Inclusion criteria were: discovery of scoliosis and initiated treatment below age 5; exclusion criteria: previous spine surgery. On a yearly cycle, the cast was applied under general anesthesia and remained for 2-4 months according to the patient's age, and the brace was continuously worn for another 10-8 months. The cast-brace rotation treatment (CBRT) was repeatedly applied until the scoliosis was cured or surgical intervention was required. The change in the major curve angle and complications of CBRT were analyzed.

#### **Results / Discussion**

Twenty-nine children were included. Fourteen patients had idiopathic scoliosis, and 15 had secondary scoliosis. Cast treatment was initiated at  $3.4 \pm 1.9$  years of age, and the patients were followed up for 4.3 years. An average of 2.9 casts were performed per patient. The mean major scoliosis angle was  $45.5 \pm 8.7$  degrees at the first visit; this was corrected to  $21.8 \pm 14.8$  degrees at the first cast application and  $31.6 \pm 18.0$  degrees at the final visit. Seven patients whose scoliosis angle was less than 15 degrees stopped the rotation. Six patients whose scoliosis progressed finally underwent surgery. Patients with idiopathic scoliosis tend to have better results compared to secondary scoliosis. The chest width and height of thoracic vertebrae in both groups were significantly increased at the last follow-up. The cast-related complication rate was 6.9%, and most complications were skin problems.

#### **Conclusion**

For patients with early-onset scoliosis, CBRT might be effective in the mid-term. This should be considered a time-buying treatment option for EOS.

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#### **Retrospective study identifying risk factors for severe glass injuries in paediatric population**

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#### **Introduction / Object**

Most glass-related injuries in children are accidental. Therefore this study aims to identify risk factors associated with more severe glass injuries and recommend ways to prevent them.

#### **Materials & Method**

This study is a retrospective review of glass-related trauma presented to paediatric hospital KKH Emergency Department between 1st January 2017 and 4th July 2023. Age, gender, body weight, presence of supervision - are risk factors identified, and compared against the following severity markers: depth of injury, need for inpatient care, and length of hospitalisation. A simple regression analysis was applied to the risk factors and severity markers to establish any significant correlation.

#### **Results / Discussion**

680 paediatric patients were included in the study. 420 (62%) were male. Increased age is associated with lesser depth of injury ( $p < 0.001$ ), higher likelihood of inpatient care ( $p < 0.001$ ) and increased length of hospitalisation ( $p < 0.001$ ). Females are associated with lesser depth of injury ( $p < 0.05$ ) and decreased length of hospitalisation ( $p < 0.05$ ). Absence of adult supervision is associated with higher likelihood of inpatient care ( $p < 0.05$ ). Increased body weight was associated with lesser depth of injury ( $p < 0.001$ ), higher likelihood of inpatient care ( $p < 0.001$ ) and increased length of hospitalisation ( $p < 0.001$ ).

#### **Conclusion**

Increased age, body weight and absent adult supervision are associated with higher likelihood of inpatient care, with the former two being associated with increased length of hospitalisation. Males are also found to be more prone to severe injury.

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#### **Pelvic Support Osteotomy in Adolescent**

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### **Introduction / Objection**

Pelvic support osteotomy (PSO) is described as a treatment for hip instability in adolescents and young adults with Trendelenburg gait and mobile hip. It eliminates the Trendelenburg effectively by placing the hip in maximum adduction (correcting stability). Two most frequent indications are neglected or an unsuccessfully treated DDH and severe septic hip sequelae. Consequences if left untreated could be inefficient gait (Trendelenburg, short limb), unstable hip (proximal migration) and easily fatigue.

### **Materials & Method**

Preoperatively, maximum hip adduction view is obtained. There will be no more Trendelenburg limp if the hip is maximally adducted until no more adduction possible. The femoral shaft is fully adducted against the lateral wall of the pelvis (ischium), which marks the site of femoral valgus osteotomy. The amount of valgus correction = degree of maximum adduction + overcorrection (15 – 40 degrees). Overcorrection is needed to eliminate any hip adduction and pelvic drop angle, to lateralize the limb and the knee joint from midline of body, to compensate remodeling in children and to anticipate atrophy of tissue in between lateral pelvic wall and femur. Distal osteotomy is later performed between the proximal valgus osteotomy and the knee joint in order to realign the “abducted” distal limb. Therefore both limbs become parallel and mechanical axis corrected. Not only parallel limbs, both knees will have equal distance from midline of body. Distal osteotomy also allows knee joint inclination horizontal to the pelvis and contralateral side. It also allows for limb lengthening.

### **Results / Discussion**

Pelvic support osteotomy improved the Trendelenburg limp in diseased hip. Stable hip with improved function is anticipated upon standing and walking

### **Conclusion**

Pelvic support osteotomy is meant for correcting the hip stability by addressing the Trendelenburg limp in diseased hip. PSO combining with distal femoral osteotomy will improve limb realignment and achieve concomitant lengthening. Stable hip with improved function is anticipated

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### **Terrible Triad Injury in a Pediatric Patient: Surgical Technique and Outcome**

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### **Introduction / Objection**

The Terrible Triad Injury of the Elbow is a complex injury involving a fracture of the radial head and coronoid along with a posterior elbow dislocation. Elbow dislocations in children are rare, with an estimated incidence of only 3-6%. Current surgical protocols are primarily based on studies and treatments for the adult population. However, the management and outcome of such injuries in children remain less understood. In this paper, the surgical management and outcome of a terrible triad injury of the elbow in an 11-year-old girl are described.

### **Materials & Method**

The patient underwent open reduction via a triceps-sparing approach. Instability during full extension was still noted after thorough debridement of the elbow joint, hence the coronoid was fixed using a suture lasso technique. Under image intensification, the reduction of the elbow was confirmed, demonstrating stability and a range of motion from 100 to 45 degrees of flexion. No laxity was observed during the valgus and varus stress test.

### **Results / Discussion**

During the postoperative period, the patient had regular follow-up visits and underwent radiographs at each visit. Physical therapy for range of motion exercises started at week 4 and showed gradual improvement. At 18 weeks, the patient reported no pain, instability, or limitations. Radiographs did not show any recurrence of dislocation. Range-of-motion measurements were within normal limits, and the patient had excellent elbow function according to the Mayo Elbow Performance Score (MEPS) of 100.

### **Conclusion**

Terrible Triad Injury of the elbow is a challenging condition to diagnose and treat. It is uncommon in the pediatric population, and the current surgical protocols used for pediatric patients are based on adult injury. It is important that a thorough assessment of the components of the injury is done and that timely surgical management is considered even for pediatric patients.

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### **Ambulatory uniportal versus biportal endoscopic unilateral laminotomy with bilateral decompression for lumbar spinal stenosis—cohort study using a prospective registry**

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### **Introduction / Objection**

Endoscopic spine surgery has been established as a practical, minimally invasive technique for decompression in patients with lumbar spinal stenosis. However, there remains a paucity of studies prospective cohort study comparing uniportal lumbar endoscopic unilateral laminotomy with bilateral decompression (UPE) and unilateral biportal endoscopic unilateral laminotomy with bilateral decompression (BPE) with open spinal decompression—both viable techniques with satisfactory clinical outcomes in the treatment of lumbar spinal stenosis. This paper aims to compare the efficacy of UPE and BPE lumbar decompression surgery for patients with lumbar spinal stenosis

### **Materials & Method**

A prospective registry of patients who had undergone spinal decompression for lumbar stenosis via UPE or BPE under a single surgeon was studied. Baseline characteristics, initial clinical presentation, and operative details including complications were recorded. Clinical outcomes, such as visual analogue scale and Oswestry Disability Index, were recorded at preoperative, immediate postoperative, 2-week, 3-, 6-, and 12-month follow-up periods.

## Results / Discussion

62 patients underwent endoscopic decompression surgery for lumbar spinal stenosis (29 UPE, 33 BPE). No significant baseline differences were found between UPE and BPE, when comparing operative duration (130 vs. 140 min;  $p = 0.30$ ), intraoperative blood loss (5.4 vs. 6mLs;  $p = 0.05$ ), and LOS (23.6 vs. 20.3 h;  $p = 0.35$ ). Two UPE patients (7%) required conversion to open surgery due to inadequate decompression. Intraoperative complication rates were significantly higher in the UPE group (13.4% vs. 0%,  $p < 0.05$ ). VAS score (leg & back) and ODI improved significantly ( $p < 0.001$ ) in both cohorts across all follow-up time points, with no appreciable statistical differences between both cohorts.

## Conclusion

UPE has the same efficacy as BPE in lumbar spinal stenosis surgical treatment. While UPE surgery enjoys added aesthetic benefits of only one wound, BPE had potentially lower risks of intraoperative complication, inadequate decompression, and conversion to open surgery during early period of learning curve.

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## Functional and Radiological Outcome of Single-Stage Operation for Treatment of Developmental Dysplasia of The Hip above 5 years of Age

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## Introduction / Objection

In neglected cases of DDH, achieving concentric and stable hip reduction while minimizing complications is challenging. The aim of this study is to evaluate functional and radiographic results of single-stage surgery of neglected DDH.

## Materials & Method

Between January 2012 and January 2020, 22 patients (24 hips) were further classified into group A (less than 5 years) 9 patients and group B (more than 5 years) 15 patients. They underwent single-stage surgery consist of open reduction, femoral varus derotational osteotomy with or without acetabuloplasty for treatment of neglected DDH. Postoperative radiological outcome was evaluated using Severin classification and acetabular index. Mean duration of follow up was 43.54 months. Functional outcome was measured by McKay's scoring system and CHOHES (Children's Hospital of Oakland Hip Evaluation Scores).

## Results / Discussion

The Severin's class was good to excellent in 100% in group A and 93% in group B ( $p=0,035$ ). Postoperative acetabular index was significantly better than preoperative ( $p=0,01$ ) with no significant differences post operative acetabular index between two groups. McKay's score was good to excellent 89% in group A and 73% in group B ( $p=0,038$ ). CHOHES score was good to excellent 89% in group A and 73% in group B, with no significant statistical differences ( $p=0,99$ ).

## Conclusion

Developmental dysplasia of hip in patients above 5 years of age treated with single-stage surgery consist of open reduction, femoral osteotomy, with or without acetabuloplasty showed good results, both radiologically and functionally.

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## An evaluation of prognostic scoring systems for survival in a cohort of 318 patients with surgically treated spinal metastasis

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## Introduction / Objection

Survival prognostication is crucial in guiding the surgical management of patients with spinal metastases. The accuracy of traditional scoring systems like the modified Tokuhashi and Tomita scoring systems have recently have heavily disputed. This has led to the development of machine learning algorithms to predict survival. In this study we aim to compare the accuracy of prognostic scoring systems in a surgically treated cohort of patients.

## Materials & Method

This is a retrospective review of 318 surgically treated spinal metastasis patients between 2009 to 2021. The primary outcome measured was survival from the time of diagnosis. Predicted survival at 3 months, 6 months and 1 year based on the prognostic scoring system was compared to actual survival. Predictive values of each scoring system was measured via area under receiver operating characteristic curves(AUROC). The scoring systems compared were: Modified Tokuhashi(MT), Tomital(T), Modified Bauer (MB), Van Den Linden(VDL), Oswestry (O), New England Spinal Metastases score (NESMS), GSTSG and SORG scoring systems.

## Results / Discussion

For predicting 3 months survival, the GSTSG 0.980 (0.949-1.0) and NESM 0.980 (0.949-1.0) had outstanding predictive value, while the SORG 0.837 (0.751-0.923) and O 0.837 (0.775-0.900) had excellent predictive value. At 6 months survival, only the O 0.819(0.758-0.880) had excellent predictive value and the GSTSG 0.791(0.725-0.857) had acceptable predictive value. For 1 year survival, the NESM 0.871(0.822-0.919) had excellent predictive value and the O 0.722 (0.657-0.786) had acceptable predictive value. The MT, T and MB scores had an AUC of <0.5 for 3 month, 6 month and 1 year survival

## Conclusion

Traditional scoring systems show worse predictive values compared to newer scoring systems such as the GSTSG, NESM and SORG. However, there are no survival scoring systems that are able to accurately prognosticate survival at all 3 time points. A tailored approach to survival prognostication is needed.

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## Patterns of treatment delay in patients with symptomatic metastatic epidural spinal cord compression

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#### **Introduction / Objection**

Delayed treatment in symptomatic metastatic epidural spinal cord compression (MESCC) is significantly associated with poorer functional outcomes. In this study we aim to identify the patterns of treatment delay in patients and factors predictive of post-operative ambulatory function.

#### **Materials & Method**

Retrospective review of patients with symptomatic MESCC treated surgically between January 2015 to January 2022. MESCC symptoms were categorised into symptoms suggesting cord compression requiring immediate referral and symptoms suggestive of spinal metastases. Multivariate analysis was performed to identify factors predictive of post-operative ambulatory function. Delays in treatment were identified and categorized into patient delay (onset of symptoms till initial medical consultation), diagnostic delay (medical consultation till radiological diagnosis of MESCC), referral delay (from diagnosis till spine surgeon review) and surgical delay (from spine surgeon review till surgery) and compared between patients.

#### **Results / Discussion**

In a cohort of 178 patients, 92 (52.0%) patients were able to ambulate independently, and 86(48.3%) patients were non independent. 139 (78.1%) of patients had symptoms of cord compression and 93 (52.3%) had neurological deficits on presentation. On multivariate analysis pre-operative neurological deficits ( $p=0.01$ ) and symptoms of cord compression ( $p=0.01$ ) were significantly associated with post-operative ambulatory function. Mean Total delay was 66 days, Patient delay was 41 days, Diagnostic delay was 16 day, Referral delay was 3 days and Surgical delay was 6 days. In patients with neurological deficits, there was a significant decrease in all forms of treatment delay ( $p<0.05$ ). There was no significant decrease in patient delay, diagnostic delay and referral delay in patients with symptoms of cord compression.

#### **Conclusion**

Both patients and physicians understand the need for urgent surgical treatment of MESCC with neurological deficits, however there is still a need for increased education and recognition of the symptoms of MESCC

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#### **Interaction Between Genetic and Mechanical Factor Throughout Recurrence of Idiopathic Clubfoot: Activity of TGF- $\beta$ Ligand and SMAD Signalling Pathway**

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#### **Introduction / Objection**

Recurrence of idiopathic clubfoot occurred as a result of the interaction between genetic factor and mechanical factor during development of tendon fibrosis, as a result of fibrogenic protein accumulation, throughout TGF- $\beta$  ligand and SMAD signalling pathway activities, together on anterior tibialis tendon and Achilles tendon.

#### **Materials & Method**

This study conducted as an observational cross-sectional study, on recurrence idiopathic clubfoot subject. Analysis on qualitative and semi quantitative data to reveal correlation between immunohistochemistry results of TGF- $\beta$  ligand and SMAD signalling pathway activity as well as fibronectin expression has been performed.

#### **Results / Discussion**

There were eight study subjects, mean of age 2.5 year, six with bilateral idiopathic clubfoot (75%), Diméglio classification equally between 12 and 14. Total number of sample was 14, together for anterior tibialis tendon and Achilles tendon respectively. Semi quantitative analysis between TGF- $\beta$  and SMAD activities revealed TGF- $\beta$  activity (B 0.078, Beta 0.230, and T 0.893) and SMAD activity (B 0.123, Beta 0.596, and T 2.317) together positive on anterior tibialis tendon. On Achilles tendon, revealed only SMAD (B 0.204, Beta 0.061, and T 0.196) positive, whereas TGF- $\beta$  negative (B -0.010, Beta -0.006, and T -0.021).

#### **Conclusion**

TGF- $\beta$  ligand activity play a role during development of fibrogenic protein accumulation on anterior tibialis tendon, throughout activation of SMAD signalling pathway. On Achilles tendon, fibrogenic protein accumulation occurred throughout mechanotransduction of SMAD signalling pathway by a mechanical stress. Idiopathic clubfoot recurrence occurred as a result of combination between genetic factor throughout TGF- $\beta$  ligand activity on anterior tibialis tendon, and mechanical factor throughout mechanotransduction of SMAD signalling pathway on Achilles tendon.

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#### **Management of CTEV: Modified Ponseti Technique In Hasan Sadikin Hospital Serial Case Report**

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#### **Introduction / Objection**

This is a serial case report of the management of CTEV by using the Ponseti technique. The management consists of serial manipulation and casting, followed by the use of Dennis-Browne splint. The modification of the technique is implemented in terms of manipulation technique and casting sequence. This modification has reduced the number of serial treatment to four serial.

#### **Materials & Method**

We conducted review of serial case of CTEV patient underwent serial manipulation and casting between 2012 and 2022. All data based on the patient's medical record were tabulated and summarized to facilitate evaluation.

## Results / Discussion

There were 132 patients underwent serial manipulation and casting. There were 80 boy and 52 girl, all performed during 2 month of age. Fourty two patients with unilateral deformity whereas 90 other patients with bilateral deformity. The Dimeglio score ranged from 10 to 14. We performed serial manipulation and casting. The manipulation technique described as correction of derotation, adduction, varus, equinus and cavus in this sequence. The casting sequence described as forefoot, midfoot, hindfoot and leg followed by thigh casting, and conjoined altogether, to allow knee flexion and whole leg and foot correction. All cases achieved significant correction after four serial as indicated by Pirani score, without tenotomy procedure. The correction is further maintained with Dennis-Browne splint until 1 year age. Long term follow up revealed good to excellent results.

## Conclusion

The Ponseti technique of serial manipulation and casting, with sequential modification, can be considered as an option for the management suitable type of CTEV, that is scored 10 to 14 according to Dimeglio score.

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## Short-Term Functional & Radiographic Outcome of Displaced Metaphyseal Fracture of Pediatric Distal Radius Treated with In-situ Casting in a Tertiary Hospital

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### Introduction / Objection

Pediatric forearm fractures are the most common childhood injuries. The usual mechanism is a fall on an outstretched hand. Traditionally, displaced fractures are treated with reduction under anesthesia followed by casting or pinning. Immobilizing the fracture in its bayonet position (in-situ casting) has been recently suggested as an alternative treatment, especially in children with remarkable remodeling potential. To evaluate the effectiveness of in-situ casting in children with overriding distal radius fractures through clinical & radiographical assessment in a tertiary hospital using serial X-rays & validated outcome measures.

### Materials & Method

Patients ages 3-12 years old with closed overriding distal metaphyseal fracture of the radius and/or ulna between 2020-2022 at Jose R. Reyes Memorial Medical Center were followed prospectively. Participants underwent in-situ short arm casting with no attempt to correct shortening. They were followed up for at least 6 months to 1 year post-injury. Radiographic alignment, union, and the patient's range of motion at the final follow-up were documented. Functional outcome was assessed using a validated questionnaire (Fil-QuickDash).

### Results / Discussion

Eight patients with an average age of 9.75 (9-12 years old) were included in the case series. Angulation improved from the time of injury up to the final follow-up (10.1 + 9.05° to an average of 3.76 + 2.23° in coronal view and from 10.91 + 6.58° to 4.91 + 3.75° in sagittal view). Noted bony union at time of final follow-up. All patients had full forearm and wrist motion. Based on Fil-QuickDash, patients had good to excellent functional outcomes. Parents & guardians were satisfied with the treatment outcome.

### Conclusion

Distal radius fracture in ages 12 years or younger with bayonet apposition could be treated with in-situ casting. No requirement to correct shortening. This could be done in the Emergency Room without subjecting the patient to anesthesia. It decreases hospital stays and provides less risk for hospital-acquired diseases. Radiographic and functional outcomes were good.

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## Lessons Learned from "The Great Mimicker Disease": A Retrospective Study of 18 Patients with Scurvy

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### Introduction / Objection

Scurvy is an uncommon medical condition that affects children and is caused by an inadequate intake of vitamin C. This study presents the characteristics of patients with scurvy to raise awareness of the diagnostic process in developing countries.

### Materials & Method

A retrospective study was performed from period of 2018 – 2023. Data extraction includes patient age, sex, BMI, constitutional symptoms, musculoskeletal, mucosal, cutaneous symptoms, other accompanying disorders, anaemia, ESR, CRP, radiographic examination, vitamin C dose, and duration of treatment. Descriptive statistical analysis was performed in this study.

### Results / Discussion

Eighteen cases (17 males, 1 female) of scurvy were referred to our institution. Thirteen of 18 patients were misdiagnosed before referral. The median age at presentation was 4.5 (range, 2 – 11) years. The average BMI was 13.93±0.63 kg/m<sup>2</sup>. Half of patients had healthy weight. All patients presented with lower limb pain and 17 of 18 with refusal to walk. The median onset of diagnosis was 11 (range 4-48) weeks. White line of Frankel was described in all patients. Seven had anaemia and 6 of 18 had increase in ESR and/or CRP levels. Only one patient had ascorbic acid levels evaluation before treatment since it was not readily available in our country. Treatment length varied from 2 weeks to 6 months.

### Conclusion

The diagnosis of scurvy is frequently delayed due to its extreme rarity and its ability to mimic numerous conditions. In children presenting with limb pain and/or reluctance to walk and pathognomonic radiological findings, physicians must prioritise scurvy as a differential diagnosis. Vitamin C supplementation is curative.

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### **Reoperation rates following different operations for developmental dysplasia of the hip at walking age**

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#### **Introduction / Objection**

Reoperation is a major adverse event in surgical outcomes. The study aimed to investigate the reoperation rate following different operations for developmental dysplasia of the hip (DDH) and risk factors associated with reoperation.

#### **Materials & Method**

This is a retrospective birth cohort study of children who underwent closed reduction (CR), open reduction (OR), and osteotomy for unilateral DDH at age 1-3 years using the Taiwan National Health Insurance Research Database. Subsequent operations for hip dysplasia were surveyed until 10 years old, excluding repeated CR within 6 months. Risks of reoperation were analyzed by binary logistic regression including age, sex, procedures, and birth year. Patients were stratified by age and procedures for specific reoperation rates.

#### **Results / Discussion**

There were 701 patients who underwent operations for unilateral DDH identified from 2,261,455 livebirths (0.31/1000) in 2000-2009. By their first operation, 86 underwent CR at age 1.1 years, 73 underwent OR at age 1.5 years, 405 underwent pelvis osteotomy at age 1.6 years, 44 underwent femur osteotomy at age 1.8 years, and 44 underwent pelvis and femur osteotomy at age 1.9 years. Reoperations were performed in 95 patients (13.6%) after a mean 2.7 years postoperatively. Logistic regression showed operations including pelvis osteotomy, rather than younger age at operation, was associated with lower reoperation rate (Odds ratio 0.34x, compared to CR,  $p < 0.001$ ). At age 1-2 years, reoperation rate was 9% after pelvis osteotomy, 15% after OR, 18% after femur osteotomy, and 29% after CR.

#### **Conclusion**

Reoperation may not be directly linked to radiographic and functional outcomes but is significant from patient's perspective and cost-effective. This study suggests that it is imperative to provide adequate correction procedures to address hip dysplasia and instability during the first operation for DDH at walking age, rather than rushing into early reduction and waiting for natural remodeling.

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### **Surgical Outcomes in Paediatric Lateral Condyle Nonunion: A Systematic Review and Meta-Analysis**

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#### **Introduction / Objection**

Nonunion is a known and much-dreaded complication of paediatric lateral condyle fractures. This systematic review aims to pool together individual studies to find out if the timing of fixation and method of fixation impacts surgical outcomes (postoperative union and elbow ROM) in paediatric lateral condyle nonunion.

#### **Materials & Method**

A systematic review and individual patient data meta-analysis was conducted according to PRISMA guidelines. All surgical studies with original data on pediatric lateral humeral condyle nonunion were included. Patients who did not undergo surgical fixation were excluded.

#### **Results / Discussion**

A total of 12 studies with 177 patients were included. 159 patients (89.8%) achieved bony union postoperatively while 18 patients (10.2%) did not. Mixed-effects logistic regression showed that percutaneous fixation ( $p$ -value = 0.020) was associated with lower rates of postoperative union compared to open fixation, whereas the age at surgery did not have a significant impact ( $p$ -value = 0.401). For elbow ROM, mixed-effects linear regression showed that increased age at surgery ( $p$ -value = 0.007) and reduction of the fracture fragment (vs in-situ fixation) ( $p$ -value = 0.041) were associated with reduced postoperative ROM whereas female sex ( $p$ -value = 0.009) and corrective osteotomy ( $p$ -value = 0.045) were associated with increased postoperative ROM.

#### **Conclusion**

While the timing of surgical fixation did not significantly impact postoperative bony union, undergoing fixation at an older age was associated with reduced postoperative elbow ROM. In addition, percutaneous fixation may be associated with poorer postoperative union compared to open fixation while anatomical reduction may be associated with reduced postoperative elbow ROM compared to in-situ fixation.

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### **Bivalved Long Arm Circular Casts and Their Effect On Maintenance of Reduction in Pediatric Patients with Both Bone Forearm Fractures**

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#### **Introduction / Objection**

Pediatric forearm fractures are usually treated with long arm casts, but redisplacement occurs in 7-13% of cases. The cast index should be 0.8 or lower to prevent redisplacement. Bivalving, a precautionary procedure, can increase the cast index. Unfortunately, there is a lack of local studies on redisplacement risk in forearm fractures treated with bivalved casts. This study aims to determine rate of redisplacement in patients treated with bivalved long arm casts.

#### **Materials & Method**

This is a prospective cohort study conducted from 2021 to 2023. It includes children aged 2-14 years with both bone forearm fractures requiring closed reduction and casting. Standard AP and lateral radiographs were taken after closed reduction and casting, followed by bivalving of the cast. Cast index measurements were recorded before and after bivalving. Patients were monitored at 1, 2, 4, and 6 weeks post-reduction for clinical assessment and follow-up radiographs.

### **Results / Discussion**

This study included 33 patients with an average age of 9.3 years (28 male, 5 female). There were 20 midshaft and 13 distal shaft fractures included. After closed reduction, the median angulation of distal radius and ulna fractures improved to 8 and 5.3 degrees, respectively. For midshaft radius fractures, the median angulation improved to 5 degrees, and for ulna fractures it improved to 2.9 degrees. Re-displacement was observed in 9.1% of cases, with one occurring at 2 weeks post-procedure and two at 4 weeks. The mean cast index increased from 0.91 to 0.92 after bivalving in these cases. The overall percent change in the cast index after 6 weeks post-procedure was 5.7%. No cases of compartment syndrome were observed.

### **Conclusion**

In this study on pediatric forearm fractures, re-displacement and re-manipulation occurred in 9.1% of cases treated with bivalved long arm circular casts. Based on our findings, bivalving can be safely done to prevent compartment syndrome without compromising fracture reduction.

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### **Soft tissue swelling of the lateral elbow joint is a risk factor for instability of lateral humeral condyle fractures**

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### **Introduction / Objection**

Lateral condylar fracture of humerus is a common elbow fracture in pediatrics. According to the Song classification, the treatment of Song type 2 fractures is controversial because the stability of the fracture is difficult to determine. Radiographs provided information not only on bones but also on soft tissues. The aim of this study is to investigate whether swelling of the soft tissues on the lateral side of the elbow could be used as a predictor of the stability of the fractures.

### **Materials & Method**

A retrospective analysis was performed on children diagnosed with Lateral condylar fracture of humerus in our hospital from January 2017 to December 2020. Fractures were classified by Song classification. Basic clinical data were collected. The value of lateral swelling of elbow joint was calculated by  $BC/AC \times 100\%$  (on the anteroposterior elbow radiograph, AC is a straight line passing through the metaphyseal of the proximal radius and perpendicular to the axis of the proximal radius, reflecting the soft tissue distance from the medial to the lateral elbow joint. Point B is located inside the metaphyseal of the proximal radius, and line BC represents the lateral soft tissue of the elbow joint).

### **Results / Discussion**

A total of 155 patients were enrolled. The mean value of lateral elbow swelling was 51.0% for Song 1 (n=32) fractures, 51.8% for Song 2 (n=56) fractures, 52.5% for Song 3 (n=20) fractures, 53.5% for Song 4 (n=24) fractures, and 54.6% for Song 5 (n=23) fractures. Of the 56 Song 2 fractures, 32 were initially treated conservatively, and 10 were displaced during follow-up. Binary logistic regression analysis showed that lateral elbow swelling had significant difference ( $p=0.033$ ), and ROC analysis showed a cut-off value of 53.1%.

### **Conclusion**

The soft tissue swelling of the lateral elbow joint is an indicator of the stability of the lateral condyle fracture of the humerus.

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### **A Modified Surgical Technique of Open reduction for Pediatric Gartland type III and IV of Supracondylar Humerus Fracture**

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### **Introduction / Objection**

Supracondylar humerus fractures are the most common type of elbow fracture in the pediatric population. Open reduction may be required for completely displaced fractures, especially when close reduction has failed or when the patient experiences neurovascular compromise. The purpose of this study was to introduce a surgical technique: "brachialis-periosteum flap loop suture technique" to improve reduction quality.

### **Materials & Method**

Nineteen patients with supracondylar fracture were enrolled in this retrospective study. We utilized the anterior approach for open reduction, and, in most cases, there was a flap of ruptured brachialis-periosteum which hindered the reduction process. By elevating the periosteum flap, the fracture can be easily reduced. 12 patients underwent traditional open reduction after closed reduction attempts had failed, while one patient required open reduction due to radial nerve palsy. 7 were treated with the modified technique. Operation time, complications, Bauman's angle and modified Flynn grade were compared.

### **Results / Discussion**

All 19 patients experienced a successful recovery without major complications. There was no significant difference in Bauman's angle ( $P=0.404$ ). Operation time was significant lower in flap loop suture group compared to traditional group ( $54.3 \pm 20.7$  vs  $77.9 \pm 22.0$  minutes,  $P=0.034$ ). Both groups are all satisfactory in modified Flynn grade system. It is common that the periosteum becomes trapped at the fracture site in displaced supracondylar fractures. And patients may experience limited elbow flexion after fracture healing. To address this issue, open reduction is necessary to remove any trapped tissue or deal with potential neurovascular complications. The brachialis-periosteum loop suture technique is employed during open reduction and to ensure that no tissues is entrapped.

### **Conclusion**

The brachialis-periosteum flap loop sutured technique has proven to be a safe and effective method for treating displaced supracondylar fractures. During open reduction procedures using this technique, no complications were reported and result in shorter operation time.

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### **Surgical fixation versus bipolar hemiarthroplasty for valgus-impacted femoral neck fractures: Results from an Institutional Ortho-Geriatric Hip Fracture Registry**

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#### **Introduction / Objection**

Surgical management reduces morbidity and mortality in femoral neck fractures (FNF). Bipolar hemiarthroplasty (HA) has become more popular for undisplaced femoral neck fractures with recent studies showing that HA has better outcomes compared to surgical fixation (IF) in undisplaced FNF. Most of these studies include both Garden I and II fractures. We aim to compare outcomes of HA versus IF in valgus-impacted FNF specifically.

#### **Materials & Method**

This is a retrospective single institution cohort study based on an Ortho-Geriatric hip fracture registry of hip fracture patients over 60 years old. 270 patients with valgus-impacted FNF were treated surgically - 121 underwent HA and 149 underwent IF. Baseline demographics, ambulatory status, Charlson Comorbidity Index (CCI), ASA (American Society of Anaesthesiologists) status and the Modified Barthel's Index (MBI) were collected. Post-operative complications, ambulatory status at the 6-months and 1 year mark, 1-year mortality and 1-year MBI were also collected.

#### **Results / Discussion**

Patients in the HA group were significantly older (81 years vs 77 years,  $p < 0.001$ ), had lower admission MBI score (median 90 vs 100,  $p < 0.001$ ), and worse pre-morbid ambulatory status (54.5% walking independently without aid vs 74.5%,  $p = 0.004$ ). Length of stay was significantly reduced in the IF group (median 7 days vs 9 days,  $p = 0.003$ ). MBI scores at 1-year were lower in the HA group (median: 87.5 vs 90,  $p < 0.011$ ), however there was no significant difference after correction for baseline MBI ( $p = 0.063$ ). The IF group required lower assistance in mobility at 1-year (39.7% independent without aid vs 30.5%,  $p < 0.03$ ), however the difference was not significant after accounting for baseline status ( $p = 0.159$ ).

#### **Conclusion**

Patients undergoing IF showed superior mobility and MBI scores at 1-year follow up, however this is contributed by differences in pre-morbid mobility and function. Length of stay is significantly reduced in the IF group.

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### **Measurement of shoulder kinematics using a novel markerless motion capture optical system: pilot study**

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#### **Introduction / Objection**

Accurate range of motion (ROM) measurements enable quantification of changes and improvements. While goniometers and inclinometers provide precise results when used by the same individual, patient care often involves a multidisciplinary team of professionals. This highlights the importance of instruments with improved inter-rater reliability to standardize patient assessment. The study aims to assess the reliability of shoulder active ROM measurements in healthy subjects by comparing the goniometer, inclinometer, and markerless optical motion capture system (MOCAP).

#### **Materials & Method**

The markerless MOCAP system utilizes eight cameras along with machine learning methods to predict the 3D trajectories of anatomical bone landmarks to attach virtual markers, allowing measurement of shoulder ROM. In this study, four healthy participants (mean age:  $27 \pm 3.2$  years) performed five tasks (flexion, extension, abduction, internal and external rotation) while being measured by three different instruments (goniometer, inclinometer, and markerless MOCAP system). The goniometer and inclinometer were repeated by two raters who received the same training in using these instruments. Agreement in ROM measurements was assessed using Bland-Altman plots, while intra- and inter-rater reliability were analysed using the intraclass correlation coefficient (ICC).

#### **Results / Discussion**

The findings indicate that the markerless MOCAP system, when compared to goniometer or inclinometer, was within the acceptable limits of agreement. The markerless MOCAP system also showed good-to-excellent within-session repeatability ( $ICC_{\text{markerless}}=0.76-0.99$ ). Consistent with prior research, moderate-to-excellent intra-rater reliability (Rater 1:  $ICC_{\text{goniometer}}=0.74-0.99$ ;  $ICC_{\text{inclinometer}}=0.88-0.99$ ) (Rater 2:  $ICC_{\text{goniometer}}=0.85-0.99$ ;  $ICC_{\text{inclinometer}}=0.93-0.99$ ) but highly variable inter-rater reliability ( $ICC_{\text{goniometer}}=0.36-0.96$ ;  $ICC_{\text{inclinometer}}=0.11-0.92$ ) was found for all shoulder ROM tasks using the goniometer and inclinometer.

#### **Conclusion**

These findings underscore the potential of the markerless MOCAP system as a reliable alternative for assessing shoulder active ROM. However, further research involving a larger and more diverse population would be beneficial for validating these tools and exploring the practical implications of integrating the markerless MOCAP system into routine clinical practice.

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### **UNTREATED NUTRITIONAL RICKETS PROGRESSION: a come back of old diseaseA CASE REPORT AND LITERATURE STUDY**

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#### **Introduction / Objection**

Rickets is old disease with deformities of endochondral skeleton on children. The pathology is inadequate mineralization of the bone due to defect anywhere along the pathway of vitamin D. Better understanding of etiology pathway, widespread introduction to dietary vitamin D supplementation and advocacy on sunshine exposure leads to significant prevalence decrease. Rickets is treatable with vitamin D supplementation so studies and reports mainly focus on early diagnosis and prevention. This case discussed classic case of nutritional rickets that relapse without treatment for 5 years until 9 years old.

#### **Materials & Method**

Patient was first referred when she was 4 years old with osseous signs and laboratory result shows of rickets. At the time, her height still on 15th percentile weight on 3rd percentile of WHO chart. Radiology showed splaying, frying, cupping and coarse trabecular pattern and widening of growth plate; TFA on 200 and 220. Oral supplementation vitamin D 2000iu for 3 months the vitamin D level increased to 29.7 and progression on valgum angle. Patient was supposed to continue treatment with observation and KFO braces. Parents compliances and world wide covid situation made patient lost to follow up for a year and than 3 more years. At that time height and weight are very much below the curved, progression on genu valgum angle are proved with TFA, LDFA and MPTA with addition of knee stiffness.

#### **Results / Discussion**

Rickets are responsive to vitamin D supplementation and in early age deformities are able to catch up with growing. On older children with rickets, growth modulation correction should be weighted carefully. Hemiepiphysiodesis which rely on rate of angular correction are also influenced by endochondral disturbance.

#### **Conclusion**

Rickets is responsive to vitamin D supplementation. In early age deformities still able to catchup with growth.natural progression of it cause failure to thrive and destruction of growth plate.

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### **The impact of early post-operative Fixed Flexion Deformity (FFD) after Total Knee Arthroplasty on clinical and functional outcomes**

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#### **Introduction / Objection**

The presence of Fixed Flexion Deformity (FFD) after Total Knee Replacement (TKR) is often seen as an undesirable outcome. Pre-operative FFD has been associated with poorer outcomes in some studies. However, there is limited evidence specifically looking at how post-operative FFD influences outcomes. This study aimed to evaluate whether early post-TKR FFD affected subsequent clinical and functional outcomes.

#### **Materials & Method**

This was a retrospective cohort study reviewing 540 patients who underwent primary, unilateral TKR between 2017 to 2020. The outcomes reviewed include Oxford Knee Score (OKS) and Knee Society Score (KSS). The patients were categorised into those who experienced early post-operative FFD (i.e. 3 months post-op) and those who did not. Outcomes were compared at 3, 12 and 24 months post-operatively.

#### **Results / Discussion**

540 patients who underwent TKR were reviewed, of which 195 patients had early FFD while 345 did not. Patients who had early FFD following TKR had poorer KSS compared to those without, at 3 months ( $79.86 \pm 10.48$  vs  $88.15 \pm 9.18$ ,  $p < 0.001$ ), 12 months ( $85.06 \pm 11.66$  vs  $90.02 \pm 8.30$ ,  $p < 0.001$ ) and 24 months ( $88.48 \pm 9.75$  vs  $90.61 \pm 8.74$ ,  $p=0.012$ ). However, the early FFD group had significantly greater improvement in KSS scores over time (i.e. change in KSS score from 3 months to 24 months,  $8.62 \pm 12.26$  vs  $2.46 \pm 11.03$ ,  $p < 0.01$ ). There was no significant difference in OKS between the 2 groups throughout all time periods. The severity of FFD was also evaluated, and patients with early FFD  $\geq 10$  degrees had poorer KSS compared to those with FFD  $< 10$  at 3 months only ( $76.42 \pm 10.26$  vs  $82.36 \pm 9.96$ ,  $p < 0.001$ ).

#### **Conclusion**

Early FFD post-TKR lead to poorer outcomes in terms of KSS scores, though this difference decreased over time. It did not affect OKS scores. The severity of FFD only affected functional outcomes in the early post-operative stages (i.e. 3 months).

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### **Role of pelvic osteotomy in hip displacement in cerebral palsy**

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#### **Introduction / Objection**

Cerebral palsy (CP) is a permanent disorder characterized by progressive musculoskeletal deformities caused by nonprogressive injury in an immature brain. Hip dislocations and acetabular dysplasia are common, especially in more severe cases of CP. Many investigations have been conducted regarding the natural history of CP hip displacement before skeletal maturity. Previous studies have affirmed the importance of hip surveillance in skeletally immature CP patients. The surveillance assumes that the hip condition remains steady after skeletal maturity. However, little is known about the natural course of CP hip far after skeletal maturity. Therefore, we conducted a study on the observation of CP hip after skeletal maturity.

#### **Materials & Method**

We retrospectively examined anteroposterior hip radiographs of all CP patients who visited our hospital from June 2003 to January 2023. Migration percentage (MP), femoral neck shaft angle (NSA), and hip sphericity marked as Mose hip ratio (MHR), were measured on all radiographs along with operation history. Changes in the three indicators were examined using a linear mixed model. Inter and intra-rater ICCs were measured for reliabilities.

#### **Results / Discussion**

The migration percentage (MP) in patients who underwent hip reconstructive surgery including Dega pelvic osteotomy progressed by 0.8% per year ( $p=0.0013$ ), whereas the progression rate of MP in patients who received hip reconstructive surgery without pelvic osteotomy was 1% per year ( $p=0.0011$ ).

#### **Conclusion**



When observed until after skeletal maturity, although initial MP was greater, the rate of MP progression on the side of the hip with pelvic osteotomy was less than the rate of MP progression on the hip without pelvic osteotomy. Therefore, when preparing for surgical treatment of CP hip dislocation, a surgeon must not hesitate to include pelvic osteotomy in hip reconstructive surgery to prevent re-dislocation.

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### **Changes in femoral anteversion after intramedullary nail for pediatric femoral shaft fracture: a multicenter study**

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#### **Introduction / Objection**

Femoral shaft fracture is a common injury that accounts for approximately 1.6% of all bony injuries in children. Rotational change after a flexible IM nail for femoral shaft fracture has been a question for many surgeons. Recently, a statistical shape model (SSM) has been developed for the three-dimensional reconstruction of the femur from two-dimensional plain radiographs. In this study, we measured postoperative femoral anteversion (FAV) in patients diagnosed with femoral shaft fractures who were treated with flexible IM nails and investigated the changes in FAV with age using SSM.

#### **Materials & Method**

This study used radiographic data collected from six regional tertiary centers that specialize in pediatric trauma in South Korea. Patients who were diagnosed with femoral shaft fractures between September 2002 and June 2020 and pediatric patients aged <18 years with at least two anteroposterior (AP) and lateral (LAT) femur plain radiographs obtained at least three months duration apart were included. A linear mixed model (LMM) was adopted for statistical analysis.

#### **Results / Discussion**

Overall, 73 patients were included in the study. The average age of patients was 7.6 years, ranging from 2.2 to 13.2 years. The average duration of follow-up was 6.8 years, ranging from 3 to 61 months. The average FAV of immediate postoperative images was  $27.5 \pm 11.5^\circ$ , which changed to  $27.1 \pm 12.3^\circ$  at the last follow-up. With a 1-year increase in age at the time of trauma, FAV decreased by  $0.9^\circ$  ( $p < 0.0001$ ) with a one-year increase in age at the time of trauma. With every 1-year period after the initial surgery, the FAV decreased by  $1.4^\circ$  ( $p = 0.046$ ).

#### **Conclusion**

This study explored changes in FAV after femoral shaft fracture using a newly developed technology that allows 3D reconstruction using uncalibrated 2D images. The expected FAV at skeletal maturity can be deduced based on the results of this study.

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### **Reconstruction using Non Vascularized Fibular Graft in Neglected Pediatric Femoral Neck Fracture**

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#### **Introduction / Objection**

Neglected femoral neck fracture in children and young adult still poses a formidable challenge. Pediatric femur neck fracture is exceedingly rare and accounts for fewer than 1% of all pediatric fractures. Pediatric femur neck fracture attributed this low incidence to the thick and strong periosteum cover and to the tough strong bone of children. The using of fibular graft for the femoral neck fracture introduced first by Nagi et.al in 1981. The fibula is easy to harvest and, provided that sufficient care is taken, leads to minimal morbidity of the donor site. The aim of this study was to assess outcome of nonvascularized fibular strut graft in neglected femoral neck fractures in the young patient.

#### **Materials & Method**

Medical records of 12 patients of neglected femoral neck fracture, in the age group of 8-17 years (mean 13.6 years), were retrospectively reviewed. Delay between injury and surgery varied from two weeks to 1 year (mean 19.1 weeks). Surgery done in 2 stages. The first stage was patients applied skeletal traction in distal femur without soft tissue release. The second stage was open reduction and reconstruction using non vascularized fibular graft along with cancellous screw. Post-operative follow-up was performed at 6 - 18 month thereafter.

#### **Results / Discussion**

Satisfactory bony union was obtained in 11 patients, of whom in one case, the union occurred in  $5^\circ$  of varus. Nonunion occurred in one patients (8.33%), and avascular necrosis occurred in another 2 patients (16.7%). Of the 11 patients where union was achieved, all patients showed clinical and radiologic excellent results.

#### **Conclusion**

Nonvascularized fibular strut graft provides a dependable alternative procedure for neglected femoral neck fractures in young adults. The fibular graft promotes union, provides structural support, and unintentionally aids in revascularization of the femoral head.

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### **Spontaneous comminuted fracture of proximal humerus after push up exercise**

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#### **Introduction / Objection**

Pushup is a popular closed kinetic chain exercise targeting the upper body. Wrong technique, however, will cause injury. We report a rare case of spontaneous comminuted fracture of humerus diaphysis in an adolescent following push up exercise.

#### **Materials & Method**

An otherwise healthy 15 year old boy presented to our centre with pain and deformity over left shoulder after completing a 30 repetitions of diamond pushup exercise. He reported similar pain after pushup one week prior but since there was no deformity or swelling, he did not seek medical treatment. There was no preceding trauma and no history of steroid use. Clinically, there was tender swelling and valgus deformity of left arm. Neurovascular examination was normal. X ray showed displaced fracture of proximal third left humerus, with a lateral butterfly fragment. He then underwent open reduction and plating of proximal left humerus. Intraoperative finding noted normal bone morphology. He was discharged well at 3 day post op with no complications and will be followed up in our outpatient clinic

#### **Results / Discussion**

It is possible that a stress fracture had occurred, since the patient complained of similar pain in the same arm one week before presentation. Spontaneous fracture of humerus following upper extremity overuse, although rare, have been described in multiple case reports across the world. In most cases, the fracture is minimally displaced. Stress fracture is the most common cause. Plain radiographs may reveal no abnormalities of the bone prior to the fracture and therefore MRI is the most sensitive modality to detect stress fracture. Other causes of spontaneous fracture such as metabolic disorder, metastasis and abnormal bone morphology must be excluded.

#### **Conclusion**

Spontaneous fracture in an otherwise healthy patient requires a detailed history and examination and investigation. It is imperative to exclude pathological causes. Radiographically, MRI is the most sensitive to detect subtle anatomical abnormality.

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#### **Accuracy of biplanar linear radiography versus conventional radiographs when used for lower limb and implant measurements**

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#### **Introduction / Object**

The current standard of care for measuring lower extremity length and angular discrepancies is using a full-length standing anteroposterior radiograph. However, there has been increasing interest to use biplanar linear EOS imaging as an alternative. This study aims to compare lower extremity length and implant measurements between biplanar linear and conventional radiographs.

#### **Materials & Method**

In this 5-year retrospective study, all patients who had a standing full-length anteroposterior and biplanar linear radiographs (EOS®) that include the lower extremities done within one year of each other were included. Patients who underwent surgery in between the imaging, underwent surgeries that could result in graduated length or angulated corrections and inadequate exposure of the lower extremity were excluded. Four radiographic segments were measured to assess lower limb alignment and length measurements. Height and width measurements of implants were performed for patients who had implants in both imaging.

#### **Results / Discussion**

When comparing imaging and actual implant dimensions, biplanar linear radiographs were accurate in measuring actual implant height (MD= - 0.14 cm, p=0.66), and width (MD= - 0.13 cm, p=0.71). However, conventional radiographs were inaccurate in measuring actual implant height (median difference = 0.19 cm, p = 0.01) and width (MD= 0.61 cm, p < 0.01). When comparing conventional and biplanar linear radiographs, there was statistically significant difference in all measurements. This includes anatomical femoral length (median difference = 3.53 cm, p < 0.01), mechanical femoral length (MD= 3.89 cm, p < 0.01), anatomical tibial length (MD= 2.34 cm, p < 0.01) and mechanical tibial length (median difference = 2.20 cm, p < 0.01).

#### **Conclusion**

First, there is a significant difference in the lower extremity length when comparing conventional and biplanar linear radiographs. Second, biplanar linear radiographs are found to be accurate while conventional radiographs are not as accurate in implant measurements of length and width in the lower extremity.

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#### **The incidence and risk factors of osteoarthritis following osteochondritis dissecans of the knees: a systematic review and meta-analysis**

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**Institution:** Department of Orthopaedic Surgery, National University Health System, Singapore

#### **Introduction / Object**

The current systematic review and meta-analysis aim to pool together the incidence and risk factors of osteoarthritis following osteochondritis dissecans of the knee.

#### **Materials & Method**

The systematic review was conducted according to PRISMA guidelines. A search was conducted using PubMed and Cochrane Library with the keywords being "knee" and "osteochondritis dissecans" or "osteochondral lesion". All original human studies that reported the incidence or risk factors of osteoarthritis following osteochondritis dissecans of the knee were included.

#### **Results / Discussion**

Nine studies with 496 patients were included. The incidence of osteoarthritis following osteochondritis dissecans is 0.39 (95% CI 0.19–0.59). Patients with a body mass index greater than 25 kg/m<sup>2</sup> had a significantly increased risk of osteoarthritis. Fragment excision had an increased relative risk of 1.89 (95% CI 1.19–3.01) of osteoarthritis as compared to fragment preservation. Significant heterogeneity was identified when comparing between juvenile and adult osteochondritis dissecans. The size of the lesions moderated the between-study heterogeneity with regards to the incidence of osteoarthritis, with the relative risk of osteoarthritis in lesions bigger than 4 cm<sup>2</sup> being 2.29 (95% CI 1.24–4.23). No other risk factors, including gender of the patient, location of osteochondritis dissecans, stability of osteochondritis dissecans, and surgical versus non-surgical management were significant risk factors.

#### **Conclusion**

Significant risk factors for osteoarthritis were increased body mass index and fragment excision. Probable but inconclusive risk factors were the age of the patients and the size of the osteochondritis dissecans. The gender of the patient, location of osteochondritis dissecans, the stability of osteochondritis dissecans, and surgical versus non-surgical management of osteochondritis dissecans when appropriate were not significant risk factors.

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### **Rates of Conversion to Total Knee Arthroplasty Post Tibial Tubercle Osteotomy: A Meta Analysis**

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#### **Introduction / Objection**

Tibial Tubercle Osteotomy (TTO) is an important surgical option for Patellofemoral Joint Osteoarthritis (PFJ OA). However, literature on survivorship outcomes in relation to conversion to Total Knee Arthroplasty (TKA), and associated complications is lacking. Impact of additional cartilage repair procedures also remains unclear.

#### **Materials & Method**

A single-arm meta-analysis of studies reporting on Conversions to TKA and Complications of patients undergoing Primary TTO or TTO with Autologous Chondrocyte Implantation (ACI) for PFJ OA, was performed (CRD42023450165). We searched MEDLINE, Embase, Cochrane Library and SCOPUS from inception to 18 July 2023. Pooled proportions were obtained with random-effects modeling, 95% confidence intervals estimated using the Clopper-Pearson method, and Dersimonian-and-Laird estimator for between-study variance. Further subgrouping was done on studies with concomitant ACI to assess impact on desired outcomes. We assessed risk-of-bias using ROBINS-I Tool, and evaluated publication bias through visual inspection of funnel plots and Egger's Test.

#### **Results / Discussion**

13 studies comprising 623 patients were included. Pooled Conversions to TKA was 4.23% (95%CI: 2.07-8.46%), and all-cause failures was 21.78% (95%CI: 12.09-36.06%). For surgical complications, pooled proportions for wound-related complications were 2.18% (95%CI: 0.86% - 5.41%), 2.99% (95%CI: 13.78%-32.87%) for soft-tissue complications and 21.86% (95%CI: 13.78%-32.87%) for bone & joint complications. Medical complication rates were 6.70% (95%CI: 2.52%-16.64%). Pooled perioperative fracture rate was 4.84% (95%CI: 2.41%-9.49%). Finally, pooled superficial infection rates were 2.49% (95%CI: 0.74%-8.06%), while deep infections were at 3.03% (95%CI: 0.08%-15.76%). Concomitant ACI was not associated with fewer conversions to TKA and complications.

#### **Conclusion**

TTO carries low rates of conversions to TKA (4.23%) and complications. TTO remains a viable surgical option for managing PFJ OA, regardless of concomitant ACI.

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### **Latissimus Dorsi and Teres Major Transfer in Reverse Shoulder Arthroplasty: A Systematic Review**

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**Name of Presenting Author:** Isaac Chung De Wei

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#### **Introduction / Objection**

This paper aims to conduct a systematic review of the current literature to evaluate the clinical outcomes of concurrent latissimus dorsi and teres major (LD/TM) tendon transfer in Reverse Shoulder Arthroplasty (RSA), and compare that to isolated RSA.

#### **Materials & Method**

A comprehensive search on PubMed, Web of Science (WoS), Embase and CINAHL was performed from inception up to 20 January 2023 in accordance with the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA). Follow-up studies (inception cohort studies/non-randomized controlled trials/retrospective cohort studies) and case series that were written in English, which involved patients who underwent reverse shoulder arthroplasty with LD/TM transfer were included. Quality of studies were appraised using the Cochrane Risk Of Bias In Non-randomized Studies of Interventions (ROBINS-I) tool. Systematic review of Constant-Murley score (CMS) and range of movement (ROM) was conducted.

#### **Results / Discussion**

Eight articles with a total of 265 patients were included. The average mean follow-up time was 42.5 months, with a range of 6 months to 136 months. Five studies used the CMS to report clinical outcomes, while five and six studies reported the external rotation and forward flexion respectively. Comparing post-operative to pre-operative scores, there was an improvement above the minimal clinically important difference (MCID) for CMS (Mean Difference (MD) range = 22.40 to 41.80), external rotation (Mean Difference (MD) range = 29° to 36°) and forward flexion (Mean Difference (MD) range = 50° to 75°). There was also no significant difference in ER between RSA with and without LD/TM ( $P = 0.88 > 0.05$ ).

#### **Conclusion**

RSA with LD/TM transfer has good clinical outcomes post operatively, but current evidence also show that an isolated RSA procedure is non-inferior.

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### **Navigated Robot-assisted Minimally Invasive Transforaminal Interbody Fusion (MIS-TLIF): A Pilot Feasibility Study**

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**Name of Presenting Author:** Joseph Wan

**Institution:** Changi General Hospital

#### **Introduction / Objection**

Minimal invasive Transforaminal Interbody Fusion (MIS-TLIF) is an increasingly common procedure used in treating degenerative lumbar spine conditions. Advancement of robotic-assisted technology has reportedly improved accuracy of instrumentation with smaller incisions, resulting in better surgical outcomes and shorter hospital stay.

This pilot study aims to describe a surgical workflow using the Mazor™ X Stealth Edition robotic technology in our institution; and compare patient outcomes with conventional computer-navigated MIS-TLIF.

#### **Materials & Method**

Single-centre, single surgeon prospectively collected case series of 30 patients who underwent robot-navigated MIS-TLIF (RA-TLIF) with Mazor™ X Stealth system (Medtronic). Comparative study was performed against conventional computer-navigated MIS-TLIF (CN-TLIF) on patient demographics (age, gender, BMI, Charlson Co-morbidity Index (CCI), and post-operative parameters.

#### **Results / Discussion**

Of the 30 RA-TLIF cases planned, 2 cases were abandoned due to platform start-up issues and 1 was excluded due multiple concurrent injuries. 1 patient underwent revision surgery for posterior-migrated interbody cage. No loosening of posterior instrumentation was seen in all cases at 3 months follow-up. No significant difference is found in operating time, but had shorted inpatient stay.

#### **Conclusion**

The Mazor™ X Stealth robot-navigated MIS-TLIF has improved screw accuracy with shorter hospital stay. However, it is not without its pitfalls and further costs analysis needs to be performed with longer-term follow-up data.

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#### **Novel technique for correction of coxa vara in a patient with panfemoral deformity secondary to osteogenesis imperfecta**

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**Name of Presenting Author:** Kiko Cortez

**Institution:** Philippine General Hospital

#### **Introduction / Objection**

Osteogenesis imperfecta (OI) is a rare genetic disorder causing mutation in qualitative or quantitative defect in type I collagen production resulting to bone fragility and a characteristic symptomatology. Surgical treatment mainly consists of realignment osteotomies and intramedullary rodding followed by bisphosphonate therapy to correct the deformity and decrease refracture rates, respectively. Presence of coxa vara in a patient with panfemoral bowing secondary to OI complicates treatment due to the peculiarity of the deformity and lack of available constructs.

#### **Materials & Method**

We present a case of a 13-year old patient diagnosed with OI with a coxa vara deformity and panfemoral bowing treated with realignment osteotomies and a tension band wiring incorporated into the intramedullary rod to correct both deformities.

#### **Results / Discussion**

At six months, patient is able to stand independently and ambulate using a walker. Patient has a residual limb length discrepancy of 2.5cm which was managed with a shoe lift. Repeat radiographs at latest follow-up showed a neck-shaft angle of 110° with healed osteotomy sites. At 1-year follow-up, patient was able to ambulate independently and participate in school activities. The alignment of the proximal femur and femoral shaft was maintained. No implant deformity or cutout and fractures were noted.

#### **Conclusion**

Coxa vara and femoral shaft deformities secondary to osteogenesis imperfecta can be corrected using a tension band wiring incorporated in the modified Sofield-Millar procedure to augment the fixation of the subtrochanteric osteotomy. It is a novel, cheap, and effective way of addressing the aforementioned deformities.

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#### **Validation of Brief Fear of Movement (BFOM) scale Among Patients with Knee Osteoarthritis in Singapore**

Sherlyn Yen Yu Tham<sup>1</sup>, Chien Joo Lim<sup>2</sup>, Yee Cheng Kueh<sup>3</sup>, Bryan Yijia Tan<sup>2</sup>

<sup>1</sup>Ministry of Health Holdings, Singapore, Singapore. <sup>2</sup>Woodlands Health, Singapore, Singapore. <sup>3</sup>Universiti Sains Malaysia, Kubang Kerian, Kelantan, Malaysia

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**Institution:** Woodlands Health, National Healthcare Group

#### **Introduction / Objection**

Brief Fear of Movement (BFOM) scale is used to evaluate kinesophobia in individuals with osteoarthritis (OA). This study aims to validate the BFOM scale among patients with knee osteoarthritis in Singapore.

#### **Materials & Method**

This study is part of a prospective cohort study on knee osteoarthritis in Singapore. Inclusion criteria were: i) meets NICE criteria for knee OA, and ii) independent community mobilisers. Subjects were excluded if they had: i) alternative diagnosis to knee OA, ii) secondary arthritis, iii) severe medical and/or cognitive comorbidity or iv) previous knee arthroplasty. Exploratory Factor Analysis (EFA) was performed on baseline data to determine the underlying relationships between the measured variables. Factor structure was confirmed by Confirmatory Factor Analysis (CFA) using the 3 months data. Multi-group analysis was used to test invariance of the BFOM scale among gender.

#### **Results / Discussion**

284 participants were included in the EFA analysis. One factor was extracted with minimum communalities and factor loading of 0.371 and 0.609 respectively, accounting for 53.41% of variance. 199 participants were included in the CFA and multi-group analysis. The model fit of the final CFA model were: CF FIT= 0.410; RMSEA (95% CI) = 0.012 (0.000-0.085); SRMR= 0.028; CFI= 0.999; and TLI= 0.998 with composite reliability of 0.851, demonstrating good validity and reliability. Multi-group analysis showed that BFOM scale is invariant among gender.

#### **Conclusion**

BFOM is valid and reliable among patients with knee OA in Singapore's population, and is invariant among gender. Hence, BFOM can be a useful tool used in clinical practice and research work.

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## **Hindfoot Nail for Ankle Fractures in the Frail and Fragile – A Local Case Series**

Sherlyn Yen Yu Tham<sup>1</sup>, Claris Jia-Yi Shi<sup>2</sup>, Jeffrey Gek Meng Tan<sup>2</sup>

<sup>1</sup>Ministry of Health Holdings, Singapore, Singapore. <sup>2</sup>Khoo Teck Puat Hospital, Singapore, Singapore

**Name of Presenting Author:** Sherlyn Tham Yen Yu

**Institution:** Khoo Teck Puat Hospital, Singapore

### **Introduction / Objection**

Managing ankle fractures in elderly individuals presents significant challenges, primarily attributed to their suboptimal soft tissue condition, underlying vasculopathy, and osteoporotic bone. Open reduction and internal fixation of ankle fracture and conservative management with cast immobilisation in this population often raise concerns of soft tissue complications, prolonged periods of non-weight bearing and delayed or malunion. The aim of this case series was to review our institution's experience in hindfoot nail in this population.

### **Materials & Method**

Patients with unstable ankle fracture with multiple comorbidities and/or suboptimal skin condition were selected for tibiotalar hindfoot nail fixation.

### **Results / Discussion**

In this series, we report four cases of unstable ankle fracture treated with tibiotalar hindfoot fixation. Two cases were Lauge-Hansen supination-adduction type, one case of supination-external rotation, and one case of pronation-external rotation type ankle fracture. The patients' ages ranged from 59 to 90. All patients had an American Society of Anesthesiologists score of 3 or higher. Three patients were ambulant before their injuries, while one patient was predominantly bedbound and required assistance for transfers. Postoperatively, two patients were allowed to bear weight as tolerated, while the other two cases were kept non-weight bearing for 25 and 50 days, respectively. One case experienced sub-centimeter area of wound dehiscence after the stitches were removed, which eventually healed two weeks later. The wounds of the other three patients healed without complications, and there were no cases of wound infection. The average length of stay post-operation was 8.5 days, ranging from 7 to 11 days.

### **Conclusion**

Hindfoot nailing is a good alternative management for high risk patients with ankle fracture as it allows immediate weight-bearing post operatively, and has lower incidence of wound complications.

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## **Comparative outcomes of different types of interlaminar devices as an adjunct to decompression for symptomatic lumbar spinal stenosis - 5year Study**

Andrew Thomas<sup>1</sup>, Naresh Kumar<sup>1</sup>, Kasia Chua<sup>1</sup>, Meetra Seyher<sup>1</sup>, Sean Lee Jun Kit<sup>1</sup>, Shen Liang<sup>2</sup>

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**Name of Presenting Author:** Andrew Thomas

**Institution:** National University Hospital

### **Introduction / Objection**

To assess and compare 5-year outcomes following instrumented spinal decompression with different types of interlaminar devices (ILD). We compared Coflex implants against Stenofix implants. Two popular implant choices with different working processes. We aim to determine whether improvement in clinical outcomes can be objectively correlated with changes in the radiological indices studied. To date, there is no comparative literature between different types of interlaminar devices.

### **Materials & Method**

We conducted a retrospective review of prospectively collected data from a single surgeon across 70-patients (Stenofix n=21, Coflex n=49) who underwent spinal decompression with an ILD insertion between 2007 till 2015. Patients with symptomatic LSS who met the study criteria were offered spinal decompression with ILD insertion. Clinical outcomes were assessed preoperatively and up to 5-years postoperatively using the ODI, Eq. 5d, VAS back and leg pain, and SF-36. Radiological indices (Anterior & Posterior disc height, Foraminal height, Pelvic incidence, Pelvic tilt Sacral slope, Lumbar lordosis, Sagittal angle) were assessed preoperatively and up to 5-years postoperatively.

### **Results / Discussion**

Both groups showed statistically significant ( $p < 0.001$ ) improvement in all clinical outcome indicators at all timepoints as compared to their preoperative status. The Coflex group showed a greater increase in foraminal and posterior disc height; that was maintained upto 5years post operatively. Additionally the Coflex-group patients reported greater improvements in SF-36 (MCS) and VAS. Three Patients in the Stenofix-group required revision surgery. No patients in the Coflex group required revision surgery.

### **Conclusion**

Our study found that in the management of symptomatic lumbar spinal stenosis; clinical outcomes, satisfaction scores and radiological parameters improved for both groups of ILD-instrumented spinal decompression. Coflex showed superior scores in their radiological parameters namely foraminal height and posterior disc height at the 5-year mark. The use of ILDs does not predispose to increased reoperation rates.

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## **Medial unicompartment partial knee arthroplasty confers non-inferior outcomes in an Asian population compared to total knee arthroplasty.**

Xinyi Lim, Melvin Tan Kian Loong, Wei Liang Chua

National University Hospital Singapore, Singapore, Singapore

**Name of Presenting Author:** Lim Xinyi

**Institution:** National University Hospital of Singapore

### **Introduction / Objection**

Total knee arthroplasty is a successful surgical treatment for osteoarthritis of the knee. For patients with isolated medial unicompartmental osteoarthritis of the knee, medial unicompartment partial knee arthroplasty is an alternative option in selected patients. In this study, we aim to compare the outcomes of these two arthroplasty options in an Asian population.

### **Materials & Method**

This is a retrospective review of 357 patients that underwent either medial unicompartment knee arthroplasty (UKA; n=81) or total knee replacement (TKR; n=276) at National University Hospital Singapore. Patients who underwent UKA had predominantly medial unicompartmental osteoarthritis of the knee. Patient demographics, peri-operative data (surgical time, tourniquet time, intraoperative blood loss, post-operative complications and length of stay) were evaluated. Patient reported outcome measures including Knee society score (KSS), Western Ontario and McMaster Universities Arthritis Index (WOMAC), Short Form-36 Healthy Survey version 2 (SF36v2) were collected preoperatively and at 6, 12 and 24 months after surgery. Differences in outcome were evaluated with student T test at a statistically significant value of  $p < 0.05$ .

### **Results / Discussion**

The UKA and TKR population demographics were relatively similar. Patients who underwent UKA had shorter surgical, tourniquet and hospitalisation times and lower blood loss. Postoperative complication rates (4.9% vs 14.49%) were lower for UKA group but with 2 patients undergoing revision TKR compared to 0 in the TKR group. KSS function and degree of flexion in UKA was significantly better at all timepoints. UKA score was significantly better for WOMAC and SF36v2 physical component score at the 6 month mark. KSS knee scores, WOMAC and SF36v2 were otherwise similar between UKA and TKR populations.

### **Conclusion**

UKA demonstrated non-inferior outcomes to TKR. Superior outcomes in knee range of motion and KSS function score were noted in the UKA group. UKA can be a viable surgical option that is bone-conserving for patients with isolated medial unicompartmental knee osteoarthritis.

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Xinyi Lim, Melvin Tan Kian Loong, Wei Liang Chua  
National University Hospital Singapore, Singapore, Singapore

**Name of Presenting Author:** Lim Xinyi

**Institution:** National University Hospital of Singapore

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### **Conclusion**

UKA demonstrated non-inferior outcomes to TKR. Superior outcomes in knee range of motion and KSS function score were noted in the UKA group. UKA can be a viable surgical option that is bone-conserving for patients with isolated medial unicompartmental knee osteoarthritis.

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### **Successful treatment of critical bone defects in lower limb open fractures with 3D-printed bone scaffolds (Osteopore®) - 2 Year Case Series**

Yi Rong Lum<sup>1</sup>, Ping Yen Yeo<sup>1</sup>, Claris Jia-Yi Shi<sup>1</sup>, Antony Xavier Rex Premchand<sup>1</sup>, Daniel Wei Ren Seng<sup>2</sup>, Derek Howard Park<sup>1</sup>

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### **Introduction / Object**

Critical bone defects are defined as those that are unlikely to heal spontaneously within the patient's lifetime. One way to address a critical bone defect is the use of a two stage Masquelet technique. The choice of bone graft in the second stage of Masquelet technique is highly varied. Novel synthetic bone scaffolds offer an alternative to bone graft. Their advantages lie in their ease of availability and customisation through 3-dimensional (3D) printing without donor site morbidity.

This is a 2 year follow up presentation to critical bone defects successfully treated with 3D-printed polycaprolactone-tricalcium (PCL-TCL) phosphate scaffolds.

### **Materials & Method**

This case series describes the novel use of custom 3D-printed polycaprolactone-tricalcium (PCL-TCL) phosphate scaffolds (Osteopore®) in conjunction with the Masquelet 'induced membrane' technique in the management of critical-sized bone defects, for a patient with an open intra-articular calcaneal fracture with a 4 cm bone defect, as well as a patient with an open intra-articular distal femoral shaft fracture with a 6 cm bone defect.

### **Results / Discussion**

The critical bone defects were adequately addressed resulting in good restoration of bony anatomy as well as joint congruency. At 12- and 6-months post-operation respectively, the patients remain pain and infection-free. Repeat radiographs show maintenance of fracture reduction and early signs of graft incorporation.

### **Conclusion**

This case series demonstrates the safe and efficacious use of custom PCL-TCP scaffolds (Osteopore®) in conjunction with the Masquelet 'induced membrane' technique in the management of critical-sized bone defects in patients who suffered high energy lower limb trauma.

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### **Conversion to Total Knee Arthroplasty Post High Tibial Osteotomy: A Meta Analysis**

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#### **Introduction / Objection**

High Tibial Osteotomy (HTO) is an important surgical option for relatively younger patients with isolated medial osteoarthritis (OA). However, literature on survivorship outcomes in relation to conversion to Total Knee Arthroplasty (TKA), and associated complications remain scarce and outdated. The impact of concomitant cartilage repair procedures also remains uncertain.

#### **Materials & Method**

A single arm meta-analysis of studies reporting on survivorship outcomes of HTO - including rates of Conversions to TKA, the mean time before TKA - and associated complications of patients undergoing medial opening wedge HTO (MOWHTO) was performed. We searched MEDLINE, Embase, Cochrane Library and SCOPUS from inception to 18th July 2023. Pooled proportions were obtained with random-effects modeling, 95% confidence intervals estimated using the Clopper-Pearson method and Dersimonian and Laird estimator for between-study variance. Further subgrouping was done on studies reporting on HTO with concomitant cartilage repair procedures to assess on desired outcomes. We assessed risk of bias using ROBINS-I Tool and evaluated publication bias through visual inspection of funnel plots and Egger's Test.

#### **Results / Discussion**

66 studies comprising 5685 patients were included. Pooled conversion to TKA was 7.33% (95% CI: 5.41 - 9.88%). Importantly, of the studies that reported conversions to TKA, the pooled mean time to TKA after HTO was 8.00 years (95% CI: 5.75 - 10.26). Overall pooled complication rates were at 11.88% (95% CI: 9.41 - 14.90%). Specifically, pooled proportions for perioperative fractures was 4.55% (95% CI: 2.87 - 7.14%). Finally, pooled superficial infection rates were 2.78% (95% CI: 2.11 - 3.65%) and 1.85% (95% CI: 1.43 - 2.40%) for pooled deep infections. Concomitant cartilage repair procedures were not associated with fewer conversions to TKA and lower complication rates.

#### **Conclusion**

HTO carries low rates of conversions to TKA (7.33%) and complications. HTO remains a viable surgical option for management of isolated medial osteoarthritis in relatively younger patients.

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### **Short term outcome of treatment with percutaneous cross Kirschner wires in paediatric distal humeral metaphyseal diaphyseal junction fractures**

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#### **Introduction / Objection**

Fractures at the distal metaphyseal diaphyseal junction (MDJ) of humerus in children are less frequently found in literature and controversy exists regarding treatment. Main objectives of the study were to review our experience with these injuries, their treatment with cross Kirschner wires and functional outcome.

#### **Materials & Method**

Retrospective review of medical record revealed 16 children of either gender or side presenting in the Department of Orthopedics, Unit-I at Mayo Hospital, Lahore with closed distal MDJ fractures from Aug 2019 to July 2020. These patients were surgically treated with closed reduction and fixation with cross Kirschner wires under fluoroscopy. Time taken for radiological union, complications and functional outcome of the treatment was evaluated.

#### **Results / Discussion**

The mean age at the time of injury was  $9.00 \pm 1.93$  years and mean duration was  $2.81 \pm 2.29$  days. There were 11 (68.8%) males and 5 (31.3%) females having right-sided predominance (75%). Most common mechanism involved was fall (87.5%). Fracture pattern was 43.8% transverse and 56.3% oblique. Mean Operative time was  $55.94 \pm 5.23$  minutes. Radiological union was observed in mean duration of  $6.74 \pm 0.70$  weeks. There were no post-operative complications in 56% children. However 25% had pin loosening as a result of pin tract infection, heterotrophic ossification was seen in 12.5% and ulnar nerve palsy in one child. Functional Outcome was evaluated using criteria with excellent results in 37.5% children, good in 25%, and fair result in 25% children and 12.5% had poor functional outcome.

#### **Conclusion**

Paediatric distal humeral metaphyseal diaphyseal junction fractures are different from traditional supracondylar fractures that can be successfully treated with close reduction and cross Kirschner wires fixation with excellent to good outcome according to Flynn's Criteria.

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### **Radiation exposure in Enders versus elastic stable intramedullary nails – a randomized control study**

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#### **Introduction / Objection**

Surgical stabilization with flexible intramedullary nail is the preferred treatment for pediatric femoral shaft fractures in the age group 5-15 years. Though there are few studies comparing the functional outcomes of Enders versus elastic stable intramedullary nails (ESIN), there are no randomized studies comparing the intra-operative

parameters and functional outcomes. This study was conducted to compare the intra-operative radiation exposure and operative time between Ender's and ESIN and to compare the clinical outcomes at 6 months follow-up.

#### **Materials & Method**

All closed pediatric femoral shaft fractures in 5-15 years age, amenable for flexible nailing were randomized into two groups. Radiation exposure to the surgeon, first assistant and patient was recorded using a personal electronic dosimeter (SmartRad) and total fluoroscopy time was obtained from the image intensifier. All patients were periodically followed-up and functional outcome analysis was done at 6 months.

#### **Results / Discussion**

We had 50 patients with 25 in each group. There were 36 boys and 14 girls with mean age of 8.74 years. One patient in ESIN group was lost for follow-up. Mean radiation exposure for surgeon and first assistant was 9.68, 19.86 in Ender's group and 14.73, 37.4 in ESIN group respectively ( $p > 0.05$ ). The total fluoroscopy time was significantly less in Ender's group (0.8) compared to ESIN group (1.05) ( $p = 0.042$ ). Implant back-out needing removal of implants was seen in 5 patients with Ender's and 2 with ESIN. Rotational discrepancy of 10-20° was seen in 7 in the Ender's group and 3 in ESIN group. There was no significant difference in the functional outcomes between the groups ( $p = 0.161$ ) according to Flynn's criteria.

#### **Conclusion**

ESIN and Ender's nailing are comparable in terms of intra-operative radiation exposure, surgical duration, and functional outcomes. However, total fluoroscopy time and the absolute values of radiation exposure are less in the Ender's group.

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#### **Modified Dunn Procedure without surgical hip dislocation for slip reduction in moderate and severe slipped capital femoral epiphysis (SCFE)**

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#### **Introduction / Objection**

Modified Dunn procedure is one of the preferred surgical options to do open reduction in moderate and severe slipped capital femoral epiphysis (SCFE). However, as the pathology in SCFE happened mainly at the level femoral head physis, the need of surgical hip dislocation during femoral capital realignment is questionable. We performed this Modified Dunn procedure without surgical hip dislocation with a good results.

#### **Materials & Method**

All 7 cases presented with moderate and severe SCFE underwent open reduction via Modified Dunn procedure but without surgical hip dislocation. Gibson approach used with trochanterotomy. Z-fashion of capsulotomy performed followed by temporary pins insertion to the femoral head to assess head perfusion before slip reduction. After checking head perfusion, long retinacular flap created and femoral neck dissociated from the head. The femoral head inside the acetabulum at all times throughout the procedure. Femoral neck was shortened about 1cm and inner surface of femoral head epiphysis burred to clear the remaining physis. Femoral neck was then reduced to the head and fixed with cannulated screw. Head perfusion was checked again and trochanter was placed back with screws. Wound was then closed in layers.

#### **Results / Discussion**

Out of 7 cases, 5 of them were fine without avascular necrosis of femoral head. One case was delayed for the surgical capital realignment procedure, thus was noted no head perfusion intraoperatively even before slip reduction and subsequently developed femoral head avascular necrosis. Another one case had delayed but early sign of femoral head necrosis after one year of procedure.

#### **Conclusion**

Surgical hip dislocation in Modified Dunn procedure need to review back whether it is really necessary in slip reduction for moderate and severe SCFE. Based on our case series, we believed it is not necessary, thus avoiding other potential complications for instance femoral head fracture and prolonged operation time.

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#### **Predictive Risk Factors of Graft Rupture Following Anterior Cruciate Ligament Reconstruction: A Systematic Review and Meta-Analysis**

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#### **Introduction / Objection**

Graft rupture after Anterior Cruciate Ligament (ACL) Reconstruction (ACLR) is a complication for which the risk factors are not clearly identified. Identification and stratification of contributing factors will assist in the mitigation of graft rupture in post-ACLR patients. The aim of this study was to identify and quantify the risk factors for graft rupture after ACLR.

#### **Materials & Method**

A systematic review with meta-analysis based on PRISMA guidelines was performed on randomised controlled trials (RCTs) across 5 databases. RCTs addressing the rates of graft ruptures in ACLR patients of all ages and gender were included. Meta-analyses using a random effect model (effect measure: odds ratio [OR] with 95% confidence interval [CI]) were performed where possible.

#### **Results / Discussion**

Full-text screening of 110 studies resulted in a total of 18 RCTs meeting the inclusion criteria. Meta-analysis of 5 factors was conducted, while isolated reporting of 6 additional factors was noted. ACLR augmentation with both Lateral Extra-articular Tenodesis (LET) (OR 3.09; 95% CI 1.70-5.63) and anterolateral stabilisation techniques, including Anterolateral Ligament (ALL) reconstruction and anterolateral structural augmentation (ALSA), (OR 7.35; 95% CI 2.30-23.45) significantly decreased the risk of graft failure. A greater postoperative posterior tibial slope (PTS), of  $11.9^\circ \pm 2.0$  compared to  $9.4^\circ \pm 2.2$ , was positively correlated with increased risk of re-rupture (SMD 1.21; 95% CI 0.26-2.15). Comparisons between hamstring and patellar graft selections (OR 1.30; 95% CI 0.40-4.19), as well as ipsilateral and contralateral donor sites (OR 0.76; 95% CI 0.14-4.11), yielded no significant correlations.



## Conclusion

Augmentation of ACLR with additional stabilisation techniques demonstrated lower graft rupture rates. However, a greater postoperative PTS was shown to be a risk factor for graft rupture. Other factors like graft type and side of donor site did not have an effect on graft rupture rates.

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## Risk factors for a false negative Ortolani and Barlow examination in developmental dysplasia of the hip

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### Introduction / Objection

Although universal screening by neonatal clinical examination with Ortolani and Barlow manoeuvres is widely adopted, its role as a sole screening tool is controversial due to its poor sensitivity and failure in identifying hip joints that eventually require surgical intervention. This study aims to identify risk factors for a false negative Ortolani and Barlow examination in neonatal screening for DDH. The hypothesis is that risk factors for developmental dysplasia of the hips could similarly be risk factors for a false negative Ortolani and Barlow examination.

### Materials & Method

In the 14-year retrospective cohort study, all new-born infants born in a single institution from 1st January 1999 to 31st December 2013 were screened clinically with the Ortolani/Barlow manoeuvre by a neonatologist. Infants with positive risk factors, despite a normal clinical examination, were then scheduled for bilateral hip ultrasound in the first three months of life and evaluated according to the Graf's method, Harcke's method of dynamic ultrasound screening and Terjesen's method of evaluation for femoral head coverage.

### Results / Discussion

A total of 164 infants with normal Ortolani and Barlow examinations were scheduled for bilateral hip ultrasound due to the presence of risk factors. Amongst these, 32 (19.5%) infants were evaluated to have an abnormal hip on ultrasound. Breech position was the only statistically significant risk factor for a false negative Ortolani/Barlow examination (14/34, 41.2% vs 18/112, 13.8%;  $p < 0.001$ ).

### Conclusion

Sonographic hip examinations are recommended for all infants with breech presentation even if they have a normal Ortolani and Barlow examination.

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## Hip survivorship following the Bernese PAO in the treatment of acetabular dysplasia: a systematic review and meta analysis

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### Introduction / Objection

The Bernese periacetabular osteotomy (PAO) is a popular joint-preservation technique aimed at addressing the structural and biomechanical abnormalities associated with acetabular dysplasia. However prognostic factors and long term survivorship of the native hip is not well understood. Our study aims to find out the estimated duration of survival of the native hip post PAO, prognostic factors of functional outcome and complications associated and its rate.

### Materials & Method

A systematic review was performed using the PRISMA guidelines. All studies that reported on the outcomes of isolated Bernese PAO for the treatment of acetabular dysplasia were included.

### Results / Discussion

A total of 24 studies (3471 patients, 3655 hips) were included at a mean follow-up duration of 54.2 months (range: 1–336 months). Univariate analysis identified advanced age beyond a follow-up duration of 6 years ( $p = 0.001$ ) and preoperative Tönnis grade 2 and above ( $p < 0.001$ ) to be the most significant negative prognostic factors. Beyond a follow-up duration of 2 years, intraoperative fluoroscopy proved to be a significant positive prognostic factor ( $p < 0.001$ ). Our study found the complication rate to be 23.5% with the most common complications being transient lateral femoral cutaneous nerve dysesthesia, stress fractures and delayed union/ non-union/pseudoarthrosis of the ramus not necessitating surgical correction.

### Conclusion

PAO alters the natural history of the dysplastic hip with a 10- and 20-year survivorship of approximately 75.9% and 36.5% of patients respectively. The ideal patient should be below 40 years old, with a preoperative Tönnis grade of 0 or 1. Intraoperative fluoroscopy is able to guide a better precision when re-orientating the acetabulum.

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## Overcoming the Learning curve in robotic spine surgery – improving efficiency in the OR and lessons learnt.

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### Introduction / Objection

Robotic-assisted systems combine robotic guidance with real-time imaging, offering surgeons an unprecedented level of accuracy and control during spinal procedures. As the adoption of robotic spine surgery accelerates globally, there is a need to evaluate the learning curve associated with this technology.

### Materials & Method

This retrospective study included patients who underwent robotic-assisted pedicle screw placements using a spine robotic system (Mazor X) at a single centre from December 2020 to August 2023 by a single surgeon. There were 29 males and 31 females with mean age of 69.6 (range 34-81). With CUSUM analysis on robot setup time, the patients were separated into the early case and late cases.

### **Results / Discussion**

Patient diagnoses predominantly are degenerative lumbar spinal stenosis, except 1 with trauma. 9 cases underwent open procedures, and 51 underwent minimally invasive surgery. 51 cases were performed using the CT-Fluro merge workflow, and 5 cases were performed with scan and plan workflow. Based on CUSUM analysis, the learning curve improved significantly after 9 cases. The first 9 cases were in the early group and the later 51 cases were in the late group. The mean robot set-up time was reduced from 27.4 mins in the early group to 8.48 mins in the late group. There were 6 cases converted to O-arm navigation. No cases with screw-related complications were observed.

### **Conclusion**

The learning curve of robotic-assisted spine surgery does not take long. Based on the analysis, the learning curve can be improved significantly after 9 cases. We also elaborate on improving the efficiency of robo in operating theatre.

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### **Safety of robotic spine surgery for MIS and open lumbar spine fusion cases- surgical technique and avoiding pitfalls**

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### **Introduction / Objection**

Robotic-assisted systems combine robotic guidance with real-time imaging, offering surgeons an unprecedented level of accuracy and control during spinal procedures. The aim of this study is to demonstrate the surgical technique and safety of robotic-assisted spine surgery.

### **Materials & Method**

This study described the surgical technique and operative workflow for the Mazor X robot. Patients who underwent robotic-assisted pedicle screw placements using Mazor X robot at a single centre from December 2020 to August 2023 by a single surgeon were included in the study. There were 29 males and 31 females with mean age of 69.6 (range 34-81).

### **Results / Discussion**

Patient diagnoses were all degenerative lumbar spinal stenosis, except 1 with trauma. 9 cases underwent open procedures, and 51 underwent minimally invasive surgery. 51 cases were performed using the CT-Fluro merge workflow, and 5 cases were performed with the scan and plan workflow. 22 cases underwent single-level surgery, 21 underwent 2-level surgery and 17 underwent more than 3-level surgery. Only 6 cases were converted to O arm - due either to the inability to perform a satisfactory CT- arm merge, or any concern regarding the accuracy of the screw. There was one near miss. These were mainly seen during the learning curve. A total of 320 pedicels screws were placed with robot assistance. No cases of screw-related complications were observed. No cases require revision surgery.

### **Conclusion**

Robotic-assisted surgery is safe and feasible with reliable and precise accuracy with correct indications. There was no return to OT for screw malposition or screw-related complications. Future study is needed to evaluate the long-term outcomes of this technology.

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### **Deep Learning-Based Automated Developmental Hip Dysplasia (DDH) Ultrasound Screening Software**

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### **Introduction / Objection**

Recently, many countries (e.g., US, England, Germany, Israel, Korea) have conducted Developmental Dysplasia of the Hip (DDH) screening tests on newborns at about six weeks of age. The ultrasonography (US) imaging is preferred because it can confirm cartilage conditions before femoral head ossification occurs. The most common DDH US analysis is the Graf method. However, this method has high variability as to manual selection of anatomical points for calculating angles. Efforts to screen DDH through software using artificial intelligence have been continuously made.

The purpose of this study is to verify the performance of software(MaiT The A DDH) for multiple detection of key points based on deep learning (DL) models for automatic screening of DDH.

### **Materials & Method**

The data for model development was hip US of DDH neonatal screening and diagnosis program between April 2021 and April 2022 were from two institutions, Keimyung University Dongsan Hospital and Korea University Anam Hospital. The dataset consisted of 57,770 hip US images from 1,901 infants. MaiT The A DDH (DL SW) was developed using R-CNN algorithm. The external validation test data were 25 US images selected as standard images through the scan quality AI test from 284 US images of 124 patients who visited Pusan National University Hospital for DDH screening newborns from January 2016 to December 2021. We diagnosed DDH by detecting six keypoints and measured the alpha angle to compare the ICC of humans and AI.

### **Results / Discussion**

In external validation data, the ICC of the alpha and beta angles are 0.98, respectable, and containment is 0.88. All the ICC with external validation data has excellent agreement.

### **Conclusion**

In this study, a method of automatic detection and classification of DDH is proposed. Our deep learning model had a high detection rate of diagnostic key points assessment by hip ultrasound at the external validation.

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### Is there a difference in functional outcomes of pulseless supracondylar fractures compared to those who present with intact pulse?

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#### **Introduction / Objection**

Management of pulseless supracondylar fractures is always a matter of debate as there is no strong evidence in literature. This study examines subjective and objective functional outcomes measures in pulseless Supracondylar humerus fractures in paediatric patients, managed with vascular exploration or observation alone and compare with those who presented with intact pulse.

#### **Materials & Method**

Paediatric patients with supracondylar humerus fractures without pulse between 2005 and 2021 with atleast one year of clinical follow up were identified and called for evaluation. Age and sex matched patients with intact pulse were called as controls. Patient reported outcomes of fracture fixation(PROOF) and Quick DASH scores were used for subjective outcome measurement. Objective parameters included arm circumference, range of movements of upper extremity, Grip strength analysis and radiological parameters.

#### **Results / Discussion**

Of the 1076 patients with supracondylar fracture in the database there were 66 without pulse on presentation (6.1%). 24 of 66 patients completed functional assessment at final follow up. 24 patients with intact pulse formed the control group. Of the 24 without pulse 16 were treated with closed reduction and fracture fixation alone and 8 had vascular exploration. Vascular explored patients showed lower PROOF scores when compared to observation alone group of patients. Both the groups had significant difference in length of hospital stay, injury to surgery time and follow-up data. No difference was observed in grip strength, Quick DASH functional Scores between two groups.

#### **Conclusion**

Six percent of supracondylar fractures presented with a vascular insult and absent pulse. There was no difference in the objective functional outcomes of patients of supracondylar fractures presenting with or without pulse. The patient reported outcomes was significantly less in patients who had vascular exploration compared to those managed with observation.

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### SOFT TISSUE SARCOMAS ABUTTING JOINTS – FREEZE THE TUMOUR TO SPARE THE JOINT. A NATIVE JOINT PRESERVATION TECHNIQUE USING IN-SITU CRYOTHERAPY

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#### **Introduction / Objection**

Soft Tissue Sarcomas (STS) abutting articular joints usually require partial or complete joint resection to achieve adequate margins. Subsequent reconstruction is technically challenging. Cryotherapy can be used to ablate tumour and sterilize margins. We present two patients with high-grade periarticular myxofibrosarcoma (MFS) who underwent wide resection with native joint preservation utilising in-situ liquid nitrogen (LN2) freezing.

#### **Materials & Method**

There were 2 patients who presented with MFS approximating the joint. A partial wide resection of the tumour was performed by separating adjacent soft tissue structures from the tumour except at the margin abutting the bone-joint. The patients were then repositioned to allow the exposed tumour to be immersed into LN2 ensuring a complete freeze including the remaining margin. The tumour is subsequently thawed and removed through the planned sterilized margin.

#### **Results / Discussion**

Both patients had wide margins except at the planned frozen margin. There were no intra- or post-operative complications. Both patients are local recurrence free at 48 months and 6 months postoperatively and have retained pain-free functional reconstructions. MSTs and TESS score were 24 and 73 at 2 years for case 1. Functional scores are pending for case 2. Post-operative surveillance MRI scans show an intramedullary transitional line marking the limit of bone freezing which can be misinterpreted as a fracture line by radiologists.

#### **Conclusion**

In-situ LN2 cryotherapy is useful for native joint preservation in periarticular STS. The technique is particularly well suited to tumours on the dorsal surfaces of joints.

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### Distal Femoral Replacement & Plate Fixation in Supracondylar Femoral Periprosthetic Fractures around the TKR

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#### **Introduction / Objection**

Periprosthetic fractures around the total knee replacement (TKR) is a surgical challenge. Though it remains an uncommon complication, it is expected to increase in incidence with an aging and more active population. As patient selection is further refined, this study aims to re-evaluate the outcomes of distal femoral replacement and plate fixation in supracondylar femoral periprosthetic fractures.

#### **Materials & Method**

This is a prospectively-collected retrospective review of 14 patients who underwent either a distal femoral revision (DFR = 10) or a plate fixation (PF = 5) for a supracondylar femoral periprosthetic fracture between 2017 and 2022. The study's primary outcome measure was for return to pre-morbid function. Secondary outcome measures were for time to weight bear, pain control and complications. The mean follow-up period was 20.1 months.

### **Results / Discussion**

The mean age of the patients is 80.1 years (DFR mean = 84.2, PF mean 71.8). All patients are female. At follow up, 33.3% (3/9) of the DFR patients and 80% (4/5) had returned to their pre-morbid function. The mean time to weight bear was 2.1 days and 62.2 days respectively. All 14 patients were able to achieve a VAS score <3/10. There were 7 complications seen in the DFR group not requiring reoperation, whereas there were 5 complications seen in the PF group with 1 requiring reoperation. Of note, 14.3% (2/14) of patients had demised from unrelated causes at follow up.

### **Conclusion**

In this series, the outcome of distal femoral replacement is comparable with plate fixation in the supracondylar femoral periprosthetic fracture. Though fewer patients were able to return to their pre-morbid at follow up, the DFR afforded an earlier time to weight bear, and sustained no complications requiring reoperation. It can be seen as a viable option when indicated.

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### **Effect of Selective Hip Ultrasound Screening on Early Detection of Development Hip Dysplasia— Experience in Changhua Christian Children's Hospital**

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### **Introduction / Object**

Developmental dysplasia of the hip (DDH) is the most common musculoskeletal disorders in neonates. We introduce a hip care program to promote the early detection of the DDH and preventing further surgery. The Graf's method was applied in the selective DDH screening program. Ultrasound screening and detailed post-natal hip care were applied to increase the early detection rate of DDH, and thus restore the natural development of the hip.

### **Materials & Method**

From March 2022 to March 2023, the hip stability of the neonates born within 3 days were assessed. The selective hip ultrasound according to the risk factor and each hip stability was arranged. Either observation, Pavlik harness treatment, or close reduction were applied according to the clinical condition. The DDH prevention baby care method was introduced to the parents. The diagnosis before 6 months was defined as early diagnosis. The incidence of early diagnosis, surgery for DDH and the age at first surgery for DDH were collected.

### **Results / Discussion**

The total number of neonate hip screen was 2494. The 258 cases were classified as sonographic anomaly. After the ultrasound screening, 258 cases were diagnosed DDH before the age of 6 months. The early detection rate was 5.82%. No case failed Pavlik harness treatment. No case underwent surgery at the age of 1.5 years old. The incidence of DDH surgery was 0.00%.

### **Conclusion**

Universal Hip Screening Program of Neonatal Hips in postnatal 3 days could offer the neonates and parents a promising DDH prevention program. Using the physical examination and hip sonography, the goal of increase early diagnosis rate and decrease DDH related surgery rate could be achieved. The hip ultrasound screening, the DDH prevention baby care method (Diaper wear, baby clothes, the way of carrying the baby) should be introduced to the parents for the prevention of the residual dysplasia of the hip.

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### **Hemiepiphysiodesis is a potentially effective surgical management for skeletally immature patients with patellofemoral instability associated with isolated genu valgum.**

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### **Introduction / Object**

Genu valgum is one of the well-known predisposing factors for patellofemoral instability. The study aims to investigate the outcomes of isolated hemiepiphysiodesis in the correction of genu valgum and in the management of recurrent patellofemoral instability. The hypothesis was that hemiepiphysiodesis alone would result in significant correction of genu valgum, thereby preventing recurrent patellofemoral instability.

### **Materials & Method**

In the cohort study, all skeletally immature patients who underwent isolated hemiepiphysiodesis for recurrent patellofemoral instability were included. All patients included in the study had a minimum of 1 year follow-up duration prior to the conclusion of the study.

### **Results / Discussion**

Sixteen of twenty knees had no further patellofemoral instability post-operatively. The change in the status of patellofemoral instability was statistically significant ( $p = 0.001$ ), similar to the change in the tibiofemoral angle ( $p = 0.015$ ) and patellar tilt angle ( $p = 0.002$ ). Comparison between patients with and without patellofemoral instability post-operatively revealed that the pre-operative patellar tilt angle ( $p = 0.005$ ) and tibiofemoral angle ( $p = 0.001$ ), post-operative patellar tilt angle ( $p = 0.004$ ) and tibiofemoral angle ( $p = 0.027$ ) as well as the change in patellar tilt angle ( $p = 0.001$ ) and tibiofemoral angle ( $p = 0.001$ ) were all significant predictors of the outcomes of genu valgum.

### **Conclusion**

Hemiepiphysiodesis is a potentially effective surgical management for skeletally immature patients with patellofemoral instability associated with isolated genu valgum. This is especially for patients who are skeletally immature and have sufficient remaining years for their genu valgum to be corrected using hemiepiphysiodesis. These patients also tended to have less severe genu valgum and patellar tilt angle, which could be corrected using hemiepiphysiodesis with the remaining years of growth.

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### **Is There a Role for Bone Grafting in Severely Comminuted Distal Radius Fractures Treated With Locking Plate Fixation?**

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#### **Introduction / Objection**

The introduction of locking plate technology has increased the range of distal radius fracture types amenable to fixation without the need for bone grafting as suggested by current literature. However, large bony defects in severely comminuted metaphyseal fractures may still compromise the results of locking plate fixation. Similarly, the locking plate may not adequately address small, unstable intra-articular fragments. In our study, we look at the outcomes of bone grafting used in severely comminuted distal radius fractures fixed with locking plates.

#### **Materials & Method**

We analyzed prospectively collected data of all patients who underwent surgical fixation of comminuted distal radius fractures with locking plates and bone grafting in our institution. All patients underwent a standardized postoperative rehabilitation program. Wrist motion, grip strength, and radiographic parameters and fracture union were assessed at 3, 6, and 12 months. At 12 months, the DASH (Disability of Arm Shoulder Hand) scores were evaluated.

#### **Results / Discussion**

60 of 450 consecutive patients (13%) who underwent distal radius fracture fixation with volar locking plate systems required autologous bone graft (n=30) or synthetic bone substitutes (n=30). Bone grafting was indicated for maintenance of reduction in the setting of severely comminuted articular fragments or large volar-dorsal metaphyseal defects. No donor site morbidity was encountered. At final follow up, all fractures united with an average volar tilt of 4°, radial inclination of 18.8°, and articular step or gap of 0.1mm. The outcomes were excellent or good in 75%.

#### **Conclusion**

We recommend the incorporation of bone grafts as a valuable adjunct in maintaining the reduction position of articular fracture fragments, as well as for fractures with combined volar and dorsal metaphyseal comminution.

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### **Does the infant hip dysplasia disease specific care certification program improve the infant hip care (Changhua Christian Children's Hospital Experience)?**

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#### **Introduction / Objection**

The Joint Commission of Taiwan launched the infant hip dysplasia disease specific care certification program. Changhua Christian Children's Hospital (CCCH) is the first certified healthcare organization in this program. This program aims to encourage comprehensive infant hip care services from hip dysplasia prevention to acute and chronic hip dysplasia care to meet neonate hip healthcare demands. We introduced this program in CCCH. The efficiency of the early diagnosis and avoidance of the major surgery in DDH was improved.

#### **Materials & Method**

We set up a cross-disciplinary team integrating in the infant hip dysplasia care. This program was launched from March 2022. The hip stability was assessed with standard hip physical examination, followed by selective hip ultrasound according to the risk factor and each hip stability. Either observation, Pavlik harness treatment, or close reduction were applied according to each hip condition. The DDH prevention baby care method (Diaper wear, baby clothes, the way of carrying the baby) was introduced to the parents. The incidence of early diagnosis, surgery for DDH were collected.

#### **Results / Discussion**

The total number of hip screen was 2494. 258 cases were classified as hip dysplasia. The early detection rate was 5.82%. No case failed Pavlik harness treatment. The incidence of DDH surgery was 0.00%. A Taiwanese population based study revealed the overall DDH incidence ranged from 0.14% to 0.18%, Incidence of early diagnosis ranged from 0.071% to 0.092% and Incidence of DDH surgery ranged from 0.046% to 0.067%. In our study, the incidence of early diagnosis was higher than the average incidence of DDH in Taiwanese population. The incidence of DDH surgery is lower than the average incidence of DDH surgery in Taiwanese population.

#### **Conclusion**

The infant hip dysplasia DSC certification program in CCCH improved the efficiency of the early diagnosis and treatment of DDH and avoid major DDH surgery in the infants.

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### **Subcrestal iliac screw technique in patients with lumbosacral metastatic spine disease: An alternative to traditional spinopelvic fixation**

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#### **Introduction / Objection**

Spinopelvic fixation with iliac screws has been shown to provide biomechanical advantages of a more stable fixation and has seen increased usage in lumbosacral metastatic disease. The early success with the previously described has been reported. This technique combined the advantages of the traditional iliac screw and the S2-alar-iliac (S2AI) screw, allowing for a low profile screw head, avoids violation of the SI joint, and reduced post-operative complications such as implant prominence, implant infection and need for revision surgery. This study aims to report on the clinical and radiological outcomes of patients with lumbosacral metastatic disease who underwent spinopelvic fixation with the SCIS.

## Materials & Method

All consecutive patients who had undergone iliac screw fixations with the sub-crestal iliac screw technique from Aug 2012 - Aug 2022 were included. Patient demographics, operative details, pre and post-operative clinical scores, and presence of any radiological or clinical complications specific to the SCIS were recorded and analyzed.

## Results / Discussion

A total of 12 patients were included in this study. Mean age was 60.2 years with 41.7% (n=5) males. Pre operative median Spinal instability neoplastic score (SINS) score was 13.5 and median Tokuhashi score was 9.5. All patients complained of symptoms of axial back pain pre op with median Visual analogue scale (VAS) score of 7. 11 patients underwent a MIS fixation while 1 patient underwent an open fixation.

Post operatively there were no neurological complications, deep surgical site infections, or revision surgeries. Mean time for commencement of adjuvant therapy was 5 weeks. Post op VAS back improved to a median of VAS 3. Mean follow up was 8.25 months and mean survivorship was 9 months after surgery.

## Conclusion

The sub crestal iliac screw technique is a safe and reproducible method of spinopelvic stabilization in treatment of lumbosacral metastasis. Both the MIS and open technique can be utilized.

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## The relation between the type and grade of injury in lateral discoid meniscus

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## Introduction / Objection

To observe the relationship between the type and grade of injury in lateral discoid meniscus

## Materials & Method

The 211 cases were collected in this researching with lateral discoid meniscus. The cases were divided into three subgroups according to age of onset. The cutoff age was 12 and 40 years old. The lateral discoid meniscus in all cases of the knee MR were divided into three types (Wedge-shape, plate-shape and hypertrophic horn shape) according to Wang's method. And furthermore, they were divided into different injury grades according to Fischer's method.

## Results / Discussion

The hypertrophic horn type was 45% in group A (younger than 12 years old). And grade of injury belongs to grade II in half of cases. Another half of cases were belonged to grade III. On the contrary the wedge-shaped type was 45% in group C (older than 40 years old). And grade of injury belongs to grade III in 68%.

## Conclusion

The hypertrophic horn type of lateral discoid meniscus was inclined to injury and early onset. We believe that the type of lateral discoid meniscus was related to the injury and age of onset.

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## Deep learning model for detection and classification of central canal, neural foraminal stenosis and vertebral segmentation on cervical spine MRI

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## Introduction / Objection

Deep learning (DL) could improve the productivity and consistency of reporting degenerative cervical spondylosis on MR. We developed a DL model to automate key aspects including automated detection and classification of central canal and neural foraminal stenosis and vertebral body segmentation to facilitate analysis of spinal pathology

## Materials & Method

Cervical spine MRIs performed from January 2015 to July 2021 were included. Axial T2-weighted gradient echo and sagittal T2-weighted spin echo images were utilized. The internal training/test set split was 90/10%, respectively. Training data was labelled by a radiologist using pre-defined gradings. For stenosis gradings, convolutional neural network-based backbone was adopted for feature extraction, and a transformer encoder-decoder architecture was employed to detect the objects of interest via a fixed small set of learned object queries. Vertebral segmentation was performed with the Segment Anything Model (SAM). The internal test set was labelled by the subspecialty musculoskeletal radiologist and served as the reference standard. Detection recall (%), accuracy and sensitivity/specificity were calculated for stenosis gradings. Dice coefficient and Intersection over Union (IoU) were calculated for vertebral body segmentation.

## Results / Discussion

504 cervical spine MRIs were analyzed. The DL model achieved 95.7% recall for axial central canal and neural foramina, and 85.7% for sagittal central canal. Dichotomous classification showed high accuracy for axial central canal, axial neural foramina and sagittal central canal. High specificity was achieved at all regions (range: 95.7-98.3%) with slightly lower sensitivity (range: 78.9-83.7%). For segmentation, the model achieved a Dice coefficient of 0.92 and high IoU score of 0.86.

## Conclusion

DL model showed high accuracy for detection and classification of central canal stenosis and neural foraminal stenosis on cervical spine MRI, and robust vertebral body segmentation with high DICE and IoU scores. The deep learning pipeline has potential to improve the productivity and consistency of reporting

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## Surgical Management of Missed Pediatric Monteggia Fractures: A Systematic Review and Meta-Analysis

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**Introduction / Objection**

Missed Monteggia fractures are common and pose a surgical challenge due to difficulty in obtaining stable anatomic reduction and correcting articular deformities after prolonged dislocation. Current studies are limited to small studies with no common consensus for ideal surgical management, therefore this study aims to review surgical management and outcomes of missed pediatric Monteggia fractures

**Materials & Method**

A systematic literature review was conducted using Pubmed, MEDLINE, Cumulative Index to Nursing and Allied Health Literature (CINAHL) and the Cochrane Library from inception until March 2, 2020. All original studies on missed pediatric Monteggia fractures were included, congenital Monteggia fractures and isolated radial head dislocations were excluded. The revised Methodological Index for Nonrandomised Studies tool was used to assess quality of studies. The x2 test and Fisher exact test were used to analyze the difference in outcomes for different surgical managements. Multivariate analysis was performed for variables that were significant on univariate analysis.

**Results / Discussion**

Thirty studies with 600 patients were included. Proximal ulnar osteotomies ( $P = 0.016$ ) and the absence of transcapitellar pinning ( $P = 0.001$ ) were the most significant predictors for eventual reduction of radial head. Other surgical management variables were not significant predictors. These include open or closed reduction approach of radial head reduction; presence or absence of ulnar osteotomy; presence or absence of lengthening, angular correction, overcorrection, or bone grafting of ulnar osteotomy; type of fixation for ulnar osteotomy; presence or absence of radial osteotomy; presence or absence of annular ligament repair or reconstruction; and repair or reconstruction of annular ligament.

**Conclusion**

Proximal ulnar osteotomies are recommended in the management of missed pediatric Monteggia fractures. The need for transcapitellar pinning signifies more unstable radial head reductions with poorer outcomes, and transcapitellar pinning should be reserved for use only when necessary.

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**The Utility of Magnetic Resonance Imaging (MRI) Reference Markers Beads for Planning of Soft Tissue Sarcoma (STS) Field Resection**

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**Introduction / Objection**

Marker beads are used by radiographers to define an area of interest. These beads can be repurposed to provide accurate reference points for surgical planning, where tumour is not palpable and where there are no natural reference points. This scenario is common after unplanned excision of STS when an unrecognized sarcoma is removed with inadequate margins. At our centre, the local imaging protocol for unplanned excision of STS involves a new MRI scan performed with reference marker beads placed at the proximal and distal ends of the previous scar. The planned extent of resection is mapped and referenced to the position of the marker beads and translated intraoperatively relative to the ends of surgical scar, with the aim of removing enbloc residual tumour and contaminated tissue.

**Materials & Method**

36 patients with unplanned excision of STS were assessed. Seven patients were excluded as they underwent amputations. The remaining 29 patients underwent planned wide field resections with the above MRI protocol. FNCLCC tumour grade was G1 (12 patients), G2 (5 patients), G3 (9 patients) and ungraded (3 patients). AJCC stage was IA/IB (10 patients), II (6 patients), IIIA/IIIB (9 patients) and staging incomplete (4 patients). Tumour location was deep in 12 patients and superficial in 17 patients. Outcome measures were rate of positive margin at re-resection and local recurrence (LR).

**Results / Discussion**

5/29 of patients had positive margins. Three of these patients had low grade tumours with focally positive margins and underwent no further treatment. One patient underwent re-resection with post-operative radiotherapy (RT) and one patient had re-resection without RT. Local recurrence free survival rate at 1, 5 and 8 years was 96.6%, 93.1% and 93.1% respectively.

**Conclusion**

We describe the novel use of MRI reference marker beads for planning STS field resection. Careful attention should be paid to the accurate placement of marker beads.

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**Outcome and Risk assessment of Surgically treated Arthrogryptic Hip Dysplasia**

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**Introduction / Objection**

Teratologic hip dislocations are recalcitrant to standard treatment protocols and are associated with higher re-dislocation rates. We report the intermediate-term results in arthrogryptic hips with an aim to determine possible risk factors of poor outcome.

**Materials & Method**

We reviewed the clinico-radiological and functional outcomes in all surgically treated arthrogryptic hips, in a single-center, from 2006-2018. Descriptive statistics were derived and analyzed with Student's T-test, and Fisher's test to determine the impact of bilateralism, IHDI class and concomitant joint contractures on outcome.

**Results / Discussion**

We reviewed 94 hips in 62 (32 bilateral) arthrogryptic children. 2/14 underwent closed-reduced (CR), and 3/96 underwent primary salvage procedure. Thus, 89/94 underwent open-reduction (OR) with femoral and acetabular osteotomies. 10/89 (11%) hips dislocated; five diagnosed on post-operative CT and the rest after spica removal. The mean age at index procedure was 25 months [Range:3-180; SD=30]. At mean follow-up of 47 months [Range:12-168; SD=40.2], 75/92 (81 %) hips were

reduced (Severin class I-III), 13/92 (14%) were either subluxed/ in pseudo-acetabulum (Severin IV/V), 4/92 (4%) re-dislocated (Severin VI), and 4 could not be graded. There was no significant increase in complications with bilateralism (OR: 2.5; p=0.18), concomitant lower-limb joint contractures (OR: 1.45; p=0.18), or IHD1 class (p=0.3). We observed osteonecrosis in 54/90 (58%) [Kalamchi's Grades 2, 3 and 4 in 7/90 (7.6%), 15/90 (16%) and 9/90 (10%) hips, respectively], joint incongruity in 4/90, deep infection in 1/90, femoral fracture at the implant-bone interphase in 5/62 patients. Over half the patients remained either community or household ambulators at skeletal maturity.

### **Conclusion**

The higher rate of re-dislocation and osteonecrosis are in keeping with historical reports. The bilateralism, IHD1 class and concomitant joint contractures did not seem to affect the outcome. We recommend awareness regarding the increased risk of femoral fractures secondary to possible osteopenia, immobilization, implanted hardware, and stiff joints in arthrogyposis.

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### **INITIAL EVALUATION OF INTRA-OPERATIVE NEUROMONITORING DURING SEVERE KYPHOSCOLIOSIS SURGERY WITHOUT VERTEBRAL COLUMN RESECTION**

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#### **Introduction / Objection**

Severe rigid spinal deformity carries a high risk of neurological complication with surgery. The purpose of this study is to describe the relation between intraoperative neuromonitoring (IONM) signal changes during posterior spinal fusion (PSF) without vertebral column resection (VCR) with risk factors in severe kyphoscoliosis surgery.

#### **Materials & Method**

Retrospective review of severe pediatric spinal deformity patients treated with PSF without VCR or three-column osteotomy from 2013 to 2022. Exclusion criteria were prior instrumentation, lack of IONM, and incomplete radiographic data. Coronal deformity angular ratio (C-DAR), sagittal DAR (S-DAR), total DAR (T-DAR), Cobb' Angle, kyphosis, age, and etiology were collected and compared between patients with IONM signal loss and those without.

#### **Results / Discussion**

Thirty-two patients met the inclusion criteria. Five of thirty-two (15.6%) patients had abnormal IONM signal. In our study, IONM signal loss was not associated with severity of kyphosis (p= 0.27), Cobb's angle (p= 0.16), C-DAR (p=0.19), S-DAR (p= 0.84), T-DAR (p= 0.27), and etiology (p= 0,16); significantly associated with the age (p=0.009), curve types (p=0.046).

#### **Conclusion**

Our study found that abnormal IOM signals were closely related to preoperative age, curve types; meanwhile, a greater DAR was not associated with a higher risk of neurological injury. The study needs more cases to reduce bias statistics.

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### **Bernese periacetabular osteotomy in patients with hip dysplasia secondary to cerebral palsy and developmental dysplasia of the hips**

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#### **Introduction / Objection**

The current study aims to evaluate the outcomes of the Bernese periacetabular osteotomy when performed for children and adolescents with hip dysplasia secondary to cerebral palsy. The secondary aim of the study was to compare the outcomes of the Bernese periacetabular osteotomy when performed for hip dysplasia secondary to cerebral palsy as opposed to developmental dysplasia of the hips.

#### **Materials & Method**

In the prospective case-control study, all patients under the age of 21 years who underwent the Bernese periacetabular osteotomy for hip dysplasia secondary to cerebral palsy or developmental dysplasia of the hips were included.

#### **Results / Discussion**

Statistically significant improvements were noted for the acetabular index (p = 0.040), lateral central edge angle (p = 0.001), migration index (p < 0.001), extrusion index (p = 0.001) and Shenton line (p = 0.002) post-operatively as compared to pre-operatively. These improvements were similarly noted when subgroup analyses were performed for the patients with hip dysplasia secondary to cerebral palsy versus secondary to developmental dysplasia of the hips. Amongst the patients with hip dysplasia secondary to cerebral palsy, there was also improvement, if not maintenance, of the GMFCS levels in all patients post-operatively. All patients who were GMFCS level V also identified that there was less difficulty with perineal care post-operatively. All patients also reported pain relief post-operatively. When comparing between patients with hip dysplasia secondary to cerebral palsy versus patients with hip dysplasia secondary to developmental dysplasia of the hips, there were no statistically significant differences in the post-operative outcomes or change in pre-operative versus post-operative outcomes.

#### **Conclusion**

The Bernese periacetabular osteotomy is a viable surgical option for children and adolescents with closed triradiate cartilage and hip dysplasia. This applies to both patients with hip dysplasia secondary to cerebral palsy and hip dysplasia secondary to developmental dysplasia of the hips.

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### **Audit on safe use of fluoroscopy and PPE in Orthopaedics**

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### **Introduction / Objection**

Fluoroscopy is an indispensable tool that forms a significant part of the standard practice in many trauma and orthopaedic procedures as it facilitates dynamic assessment and aids intraoperative visualization and decision making. It exposes both patients and theatre staff to the potential hazards of ionizing radiation and thus the awareness of these hazards and proper use of personal protective equipment (PPE) will help mitigate the increased of theatre staff. This audit aimed to assess awareness regarding the safe use of fluoroscopy in T&O theatres, evaluate the level of PPE use and knowledge of relevant guidelines, such as the British Orthopaedic Association (BOA) recommendations and local trust policy.

### **Materials & Method**

A prospective audit was performed between Juen and July 2023 using an online survey sent to the different professionals who work in T &O theatres across two hospital sites. Data was collected by using an online questionnaire. Standards followed included the local trust policy at the University Hospitals Sussex NHS Trust and the BOA guidelines

### **Results / Discussion**

Among 49 respondents, 59% fully knew radiation hazards and were comprised solely of radiographers. Surgeons and anaesthetists had 56% and 46% adequate knowledge, respectively. Radiation sources were correctly identified by 69% of participants. Local trust policy and BOA guideline familiarity was 49% and 39.6%, with 40.8% having formal training. Only 46% used full PPE. Surprisingly, 84% never used eye protection during fluoroscopy.

### **Conclusion**

The findings from this audit highlights the lack of awareness of radiation safety guidelines leading to suboptimal use of PPE in procedures with fluoroscopy. Recommendations for improvement include mandatory training to all theatre personnel. Methods of increasing awareness include the use of posters in theatres and performing regular audits to monitor the usage of PPE, alongside discussion of results in clinical governance meetings.

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### **Predictive scoring for recurrent patellar instability after a first-time patellar dislocation**

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### **Introduction / Objection**

Patellofemoral instability is a common acute knee injury seen in the paediatric population. First-time patellar dislocations usually undergo conservative management, but approximately 15% to 80% of patients experience recurrent instability. This study aims to develop a prediction model using radiographic parameters of the patellofemoral joint seen on computed tomography scans in different degrees of knee flexion, to determine the risk of recurrence following the first episode of patellofemoral instability.

### **Materials & Method**

A 12-year retrospective case-control study was performed. All patients in a single institution aged 18 years or younger who had a computed tomography patellar tracking scan performed for patellar instability were included. Predictors included in the score was determined through backward logistic regression and compared using receiver operating characteristic curve analysis.

### **Results / Discussion**

This study revealed that recurrent dislocation in first-time patellofemoral dislocation could be accurately predicted using the prediction score that consisted of age, tibial tubercle-trochlear groove (TTTG) distance and congruence angle at 10-degree and 20-degree flexion. The sensitivity of the score was 100% and specificity was 73.3%. Three diagnostic zones were identified and used to categorize patients into low, intermediate, and high probability groups.

### **Conclusion**

This study presented a scoring system that incorporated radiographic knee kinematics in the risk assessment for recurrent patellofemoral instability for patient stratification. The scoring system could guide the decision for early surgical intervention following a first episode patellofemoral dislocation for patients at high risk of recurrent patellofemoral dislocation.

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### **Epidemiology of knee injuries in kids**

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### **Introduction / Objection**

There is an increasing awareness of the importance of physical activity in a child's development and we are seeing a rise of children and adolescents engaging in physical activity at different levels of intensity from casual physical education classes to those that play on a national level. With that, we are also seeing an increasing number of knee injuries. In this study, we aimed to explore the prevalence of the different knee injuries in Singapore's children and adolescents.

### **Materials & Method**

All patients at and below the age of 18 years who had a magnetic resonance imaging of the knee done from January 2015 to December 2020 from a single institution were recruited. Demographics including the patients' age, height, weight, body mass index, and gender were collected. The patient's regular sports and mechanism of injury were also recorded. Magnetic resonance imaging of the knees were also reviewed for the type of injuries sustained.

### **Results / Discussion**

A total of 590 children and adolescents were recruited in the study. There were 254 males and 334 females. The average age of injury was 13 years (1.2-18.4 years). Most knee injuries occurred during physical education lessons (30%). Common sports for knee injuries include basketball (12.6%) and soccer (10.6%). Medial plica is the most common pathology resulting in knee pain (27.6%). Amongst the injuries, ligamentous tears (37.7%) is the most common, followed by meniscus tear (29.7%).

## Conclusion

Our study identified that a large proportion of knee injuries occurred during physical education lessons, with the most common sports related to injuries being basketball and soccer. This study aims to shed light on the risk of knee injuries and the goal of this research is to educate the youth and guide coaches, healthcare professionals and sporting boards on how to engage in physical activity safely.

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### Novel polyethyleneimine-functionalised antimicrobial polymers as titanium surface coatings to prevent Orthopaedic infections

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#### Introduction / Objection

This study utilises novel synthetic polymers with inherent antimicrobial properties to functionalise the titanium substrate to prevent implant-related infections. Novel polyethyleneimine-based polymers with tuneable amphiphilicity and cationicity were developed as implant coatings to prevent bacterial and protein adhesion whilst maintaining osteoblastic viability. The amphiphilicity of these polymers were modulated via the incorporation of phenylurea and PEG groups, and their effects on microbial killing, protein adhesion and cellular biocompatibility were investigated. Mechanistic evaluation of microbial killing were studied using dedicated imaging studies.

#### Materials & Method

The various polymers were coated onto pristine titanium surfaces via a 3-step process. Firstly, hydroxyl passivation in NaOH, followed by silanization and immersion in polymer-solvent solution for 24 hours. Successful coating of the polymers was confirmed with X-ray photoelectron spectroscopy. Polymer-coated Ti surfaces were cultured in *Staphylococcus aureus* and *Pseudomonas aeruginosa* for 14 days. Bacterial viability was evaluated using the BacLight assay and XTT reduction assay. Mechanistic evaluation of microbial killing was determined using confocal microscopy. MTT assay was used to determine cellular viability. Cellular morphology of seeded osteoblasts were visualised using confocal laser scanning microscopy.

#### Results / Discussion

All polymer-coated surfaces demonstrated antimicrobial activity compared to controls. Hydrophobic modification of bPEI, as well as a higher molecular weight bPEI improved anti-microbial efficacy. Bacteria viability for our best-performing polymer was  $5.8 \pm 1.2\%$  (*S. aureus*) and  $2.8 \pm 1.7\%$  (*P. aeruginosa*) respectively at 2 weeks. Confocal microscopy confirmed the physical disruption of polymer-treated bacterial membranes as the mechanism for microbial killing. All polymer-coated surfaces were bio-compatible towards MC3T3 osteoblasts with good cellular viability.

#### Conclusion

bPEI-functionalised polymers show good antimicrobial activity against both *S. aureus* and *P. aeruginosa*, whilst retaining cellular biocompatibility. They work via the novel mechanism of physical bacterial membrane disruption. These novel bPEI-functionalised polymer coatings represents a promising approach towards the reduction of Orthopaedic infections.

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### Meniscopectomy leads to good mid-term to long-term outcomes for children and adolescents with discoid lateral meniscus

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#### Introduction / Objection

There are limited studies reporting the mid- to long-term outcomes of meniscopectomies for discoid lateral meniscus. The study aims to evaluate the mid- to long-term outcomes of arthroscopic meniscopectomy for discoid lateral meniscus in children and adolescents

#### Materials & Method

Patients under the age of 21 years who had undergone arthroscopic meniscopectomy with or without meniscal repair or partial meniscectomy for symptomatic lateral discoid meniscus were included. All patients were then followed up for a minimum of 5 years (median 84 months; range 68–110 months). The Lysholm scores and Ikeuchi scores were collected pre-operatively and at final follow-up and were compared

#### Results / Discussion

A total of 24 knees were included in the study. The median duration of follow-up was 84.0 months (range 68–110 months). The Lysholm score improved from 53 (range 11–95) pre-operatively to 100.0 (range 60–100) at final follow-up ( $p < 0.001$ ). Based on the Ikeuchi score pre-operatively, 15 knees were rated as poor (62.5%), 7 knees were rated as fair (29.2%), and 2 knees were rated as good (8.4%). The Ikeuchi score improved significantly at the final follow-up, such that 1 knee was rated as good (4.2%) and 23 knees were rated as excellent (95.8%) ( $p < 0.001$ ). When analysing the effect of concomitant meniscal repair or partial meniscectomy on the outcomes at final follow-up, there was no apparent difference in the improvement in Lysholm score or Ikeuchi score when comparing between patients who had meniscopectomy alone and patients who had concomitant meniscal repair, as well as when comparing between patients who had meniscopectomy alone and patients who had concomitant partial meniscectomy

#### Conclusion

Meniscopectomy leads to good mid-term to long-term outcomes for children and adolescents with discoid lateral meniscus. Concomitant procedures such as meniscal repair or partial meniscectomy do not improve or worsen the mid- to long-term outcomes in these patients.

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### Predicting transfusion requirements for primary arthroplasty surgery: designing a patient centred service for a high volume elective orthopaedic centre

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#### **Introduction / Objection**

Extended patient waiting lists for assessment and treatment are widely reported for planned elective joint replacement surgery. We plan to establish a new elective orthopaedic centre serving a population of 2.4 million people. A local census conducted in 2022 identified that 15000 patients were awaiting joint replacement surgery with predictions for further increases in waiting times.

#### **Materials & Method**

The principle of care will be to offer routine primary arthroplasty surgery for low risk (ASA 1 and 2) patients at a new regional centre. There is a patient-centred priority to maintain as much care and pre-operative preparation local to the patient in order to reduce travel costs and time, improve flow, to avoid inadvertently excluding patients and to improve patient experience. This requires new and integrated pathways and ways of working. We designed a predictive model to determine which patients are likely to require perioperative transfusion. We reviewed all cases of hip and knee arthroplasty surgery conducted at our centre over a 12-month period. Using a 22-point TRIPOD framework and binary logistic regression we have developed a predictive model for the need for the perioperative transfusion of blood products in this patient group which is highly reliable.

#### **Results / Discussion**

We examined patient sex, age, pre-operative haemoglobin and platelet count, use of anti-coagulants, weight and body mass index to allow us to construct the Imperial blood transfusion tool. Backwards stepwise elimination of variables resulted in a stable model which showed an Area Under Curve (AUC) of 0.970 on ROC analysis. The model has been validated on an independent patient set.

#### **Conclusion**

We have used the results of our study to develop a reliable predictive transfusion tool which should allow us to deliver the aims of the elective orthopaedic centre.

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#### **Novel Modified Annular Ligament Reconstruction using Triceps Fascia for Neglected Dislocation of Radial Head on Pediatric Monteggia Fracture : Case Series**

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#### **Introduction / Objection**

Children with persistent unreduced dislocation of the radial head, which is defined chronic after four weeks, can experience instability, progressive elbow valgus deformity, and also ulnar nerve palsy. Triceps Fascia can be used for annular ligament reconstruction with radial head reduction introduced by Bell Tawse seems to be a simple and reproducible technique with overall good outcomes.

#### **Materials & Method**

We present five patients with dislocation of radial head complaints of chronic pain and numbness on the forearm and cubitus area. All patients underwent open reduction of radial head, ulnar osteotomy, and annular ligament reconstruction using Novel modified triceps fascia. To maintain the stability of the elbow, a long arm cast was applied for four weeks. The postoperative x-ray revealed adequate reduction of the dislocation of the radial head. Mayo Elbow Performance Score (MEPS) was used to evaluate the outcomes and 100 % showed a satisfying result.

#### **Results / Discussion**

Several authors have stated that stability of the radial head is majorly maintained by the annular ligament. Annular ligament reconstruction (ALR) is a crucial management in restoring normal elbow kinematics. Triceps tendon is more preferable to others because it is anatomically closer to the radial head thus prevents donor-site morbidity. Our technique includes central slip of the triceps tendon that extend until the distal of its insertion, drilling ulna for graft passing, insert fascia below anconeus and reinforcement of the graft using ethylene terephthalate (ethibond<sup>TM</sup>), no additional K-wire fixation, only long arm cast for 4 weeks.

#### **Conclusion**

The novel modified using triceps fascia utilises a strong and highly vascularised tendon that aids in better ligament reconstruction and oblique ulnar osteotomy to help facilitate the reduction by dragging the interosseous membrane and reducing pressure of the radial head. The result has been shown to give favourable outcomes and prevent further problems of the forearm.

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#### **Outcome of Coronal Angular Deformity Correction around the Knee Joint Using Guided Growth by Hinged Tension Band Plating**

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#### **Introduction / Objection**

The objectives of this study are to delineate the relation between anatomical angle (AA) change versus possible factors such as inter-screw angle (ISA) change, speed of longitudinal growth, screw length, and aetiology during the coronal angular deformity correction around the knee joint by tension band plating.

#### **Materials & Method**

One hundred thirteen operated physes from 54 patients were subjects of this study, which underwent guided growth by hinged-tension band plating. They were 96 genu valgum and 17 genu varum deformities from 65 distal femoral and 48 proximal tibial physes of different etiologies. Inter-screw angle (ISA) and anatomical angle such as LDFA and MPFA, interphyseal length between proximal and distal of the operated bone segment, screw length and epiphyseal width were measured on radiographs. Speed of the longitudinal growth (SLG) and relative screw length (RSL) were calculated. Statistical analysis was conducted using SPSS version 29.

#### **Results / Discussion**

The mean age at index surgery was  $8.6 \pm 2.6$  years. Duration of plating averaged  $14.4 \pm 6.6$  months. The rate of AA change was  $0.72^\circ \pm 0.46^\circ/\text{month}$  at the distal femur and  $0.58^\circ \pm 0.49^\circ/\text{month}$  at the proximal tibia, while that of ISA was  $1.2^\circ \pm 0.89^\circ/\text{month}$  at the distal femur and  $0.87^\circ \pm 0.45^\circ/\text{month}$  at the proximal tibia. The ratio between ISA to AA averaged  $2.10 \pm 2.02$ , which was not significantly different between distal femur and proximal tibia ( $p=0.13$ ), between valgus and varus group ( $p=0.42$ ), and among aetiologies ( $p=0.15$ ). Multivariate linear regression analysis demonstrated SLG was positively correlated with AA change ( $p=0.031$ ), but RSL in range from 0.31 to 0.63 was not ( $p=0.386$ ).

#### **Conclusion**

Inter-screw angle changes consistently more than anatomical angle does. Faster longitudinal growth of the bone segment produced faster AA change. Screw lengths in the range of this series (31 to 63% of epiphyseal width) did not show any effect on the rate of anatomical angle change.

### **220**

#### **Tibial metaphyseal-diaphyseal beaking: A novel radiographic sign that predicts greater magnitude of proximal tibia vara in knee osteoarthritis.**

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**Institution:** NTU LKC Medicine

#### **Introduction / Objection**

Proximal tibia vara, characterized by a medial shift of the tibial articular surface, is common in knee osteoarthritis patients of Asian descent. A novel radiographic sign termed "tibial beaking" has been observed in osteoarthritis patients with severe proximal tibia vara. This radiographic marker can assist with accurate assessment of tibial geometry, which is crucial for pre-operative planning and appropriate implant positioning during total knee arthroplasty (TKA).

#### **Materials & Method**

Preoperative knee radiographs of 106 knee osteoarthritis patients planned for TKA were retrospectively reviewed. Radiographs were assessed for presence of tibial beaking and radiographic parameters; Kellgren-Lawrence grade, hip-knee-ankle angle (HKAA), medial proximal tibial angle (MPTA), mechanical axis deviation (MAD), tibial axis deviation (TAD), magnitude of proximal tibia vara (MaPTV), and proximal tibial reference point (PTRP).

#### **Results / Discussion**

59 knees exhibited tibial beaking. The beaking group had significantly lower mean MPTA ( $84.22^\circ \pm 5.25^\circ$  vs  $86.11^\circ \pm 3.30^\circ$ ,  $p=0.034$ ), significantly higher mean MaPTV ( $5.78^\circ \pm 5.25^\circ$  vs  $3.90^\circ \pm 3.28^\circ$ ,  $p=0.035$ ) and PTRP ( $0.39\text{cm} \pm 0.55\text{cm}$  vs  $0.14\text{cm} \pm 0.30\text{cm}$ ,  $p=0.005$ ) compared to the non-beaking group. There was a strong positive linear correlation between MaPTV and PTRP ( $r=0.751$ ,  $p<0.001$ ). No significant differences were found with HKAA, MAD, and TAD.

#### **Conclusion**

Tibial beaking is associated with greater magnitude of proximal tibia vara and can be used to guide surgical planning in patients with severe proximal tibia deformity.

### **221**

#### **Outcome of locking plate fixation adjunctive to intramedullary rodding in osteogenesis imperfecta patient**

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#### **Introduction / Objection**

Locking plate fixation with unicortical screws adjunctive to intramedullary rodding was introduced for difficult long bone stabilization in osteogenesis imperfecta. The purposes of this study were to evaluate the outcome of this technique and to assess the complications associated with it.

#### **Materials & Method**

The study subjects were 75 cases of 46 patients with osteogenesis imperfecta (9 type I, 11 type III, 23 type IV, and 3 type V) in which this technique was applied, and the plate was removed after union achieved. The mean age at the index surgery was  $15.4 \pm 8.3$  years. The plates were removed in  $17.1 \pm 9.6$  months. Follow-up after the index surgery was  $6.3 \pm 2.9$  years. Medical records and radiographs were reviewed to assess union of target lesion and related complications.

#### **Results / Discussion**

The target lesions were fracture in 50 cases, failure to achieve complete union in 17, and deformity of the long bone in 8. Successful union of the target lesion was achieved in 64 cases (85.3%). In the remaining 11 cases, revision surgery was performed for screw hole fracture (5) or failure-to-union (6), in average 21 months (2 to 71 months) after index surgery. One of the failure-to-union cases had intramedullary rod breakage at the un-united target lesion, and the other had intramedullary rod backing-out. After plate removal, 16 of 64 cases developed complications such as screw hole fracture (12), recurrence of target lesion (3), and osteomyelitis (1). Kaplan-Meier survival analysis demonstrated half of the screw hole fractures developed within 1.8 years after plate removal, and 90% in 3.9 years.

#### **Conclusion**

Combination of locking plating with intramedullary rodding is an effective technique to achieve difficult bony union in osteogenesis imperfecta patients, however complications may develop even after plate removal. Screw hole fracture is the most common that can occur even in 3 years after plate removal.

### **222**

#### **Can acute correction with simultaneous hemiepiphyseal diaphyseal osteotomy of lateral proximal tibia physis prevent recurrence in neglected infantile Blount's disease?**

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#### **Introduction / Objection**

The treatment of infantile Blount's disease usually includes surgical correction, but high recurrence is still a problem regardless of the procedure. We conducted a cross-sectional study of severely neglected infantile Blount's disease treated with acute correction and simultaneous hemiepiphyodesis of lateral proximal tibia physis. In this study, we aimed to observe the complication and recurrence.

#### **Materials & Method**

This research is an analytical study with a cross-sectional design using retrospective data collection and total sampling. The subjects were patients with neglected infantile Blount's disease treated from 2018 to 2023 in our institution. Follow-up was conducted in 6, 12, 24, and 36 months.

#### **Results / Discussion**

A total of 25 legs from twenty patients were recorded. We observed three legs (12.0%) had recurrence. No neurovascular complications and infections were observed. All subjects had significant postoperative improvement of TFA (mean  $6.8 \pm 0.730$  valgus), Drennan angle, MPTA, MTPD, JLCA, and ligamentous laxity grading ( $p < 0.001$ ). Lower than  $5^\circ$  postoperative valgus overcorrections and preoperative physeal bar were significant factors in patients with recurrence ( $p = 0.020$  and  $p = 0.010$ ). There was no significant increase in leg-length discrepancy during follow-up ( $p = 0.052$ ). There were no significant differences between age, BMI, preoperative TFA, pre- and postoperative Drennan angle, MPTA, MTPD, JLCA, Langenskiöld stages, and length of follow-up in patients with recurrence and not.

#### **Conclusion**

Acute correction with simultaneous hemiepiphyodesis of lateral proximal tibia physis is an effective technique to prevent deformity recurrence in neglected infantile Blount's disease, provided that the postoperative TFA is more than  $5^\circ$  of valgus and no evidence of physeal bar in the preoperative radiograph.

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#### **Applications of 3D printing in orthopedics: A scoping review**

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#### **Introduction / Object**

In light of increasing adoption of 3D printing in clinical practice, this review aims to provide an updated overview on the current applications of 3D printing in orthopaedics and identify the gaps in existing literature.

#### **Materials & Method**

Electronic database search of PubMed, Embase, Ovidmedline, Cochrane Library and Cumulative Index to Nursing & Allied Health Literature was performed on 7 April 2023, in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis guidelines for scoping reviews. The searches were conducted using the keywords relating to "orthopaedic" and "three-dimensional printing". No restrictions were placed on the date of publication.

#### **Results / Discussion**

1333 articles were included in the final synthesis of this review. 6 main themes were identified: surgical planning (57.01%), implants (28.73%), prostheses (5.03%), surgical training and education (4.20%), orthosis (3.98%) and patient education (1.05%). Specialties which commonly used 3D-printing included trauma, spine and adult reconstruction. Common anatomical sites included pelvis, spine and knee. Titanium was the most used material, followed by polylactic acid and resin. Titanium was predominantly used in 3D printed implants while polylactic acid and resin were predominantly used during surgical planning. There was a paucity of literature pertaining to legal and economical papers.

#### **Conclusion**

Existing literature demonstrates the growing applications of 3D printing in orthopaedics with the potential for it to address the needs of low-income countries, improve patient outcomes and enhance surgical practices. However, further research is needed to explore the clinical, economic aspects and optimization of workflow to establish 3D printing as a standard of care in orthopaedics.

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#### **ERAS in Asians after total knee arthroplasty achieved transition to ambulatory surgery, saves hospital bed days and costs to patients.**

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#### **Introduction / Object**

Enhanced recovery after surgery (ERAS) in total knee arthroplasty (TKA) has reduced the length of stay (LOS) and cost of TKA in the Western population. Asians had been identified to be at higher odds of non-home discharge following TKA due to cultural differences. The efficacy of ERAS in TKA for Asian patients is less known. We aimed to investigate the efficacy of ERAS in reducing the LOS, transition to ambulatory surgery, improving home discharges, and reducing cost in an Asian population following TKA.

#### **Materials & Method**

Retrospective analysis was performed on 634 TKA patients in 2017 (pre- ERAS) and 584 TKA patients who had undergone ERAS in 2022 in a tertiary hospital.

#### **Results / Discussion**

Patients in 2022 (ERAS) were older ( $69 \pm 7$  vs.  $68 \pm 7$  years old,  $p < 0.001$ ) and had a higher proportion of patients with poorer function ( $p < 0.001$ ). The LOS reduced from 5.4 days (95%CI:5.2-5.6) to 2.9 days (95%CI:2.7-3.2) ( $p < 0.001$ ) with about 49% of patients transitioning to ambulatory surgery and having a LOS of 1.4 days (95%CI:1.3-1.5). The proportion of patients being discharged home in 2022 (78.9%) was higher compared to 2017 (62.2%) ( $p < 0.001$ ). This saved the hospital 1817.4 inpatient ward bed days, which based on room rates alone, translated to S\$ 1,167,843 of cost savings in a year, and S\$2821.40 for individual patients

#### **Conclusion**

ERAS after TKA was able to safely achieve LOS comparable to the western population and allow transition to ambulatory knee replacement in the Asian population. Consequently, this led to higher proportion of home discharges and achieved significant cost savings and hospital bed days.

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### **Is lag screw fixation alone enough for transverse patella fractures? - A Biomechanical Analysis**

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#### **Introduction / Objection**

The modified anterior tension-band wiring (TBW) is the traditionally described technique for fixation of patella fractures. Unfortunately, complications such as implant prominence, protrusion and skin irritation require their removal in reportedly 52% of cases.

In recent years, alternative fixation techniques have been proposed with newer implants. We performed a biomechanical analysis to compare these techniques.

#### **Materials & Method**

A transverse fracture pattern was re-created on 24 sawbone patellas and subsequently fixed with 4 different techniques:

1. Modified TBW
2. Cannulated lag screws (CLS) only
3. CLS with PermaTape suture
4. CLS with TBW

Tension was applied to the constructs via polyester straps with a Shimadzu tensile machine to replicate the forces on a patella until failure occurred. Indications of failure included a plunge in the force-displacement curve, a fracture gap exceeding 2mm or failure of the saw-bone itself.

#### **Results / Discussion**

TBW withstood the smallest load of 534.54±114.63 N. Comparatively, CLS with TBW(D) had the highest failure load of 1017.95±164.68 N. CLS with PermaTape(C) withstood a smaller load of 886.08±155.12 N. The difference in strength between construct C and D was not statistically significant. However, the cost price of a PermaTape suture is approximately 20 times more than a length of cerclage wire.

#### **Conclusion**

Lag screw fixation alone for transverse patella fractures is stronger than TBW. The CLS with TBW is a strong and cost-efficient technique for supplementing this fixation. It provides more stability than the traditional TBW constructs and reduces the risk of complications such as backing out of wires and implant prominence requiring removal and revision surgery.

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### **Anterior Shear Capitellum fracture in a 16-year-old male: Surgical Approach and Short-term Outcome**

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#### **Introduction / Objection**

Solitary capitellum fractures are rare in the pediatric population. If misdiagnosed or missed, it could significantly decrease elbow range of motion. There is no established treatment protocol due to very few reported cases. Here's a case of a 16-year old male who came to the ER due to elbow pain after falling on an outstretched hand. Examination revealed swelling and tenderness on the right elbow. Displaced anterior shear capitellum fracture was seen on lateral X-ray. CT scan showed extension to the trochlea. He underwent ORIF, using Herbert screws via the anterolateral approach. This illustrates presentation, diagnosis, treatment approach and short-term outcome of capitellar fracture in a 16-year-old male.

#### **Materials & Method**

He underwent ORIF via the anterolateral approach. Incision was made 5cm above the flexion crease over the lateral border of the biceps and curved along the crease continuing medially following the border of the brachioradialis muscle. Lateral cutaneous nerve of the forearm was identified and retracted. Plane between the brachialis and brachioradialis was developed. Radial nerve was identified and isolated. Anterior capsule was incised longitudinally. Reduction with provisional fixation with k-wires in AP direction was done and confirmed via c-arm. Pilot hole was created. The screws were inserted in the direction perpendicular to the fracture line.

#### **Results / Discussion**

He followed up at one, two, six, twelve, eighteen weeks and 9 months post-op noting improvement in elbow ROM and with signs of union on serial X-rays. Based on the MEPS system, he had good short-term functional outcome.

#### **Conclusion**

Although elbow fractures are common in the pediatric population, those involving the capitellum alone are rare. High index of suspicion with orthogonal imaging is necessary to diagnose capitellar fractures in pediatrics. CT scan allows further visualization of fracture extension. Anterolateral approach offers good exposure to the fracture site and fixation perpendicular to the plane could be easily achieved.

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### **Novel 3D printable PEEK-HA-Mg2SiO4 composite material for spine implants: biocompatibility and imaging compatibility assessments**

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#### **Introduction / Objection**

Current 'gold standard' (Titanium) for spine implants have high young's modulus which causes stress shielding and generates imaging artifacts. We aim to develop a novel 3D printable polyether ether ketone (PEEK)-hydroxyapatite (HA)-magnesium orthosilicate ( $Mg_2SiO_4$ ) composite material with enhanced properties for use in tumour, osteoporosis and other spinal conditions. We aim to evaluate biocompatibility and imaging compatibility of the material.

#### **Materials & Method**

Materials were prepared in three compositions, A: 75 weight % PEEK, 20 weight % HA; B: 70 weight% PEEK, 25 weight % HA; C: 65 weight % PEEK, 30 weight % HA; with 5 weight %  $Mg_2SiO_4$  in all. Biomechanical properties were analyzed as per ASTM standards and biocompatibility of the novel material was evaluated using indirect and direct cell cytotoxicity tests. Cell viability of the novel material was compared to PEEK and PEEK-HA materials. CT & MR imaging compatibility of the novel material cage were evaluated using a phantom setup.

#### **Results / Discussion**

A resulted in optimal material processing to obtain a 3D printable filament, while B & C resulted in non-optimal processing. Biocomposites exhibited linear elastic characteristic under bending load. A enhanced cell viability up to ~20% compared to PEEK and PEEK-HA materials. Our material induces bioactivity thus avoiding the risk of delamination. Composite A cage generated minimal/no artefacts on CT & MR imaging and were comparable to that of PEEK and PEEK-HA cages. This facilitates improved RT planning and delivery.

#### **Conclusion**

A demonstrated superior bioactivity and comparable imaging compatibility vs PEEK and PEEK-HA materials. Our biocomposite has Young's modulus comparable to that of cortical bone, facilitating reduction in stress shielding. Therefore, our material displays an excellent potential to manufacture spine implants with enhanced mechanical and bioactive property. This novel material is predicted to improve osseointegration and reduce the chances of construct loosening/implant failure in MSTs and osteoporotic fixations.

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#### **Semaphorin 3f regulates bone homeostasis**

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**Name of Presenting Author:** Qian Huang

**Institution:** Guangxi Medical University

#### **Introduction / Objection**

Paracrine interactions between cells are decisive bone homeostasis regulations in addition to hormonal control<sup>1</sup>. There is growing evidence that bone also controlled by neuronal regulators, such as semaphorin. But the role of the semaphorin family in the maintenance and regulation of bone homeostasis has not yet been clarified.

#### **Materials & Method**

*Sema3f*-KO mice (Strain NO.T019165) were used for observation of bone mass phenotype which purchased from GemPharmatech (Nanjing, China). All mice were maintained in a C57BL/6J background under specific-pathogen free conditions. Mice were maintained in a temperature and humidity-controlled room on a 12 h light cycle with ad libitum access to water and standard laboratory chow diet. All animal experiments were approved by the Institutional Animal Care and Use Committee of Guangxi Medical University.

#### **Results / Discussion**

Here we identify that semaphorin 3f (*Sema3f*) acts as osteoprotective role by inhibiting osteoclastic bone resorption and promoting osteoblastic bone formation. *Sema3f* KO mice exhibit a bone loss phenotype. Immunohistochemical analyses indicate an increase in osteoclasts and a decrease in osteoblasts in bone of *Sema3f* KO mice. In addition, single cell transcriptome sequencing analysis of bone marrow based on previous reports reveals endothelial cells as a major source of *sema3f* protein in bone marrow.

#### **Conclusion**

Thus, our study suggests that *sema3f* may serve as a promising therapeutic target for orthopedic-related diseases such as osteoporosis.

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#### **MPC inhibitor MSDC-0160 in preventing type 2 diabetic osteoporosis by reducing ROS production through regulating the TCA cycle**

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**Name of Presenting Author:** Chaofeng Wang

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#### **Introduction / Objection**

Diabetic osteoporosis (DOP) is a disease of bone loss secondary to diabetes mellitus, in which patients often present with fragility fractures and a delayed fracture prognosis<sup>1</sup>. This imbalance in bone homeostasis is often closely associated with osteoclast overactivation. The mitochondrial pyruvate carrier (MPC) is located on the inner mitochondrial membrane and regulates the energy required for osteoclast metabolism<sup>2</sup>. MSDC-0160, as an MPC inhibitor, has been shown in clinical trials to have hypoglycemic effect and its effect is not different from that of pioglitazone, an insulin sensitizer used in clinical practice<sup>3</sup>. This suggests that MSDC-0160, as a preclinical drug, not only treats diabetes, but may also ameliorate diabetic bone loss by modulating MPC activity.

#### **Materials & Method**

We constructed a mouse model of type II diabetes induced by STZ in combination with a high-fat diet to detect osteoclast differentiation as well as mouse bone mass. The experimental procedures for the mouse studies involved in the experiments followed the standards of treatment for laboratory animals established by Guangxi Medical University and approved by the Committee on Animal Health and Welfare of the Committee.

#### **Results / Discussion**

Our study demonstrates that bone loss occurring in type II diabetic mice is associated with osteoclast activation and that MPC play a key role in osteoclast differentiation and maturation. MSDC-0160, as a novel insulin sensitizer, can inhibit osteoclast differentiation and function while lowering blood glucose by regulating the activity of pyruvate transporter thereby improving bone loss.

#### **Conclusion**

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#### **Efficacy of Knee Ankle Foot Orthosis in Congenital Talipes Equinovarus Walking Age Patients**

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#### **Introduction / Object**

Ponseti method for clubfoot is golden standard of care due to its high rate of success. Reports has shown that failures of Ponseti method is mainly due to non-compliance with the foot abduction orthosis, especially in walking age patient. Knee Ankle Foot Orthosis (KAFO) is believed in improved compliances and thus fewer recurrence due its enability to walk. This study was designed to determine the prevalence, clinical outcome, and functional outcome of the use of KAFO in walking-aged CTEV patients.

#### **Materials & Method**

This is an observational study with cross-sectional design, conducted between February 2021-February 2022 at the Orthopaedic Polyclinic of Ciptomangunkusumo Hospital in Jakarta. We collected data from 40 patients with age range 12-72 months. PIRANI and NWDP scores was used to measures the deformity and functional scoring.

#### **Results / Discussion**

There was a significant relationship between the age of starting the use of KAFO with functional outcomes ( $p = 0.047$ ) and the PIRANI score ( $p < 0.001$ ) post-KAFO usage. In addition, there was a significant relationship between the duration of KAFO usage with functional outcomes ( $p = 0.049$ ) and PIRANI score ( $p < 0.001$ ) post-KAFO usage. There is a significant relationship between the age of starting KAFO use and duration of KAFO use with functional outcomes and PIRANI scores after using KAFO. This shows a higher relapse rate in older children or late in the treatment of CTEV.

#### **Conclusion**

Recurrence is still a challenge for clubfoot treated using Ponseti method. Enhanced adherence to the Foot abduction orthosis using KAFO in the maintenance phase of CTEV treatment in children of walking age is also well-marked in this study.

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#### **Influence of pre-operative and early post-operative Range of Motion parameters on long term Range of Motion after Total Knee Arthroplasty**

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#### **Introduction / Object**

The range of motion after a total knee replacement (TKR) affects the clinical and functional outcomes for patients. This study aims to assess the influence of pre-operative and early post-operative range of motion (ROM) measures on the impact of ROM at 2 years post-TKR.

#### **Materials & Method**

540 patients who underwent primary, unilateral TKR between 2017 to 2020 were retrospectively reviewed. These patients' pre-operative and 3, 12 and 24 months post-operative data were accessed from our institute's knee arthroplasty database. Baseline characteristics were analysed, and various ROM measures (flexion, fixed flexion deformity (FFD), extensor lag, arc of motion) were recorded. Thereafter, multiple linear regression was performed to assess the impact of various ROM measures on 2 year ROM results.

#### **Results / Discussion**

The presence of pre-operative FFD resulted in significantly lower ROM at 2 years post-TKR ( $113.69 \pm 13.79$  vs  $117.44 \pm 12.86$ ,  $p=0.004$ ). Posterior Stabilised (PS) knees had higher ROM compared to Cruciate Retaining (CR) and Highly Congruent Liners (Medial Congruent (MC) and Condylar Stabilised (CS)) ( $116.37 \pm 13.64$  vs  $113.94 \pm 12.37$  vs  $112.22 \pm 13.97$  respectively,  $p=0.03$ ). Correlation was performed and revealed that pre-operative as well as early (i.e. 3 month) flexion, arc of motion and FFD had significant impacts on ROM at 2 years (all  $p < 0.001$ ). Subsequently, a multiple linear regression model produced using the above variables statistically significantly predicted 2 year ROM,  $F(6, 533) = 46.200$ ,  $p < 0.001$ , adjusted  $R^2=0.335$ . 3-month knee flexion post-TKR had the most significant impact ( $B=0.515$ ,  $p < 0.001$ ).

#### **Conclusion**

In terms of pre-operative factors, pre-operative FFD had the greatest impact on long-term ROM. The type of constraint used also affected ROM, with the use of PS resulting in higher ROM at 2 years as compared to CR or HCL. In terms of various ROM measures, knee flexion at 3-months post-TKR had the most significant impact on ROM at 2 years post-TKR.

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#### **The use of 3D-printed osteotomy jig for minimally invasive limb reconstruction surgery in Charcot foot - a case report**

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#### **Introduction / Object**

Correction of the bony deformity in Charcot neuroarthopathy of the foot continues to pose a significant challenge. We present a case using 3d printing to aid with surgery for a patient with a Charcot foot deformity and mid foot collapse.

#### **Materials & Method**



After obtaining fine-cut CT scans of the foot, the DICOM images are segmented and a 3D model is created using a Computer-Aided Design (CAD) software and printed. After analysis of the deformity, a 3D printed biplanar osteotomy jig is designed on the CAD software and printed. Verification of the fit of the osteotomy jig is then performed on the 3D model prior to sterilisation. Intra-operatively, a minimally invasive incision is made to fit the jig onto the bone and an osteotomy performed. A Butt frame is applied to perform gradual correction of the midfoot deformity in accordance to the principles of distraction osteogenesis over a 6 week period. Upon completion of the correction, a 2nd stage surgery is performed to prepare fusion surfaces and stabilise the foot using beam screws with concurrent frame removal.

#### **Results / Discussion**

The advantage of this technique is that it is minimally invasive. With the use of a custom jig to perform the osteotomy, traditional open surgery can be avoided. Coupled with a hexapod to perform a 3D correction and beam screws to stabilise the foot, the soft tissue violation is significantly reduced, maintaining biology to the foot. However, this technique requires a two stage surgery and significant pre-operatively preparation.

#### **Conclusion**

Minimally invasive two-stage Charcot foot surgery using 3D printing technology may be a viable alternative to traditional open surgery with the ability reduce soft tissue violation. Further studies are needed to validate this finding and refine this technique.

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#### **The Efficacy of calcaneal stop procedure to treat flexible flat foot(FFF) in children**

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#### **Introduction / Objection**

Flatfoot is a common deformity and becomes symptomatic, like gait disturbance, several treatment options are available. Calcaneal stop procedure is one of the option for FFF with minimal invasive surgery method. The purpose of this study is to evaluate the efficacy of calcaneal stop procedure in FFF

#### **Materials & Method**

Patients with flexible flat foot who were treated with calcaneal stop procedure was enrolled from 2020 to 2022. A single center, prospective case included 12 patients (8 males, 4 females) with 23 feet (11 both feet, 1 unilateral foot). The outcome was evaluated by anteroposterior(AP) talo-1st metatarsal angle(AP T1MTA), talo-navicular coverage angle(TNCA) in AP foot standing radiograph, lateral meary angle(LMA), calcaneal pitch angle(CPA) in lateral foot standing radiograph. These images are taken before the surgery, immediately after the surgery, and at the last follow-up time.

#### **Results / Discussion**

Mean age at operation was 9 years old (range 5-16) and mean follow-up period was 21 months. In AP radiograph, Mean AP T1MTA was 26.2 preoperatively and 6.2 postoperatively, 9.4 in last follow-up. Mean TNCA was 36.0 preoperatively and 20.0 postoperatively, 22.6 in last follow-up. In Lateral radiograph, Mean LMA was -19.4 preoperatively and -10.7 postoperatively, -11.1 in last follow-up. Mean CPA was 11.6 and 13.3 postoperatively, 13.5 in last follow-up.

#### **Conclusion**

In terms of radiological parameters (AP T1MTA, TNCA, LMA, CPA) to evaluate the flat foot deformity, all results showed improvement immediately after surgery and at the last follow-up examination when compared to before surgery.

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#### **Looking back to move forward: revisiting the Fish cuneiform osteotomy for SCFE (Slipped Capital Femoral Epiphysis)**

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#### **Introduction / Objection**

The vascular anatomy of the proximal femur creates a challenging scenario in which procedures designed to address the deformity induced by a Slipped Capital Femoral Epiphysis (SCFE) place the lateral epiphyseal structures at risk. Multiple surgical options have been described over the past 50 years with varying degrees of success. The purpose of this study was to retrospectively assess our outcomes with the Fish Cuneiform Osteotomy for the treatment of SCFE.

#### **Materials & Method**

Between June 2018 and January 2023, 13 unstable severe SCFEs were realigned using the technique originally described by Fish in 1984. A post-subcapital realignment Southwick angle of <30° or "Mild" slip angle deformity was accepted, and post-operative CTs were obtained to confirm deformity correction in the axial plane. All patients had a minimum follow-up of 6 months with surveillance by serial X-rays and PROMs.

#### **Results / Discussion**

No hips demonstrated avascular necrosis (AVN), with maintenance of femoral head sphericity. Two femoral heads demonstrated chondrolysis. There were no unplanned returns to theatre. All patients returned to their pre-morbid level of activity by the 6-month mark.

#### **Conclusion**

The dual-approach Fish cuneiform osteotomy technique demonstrates promise as an effective treatment method for severe unstable SCFE with favourable rates of AVN and minimal complications.

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#### **Classification and Regression Tree (CART) model using machine learning to predict a patient's discharge destination post Total Knee Arthroplasty**

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### **Introduction / Objection**

Total Knee Replacement (TKR) remains one of the most frequently performed and successful Orthopaedic procedures. Recovery after TKR has seen significant improvements with the development and implementation of Early Recovery After Surgery (ERAS) protocols, enabling patients to be discharged earlier. However, a proportion of patients still require a prolonged hospital stay or further rehabilitation at a community hospital (CH). Our study aimed to develop an algorithm using machine learning to predict a patient's likely discharge destination.

### **Materials & Method**

Retrospective data was collected for patients who underwent primary unilateral TKR for osteoarthritis between January 2021 to June 2023. The population was divided based on their discharge destination – home or community hospital (CH). Patient characteristics including demographic data, method of knee replacement, baseline functional scores (Knee Society Score (KSS), Oxford Knee Score (OKS), EQ-5D) were collected. The collected data was imputed through a Multivariate Imputation via Chained Equations (MICE). A decision tree analysis was computed using recursive partitioning and regression trees machine learning analysis and optimization of the model was a balance between the complexity of parameters and clinical interpretability.

### **Results / Discussion**

900 patients were included in this study, of which 729 patients discharged home and 171 patients went to CH. CART analysis created via machine learning found that age  $\geq 85$ , BMI  $> 33$ , KSS  $< 67$ , OKS  $< 20$ . OKS specific questions 5 and 8  $\leq 1$  were significantly associated with a patient going to CH. Each terminal node of the decision tree was given a probability of a patient going to CH. The model presented a sensitivity of 91.8% and specificity of 98.8% based on the sample population.

### **Conclusion**

We were able to develop a model to predict a patient's likely discharge destination post TKR. With this knowledge, we can identify patients who may require CH placement early, look to streamline the transfer process and hence facilitate better recovery.

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### **Treatment of Idiopathic and Non-idiopathic Clubfoot Using the Ponseti Method: A Comparison of Outcome**

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### **Introduction / Objection**

We retrospectively reviewed the results of serial casting between patients with Idiopathic Clubfoot and Arthrogyposis. All patients underwent serial casting using the Ponseti method and were followed up until they were put on a foot abduction splint or advised clubfoot surgery correction (excluding percutaneous achilles tendon tenotomy).

### **Materials & Method**

Thirty-nine patients with 60 clubfeet were identified via a retrospective review of records. Forty-one feet were included in the group diagnosed with idiopathic clubfoot (ICF), and nineteen feet were included in the group diagnosed with arthrogyposis (AG).

### **Results / Discussion**

There was a significant difference in mean cast changes between the ICF group (10) and the AG group (14). Both groups had an average mean improvement of 2 grades in the Pirani score after serial casting. Only 2(4.9%) feet in the ICF group and 8(42%) in the AG group had poor outcome that led to surgery. Odds for poor outcome showed patients with arthrogyposis were 23 times more likely to be operated on than those patients with idiopathic clubfoot. Those with poor outcomes in ICF group all underwent a simple posterior release of the feet. 4 patients in the AG group who were operated on had a posterior release while the other four had a more extensive posteromedial release.

### **Conclusion**

Although it takes more cast changes for patients with arthrogyposis, serial casting using the Ponseti method is effective for both arthrogyposis and idiopathic clubfoot. Of those who had a poor outcome after serial casting, majority ended up with only a simple posterior release instead of the more extensive procedures like posteromedial releases.

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### **A good index surgery for congenital pseudoarthrosis of the tibia minimizes eventual leg length discrepancy following treatment**

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### **Introduction / Objection**

Congenital pseudoarthrosis of the tibia (CPT) have classically been a difficult condition to manage given that the conventional surgical methods yielded less-than-ideal results, with refracture rates averaging 50%. Secondary complications as a result of failure of treatment include leg length discrepancy or deformities of the ankle and foot.

### **Materials & Method**

This is a multi-centre retrospective study involving two institutions. All patients with CPT that were surgically managed between 2009 to 2020 were included. The patients were categorized into 2 groups. Group 1 patients underwent combined treatment by cross-union of the tibia and fibula, autologous iliac bone grafting, and plate internal fixation, and Group 2 patients underwent excision of hamatoma with or without intramedullary nailing, but without cross-union of the tibia and fibula. Statistical analyses were performed to compare the two groups of patients.

### **Results / Discussion**

A total of 36 patients were included. The mean age at surgery was 5.3 years (range: 2.2 to 10 years). The mean follow-up period was 5.5 years (range: 2.1 to 13.2 years). There were 15 patients (41.6%) in Group 1, and 21 patients (48.4%) in Group 2. All patients in Group 1 had complete cross-union, with a mean duration to radiologic union of 2.6 months. In comparison, 7 patients (33.3%) in Group 2 had refractures or non-union which needed cast immobilization or secondary surgery ( $p <$

0.01). None of the patients in Group 1 had a limb length discrepancy at final follow-up, while 5 patients (23.8%) in Group 2 had leg length discrepancy which required subsequent epiphysiodesis or limb lengthening ( $p < 0.05$ ).

#### **Conclusion**

A good index surgery for CPT minimizes refracture rates and need for secondary or repeated surgeries. Longitudinal follow-up of our series of patients demonstrated good leg length growth as a result of a successful index surgery.

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#### **Exosome Augmentation Enhances Healing In Primary Repair Of Anterior Cruciate Ligament Tears**

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#### **Introduction / Objection**

Anterior cruciate ligament (ACL) reconstructions are increasingly performed in children and adolescents. Even with physal-respecting surgery, growth disturbance remains a concern and ACL graft ruptures continue despite advancements in surgical technique and graft choice. With the improved understanding that mesenchymal stem/stromal cells (MSCs) mediate tissue repair through paracrine factors instead of replacing damaged cells through their differentiation potential, we hypothesize that MSC exosomes delivered with a fibrin sealant can enhance ACL primary repair, and aim to investigate its efficacy in a rabbit model.

#### **Materials & Method**

12 rabbits with surgically created ACL tears were randomly allocated to: (1) fibrin sealant and MSC exosomes (TISSEEL+Exosomes), and (2) fibrin sealant and phosphate-buffered saline (TISSEEL+PBS) groups ( $n=6$ /group). 400 $\mu$ l of either 200 $\mu$ l TISSEEL with 200 $\mu$ g exosomes in 200 $\mu$ l PBS, or 200 $\mu$ l TISSEEL with 200 $\mu$ l PBS were applied to the ACLs after suture repair. Analyses were performed at 6 weeks using magnetic resonance imaging (MRI), and at 12 weeks with MRI, histology, and immunohistochemistry. Cell cultures were performed to investigate cellular reparative processes.

#### **Results / Discussion**

5 of 6 rabbits in the TISSEEL+Exosomes group showed sustained ACL healing on MRI from 6 to 12 weeks, compared to 1 of 6 rabbits in the TISSEEL+PBS group. Histologically, the TISSEEL+Exosomes group showed morphological restoration of ligamentous integrity and rich deposition of Type I collagen similar to the native ACL, compared to the TISSEEL+PBS group which had mainly Type III collagen. On cell cultures, MSC exosomes showed (i) dose-dependent enhancement of cell metabolic activity ( $p=0.002$ ), proliferation and migration ( $p<0.001$ ), (ii) suppressed ACL matrix degradation and enhanced collagen synthesis ( $p=0.015$ ), and (iii) upregulated gene expression for proliferation and migration (PCNA, FGF-2;  $p<0.001$ ), and matrix synthesis (COL3A1, COL5A1, TGF- $\beta$ 1;  $p<0.001$ , Tenascin C, Decorin;  $p<0.01$ ).

#### **Conclusion**

MSC exosomes with fibrin sealant biologically enhance primary ACL repair by augmenting ACL cell functions.

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#### **Retrospective Single-Surgeon Review of the Safety and Learning Curve of Direct Anterior Approach in Hip Hemiarthroplasty for Femoral Neck Fractures**

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#### **Introduction / Objection**

Hemiarthroplasty of the hip is a commonly performed surgery in elderly patients with femoral neck fractures. While there are numerous approaches to the hip for a hemiarthroplasty, the Direct Anterior Approach (DAA) is viewed as a minimally invasive approach owing to the use of an intermuscular and internervous plane of tissue. However, the DAA has been described as being technically challenging with a greater learning curve and risk of intraoperative complications, especially on the femoral side. This study aims to analyze the safety and learning curve of the DAA in hip hemiarthroplasty for femoral neck fractures.

#### **Materials & Method**

A retrospective review of patients who sustained a femoral neck fracture and underwent a hemiarthroplasty of the hip via a DAA between August 2020 and July 2023 was conducted. Data on patient demographics, surgical characteristics, operative duration and perioperative complications were collected and analyzed. A Cumulative Sum (CUSUM) analysis was performed to study the learning curve in utilizing a DAA for hemiarthroplasty of the hip.

#### **Results / Discussion**

The series consisted of 60 patients (19 males, 41 females) with a mean age of 79.6 years. The average operative duration was 122 minutes. The rate of perioperative complication was 6.67% with 4 patients facing complications – greater trochanteric tip fracture not requiring fixation (case 13), closed anterior dislocation (case 14), calcar fracture requiring cable fixation (case 34) and sciatic neuropathy (case 54). CUSUM analysis showed that the learning curve could be overcome after the first 22 cases.

#### **Conclusion**

This study provides valuable insights into the safety and learning curve associated with the direct anterior approach to hip hemiarthroplasty for femoral neck fractures. The perioperative risk in performing a DAA remains low and the learning curve can be quickly overcome compared to DAA in total hip hemiarthroplasty. Adoption of the DAA is complementary to a surgeon's journey with hip hemiarthroplasty procedures.

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#### **Complication Rates in Hip Hemiarthroplasty: A Comparative Analysis of the Direct Anterior Approach and Alternative Surgical Approaches**

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### **Introduction / Objection**

Hip hemiarthroplasty is a common surgical procedure for femoral neck fractures with the option of numerous surgical approaches to the hip. The direct anterior approach (DAA), known for its potential benefits in early recovery, is gaining popularity among surgeons. However, concerns regarding increased complications in the DAA compared to other approaches do exist, especially femoral sided complications. This study conducts a comparative analysis between the DAA and other traditional approaches such as the posterior and lateral approaches to evaluate the complication rates.

### **Materials & Method**

A retrospective review of patients who sustained a femoral neck fracture and underwent a hip hemiarthroplasty via a DAA between August 2020 and July 2023 was conducted. Data on patient demographics, surgical characteristics and perioperative complications were collected and analyzed. The rate of complications for the DAA were compared to that of the posterior and lateral approaches described in the literature.

### **Results / Discussion**

The series consisted of 60 patients (19 males, 41 females) with a mean age of 79.6 years. The rate of perioperative complication was 6.67% with 4 patients facing complications – greater trochanteric tip fracture not requiring fixation (case 13), closed anterior dislocation (case 14), calcar fracture requiring cable fixation (case 34) and sciatic neuropathy (case 54). The literature describes a complication rate of 6.9 – 12% with a lateral approach and 7.8 – 8% with a posterior approach.

### **Conclusion**

The direct anterior approach for hip hemiarthroplasty does not result in an increased rate of complication as compared to the posterior and lateral approaches, and therefore can be safely utilized.

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### **Spacer and Peri-spacer Fractures – the Ultimate Fate of Distal Femur Cement Spacer Left in-situ for Several Years**

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### **Introduction / Objection**

Antibiotic impregnated cement spacers are commonly used in two-staged revision surgery for prosthetic joint infections (PJI). Despite good outcomes, morbidity associated with spacer-related complications remain a concern. The long-term safety profile and longevity of cement spacer implants have not been well established.

We present a rare case of concomitant cement spacer and peri-spacer fractures occurring in a patient seven years after initial first-stage revision knee arthroplasty, and discuss the technical challenges and management of this patient.

### **Materials & Method**

A 64-year-old lady was treated with antibiotic cement spacer for a recurrent total knee replacement PJI. She recovered well following the first-stage of surgery but refused to undergo the second-stage and was lost to follow-up. She re-presented seven years later with knee pain following mechanical fall. Evaluation showed a displaced transverse distal femoral fracture with concomitant fracture of the femoral spacer component. The patient underwent revision knee arthroplasty with megaprosthesis. She recovered well and was able to ambulate independently with walking frame with range of motion of 0-110 degrees.

### **Results / Discussion**

Spacers are typically left in-situ for few months to allow PJI to be treated with culture-directed antibiotics and skin wounds to heal. They can be left longer than expected due to continued infection or inability to complete second-stage revision. Prolonged loading of the cement spacers leads to progressive implant fatigue and bone wear predisposing to implant loosening, spacer or peri-spacer fractures. Our patient ambulated with an articulating cement spacer for seven years without major issues, culminating in a distal femur peri-spacer fracture and femoral component spacer fracture following low-energy trauma.

### **Conclusion**

Regular evaluation for development and progress of bone wear and implant fatigue are recommended in patients with prolonged retention of cement spacers. Clinicians must take care to expect considerable amount of bone loss during conversion TKA in patients with prolonged retention of articulating cement spacers.

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### **Roquin1 maintains bone mass by repressing mitochondrial biogenesis in osteoclasts**

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### **Introduction / Objection**

Over-activated osteoclasts cause exorbitant bone resorption, resulting in osteoporosis(1). OCs are mitochondrial-rich multinucleated cells, origin from bone marrow monocytes/macrophages (BMMs)(2). Roquin1, encoded by Rc3h1, is an RNA-binding protein which directly interacts with specific stem-loop structural elements within 3' untranslated regions of its target genes(3, 4). Roquin1 is a major regulator of cellular iron homeostasis through the limits the expression of Tfr1, encoded by TFRC (5). However, it's unknown that whether roquin1 play an important role in regulating the mitochondrial biogenesis and energy metabolism in osteoclasts and bone or not. We show that the bone loss is obvious in roquin1 deficiency mice. In line with the in vivo observation, roquin can repress the osteoclast activation.

### **Materials & Method**

We used the flox/flox-cre system to generate the Rc3h1 knock out mice. Briefly, we crossed Rc3h1<sup>fl/fl</sup> mice with Lyz2-Cre and Ctsk- cre knock-in mice to obtain the myeloid-specific and differentiated-osteoclast Rc3h1 knock out mice. For osteoclast formation in vitro, BMMs (6 ×10<sup>3</sup> cells per well) were seeded in 96-well plates. After adhesion, RANKL (25 ng/mL), M-CSF were applied to the cells. Every other day, the medium was renewed until mature OCs developed.

### **Results / Discussion**

Deficiency of Rc3h1 in osteoclast precursors and differentiated OCs results in decreased bone mass and enhanced osteoclastogenesis. Rc3h1 knockout increased the tfr1 expression . mitochondrial biogenesis increased in Rc3h1 deficient osteoclasts .

## Conclusion

In conclusion, this study was the first to demonstrate that Rc3h1 loss can cause bone loss in male and female mice. And Rc3h1 can repress osteoclasts maturation via decrease mitochondrial biogenesis.

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### Does intra-operative cell-salvaged autologous blood transfusion in metastatic spine tumour surgery improve long-term clinical outcomes: A prospective clinical study

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#### Introduction / Objection

Allogeneic blood transfusion (ABT) is the current standard of blood replenishment for metastatic spine tumour surgery (MSTS) despite known complications. Salvaged blood transfusion (SBT) addresses majority of complications related to ABT. However, surgeons remain reluctant to employ SBT in MSTS despite ample laboratory evidence. This can be due to a current lack of literature regarding the long-term outcomes of SBT in MSTS patients. This prompted us to conduct a prospective clinical study to ascertain the long-term clinical outcomes of intra-operative cell salvage (IOCS) in MSTS.

#### Materials & Method

Our prospective study included 98 patients who underwent MSTS from 2014 to 2017. Demographics, clinical findings, tumour characteristics, modified Tokuhashi score, operative and blood transfusion (BT) details were recorded. Patients were divided based on BT type: no blood transfusion (NBT), ABT or SBT. Primary outcomes assessed were overall survival (OS) and tumour progression, evaluated using RECIST (v1.1) employing follow-up radiological investigations up to 48 months/

#### Results / Discussion

Our study had a total of 98 patients with a mean age of 64 years. Median follow-up and survival were 30 and 21 months respectively. All BT groups were comparable for demographics and tumour characteristics ( $p=0.648$ ). Median blood loss and BT was 647 mL and 900 mL respectively. 32 (32.7%) patients received SBT, 39 (39.8%) ABT and 27 (27.5%) NBT. Females had lower OS and higher risk of tumour progression. SBT had better OS and reduced risk of tumour progression than ABT. Total blood loss was not associated with reduced overall survival or tumour progression. Infective complications other than SSI were significantly ( $p = 0.023$ ) higher in ABT than NBT/SBT groups.

#### Conclusion

Patients of SBT had OS and tumour progression that was better than ABT/NBT groups. This is the first long term clinical study to report on the clinical outcomes of SBT in comparison with control groups in MSTS.

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### Quality of cementing in hemiarthroplasty for elderly neck of femur fractures does not affect short term functional outcomes

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#### Introduction / Objection

Cemented hip hemiarthroplasty is a common surgical treatment for elderly neck of femur (NOF) fractures. It is uncertain if the quality of cementing has any effect on functional outcomes. The aim of this study was to determine if the quality of cementing would affect short term functional outcomes in elderly neck of femur fractures.

#### Materials & Method

Retrospective analysis of 637 cemented hip hemiarthroplasties from 2014 to 2021 was performed. Each post-operative radiograph was double-read by 2 authors (1 resident and 1 fellowship trained surgeon) to determine quality of cementing via the Barrack grading. Disagreements were reviewed by a third reader. Cement grades were grouped as "Optimal" (Barrack grade A-B), or "Suboptimal" (Barrack grade C-D). Functional outcomes were compared using mobility (community- or home-ambulant), assistance required for mobility, and Modified Barthel Index (MBI).

#### Results / Discussion

There were 429 "Optimal" and 208 "Suboptimal" cases of cementing performed. There was no difference in age, American Society of Anesthesiologists score, mobility, assistance required, and MBI score pre-operatively ( $p>0.05$ ). Patients in the "Suboptimal" cementing group had a higher Charlson Comorbidity Index (CCI) score ( $p<0.001$ ). At 1 year post-operation, there was no significant difference between "Optimal" and "Suboptimal" cementing with regards to the proportion of community ambulators (30.2%vs.25.7%, $p=0.252$ ), walking independence (independent walkers (19.8%vs.17.3%), independent walkers with aids (41.3%vs.42.1%), walker with caregiver assistance (29.2%vs.33.7%), wheelchair-bound (9.6%vs.6.9%),  $p=0.478$ ), and distribution of MBI score (81.1%vs.82.2% achieving MBI $>60$ , $p=0.767$ ). There was no significant difference in the proportion of patients with postoperative delirium (7.9%vs.5.8, $p=0.324$ ) or 1-year mortality rates (3.5%vs.2.9%, $p=0.685$ ). The kappa value for inter-reader agreement was "substantial" at 0.727 (95% CI: 0.682-0.772) ( $p<0.001$ ).

#### Conclusion

Quality of cementing in cemented hip hemiarthroplasty for elderly NOF fractures does not affect the short-term functional outcomes. Surgeons should not be pressured to pursue the perfect cementing radiograph in these patients with fragility fracture.

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### Medial Congruent with Posterior Cruciate Ligament resected achieves similar 1 year outcome as Posterior Stabilised Total Knee Arthroplasty

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## Introduction / Objection

Comparisons have been previously made between medial pivot total knee arthroplasty (TKA) systems and the posterior stabilized (PS) systems. However, majority of these studies utilized a medial pivot system with variable polyethylene designs dependent upon the resection of the posterior cruciate ligament (PCL). Conversely, the Medial Congruent (MC) TKA maintains a consistent polyethylene design irrespective of the PCL status. Presently, the superiority of MC TKA over PS TKA remains undetermined.

## Materials & Method

A retrospective review of a single-surgeon's registry data comparing 45 MC with PCL resected (MC-PCLR) and 44 PS TKAs were performed.

## Results / Discussion

Both group has similar baseline demographics in terms of gender (68% vs 73% female,  $p=0.60$ ), BMI ( $26.4 \pm 5.7$  vs  $28.3 \pm 5.1$ ,  $p=0.81$ ) and American Society for Anaesthesiology score (75% vs 84% score of 2,  $p=0.12$ ), with the exception of age where the PS group is significantly greater ( $71 \pm 8$  vs  $66 \pm 7$  years,  $p<0.01$ ). There was no significant difference in range of motion (ROM), Oxford Knee Score (OKS), Knee Society Scoring System (KS) Function Score (KS-FS) and KS Knee Score (KS-KS) for all time periods except for one time stamp where preoperatively, the preoperative KS Knee Score (KS-KS) was significantly lower in the PS group.

However, when comparing the change between KS-KS of pre-operation and 3 months post operation ( $44 \pm 18$  vs  $31 \pm 18$ ,  $p<0.01$ ), and pre-operation and 1 year post operation ( $46 \pm 16$  vs  $34 \pm 17$ ,  $p<0.01$ ), it is found to be significantly higher in the PS group for both time periods.

All other comparisons between the three time periods were found to have similar parameters.

## Conclusion

PS and MC-PCLR demonstrates similar outcomes at the 1-year mark. However PS exhibits a faster rate of improvement from pre-operation to 3 months as compared to MC-PCLR.

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## Routine Postoperative Full Blood Count is not Necessary with Modern Day ERAS Protocols after Unilateral Knee Arthroplasty

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## Introduction / Objection

Routine full blood count (FBC) tests are commonly performed after unilateral knee arthroplasty surgery. This study aims to evaluate postoperative transfusion rates and identify its risk factors.

## Materials & Method

All patients who underwent primary unilateral knee arthroplasty between August 2017 to July 2022 in a single tertiary institution in Singapore were recorded. Patients clinical data and progress were retrospectively collected. Descriptive analysis and univariate analyses were performed. Multivariate binary logistic regression was computed using variables with significant outcomes identified in univariate analysis.

## Results / Discussion

A total of 2489 patients were included in this study. Preoperative haemoglobin (Hb) was  $13.3 \pm 2.63$  g/dL while postoperative Hb was  $11.87 \pm 1.49$  g/dL, and estimated blood loss was  $96.78 \pm 70.30$  ml. Preoperative anemia was identified in 19% (457/2488) patients. 2.8% (70/2488) patients required transfusion after surgery, of which 78.7% (59/74) had preoperative anemia. Univariate analysis identified tranexamic acid (TXA), drain and tourniquet use, estimated blood loss and duration of surgery as risk factors of postoperative transfusion ( $p<0.05$ ). Multivariate logistic regression revealed that TXA (odds ratio 0.306,  $p=0.002$ ), drain use (odds ratio 5.30,  $p<0.001$ ), estimated blood loss (odds ratio 1.007,  $p<0.001$ ), surgery time (odds ratio 1.015,  $p<0.001$ ) and preoperative haemoglobin (odds ratio 0.240,  $p<0.001$ ) are significant risk factors of postoperative transfusion. Preoperative Hb  $\leq 12.05$ g/dL was the threshold value for predicting postoperative transfusion based on receiver operative characteristic (ROC) curve (sensitivity = 0.824, specificity = 0.851, area under curve = 0.892,  $p<0.001$ ).

## Conclusion

This study demonstrates low incidence of postoperative transfusion. Preoperative Hb, volume of intraoperative blood loss, duration of surgery, TXA administration and use of drain are significant predictors of postoperative transfusion. Preoperative Hb  $\leq 12.05$ g/dL is a strong predictor that patients will not require transfusion post-operatively. Hence, routine postoperative FBC after primary unilateral knee arthroplasty is not necessary and should only be considered in patients with these risk factors.

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## Is the Internal Rotation Stress Test Necessary in Pin Fixation of Pediatric Supracondylar Humerus Fractures?

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## Introduction / Objection

The Internal Rotation Stress Test (IRST) is commonly used intraoperatively to assess rotational instability during pin fixation of pediatric supracondylar humerus fractures. However, the necessity of this test in achieving optimal surgical outcomes remains unclear. The purpose of this study was to evaluate the utility of IRST by comparing outcomes of cases with and without rotational instability identified by IRST.

## Materials & Method

Medical records of patients who underwent surgical management of Gartland type 3, 4 pediatric supracondylar humerus fractures between 2015 and 2022 were reviewed. A total of 46 patients were included. All patients showed adequate anatomical reduction and stability on the routine external rotation lateral view. Group A refers to cases

with rotational instability identified by IRST, while the Group B refers to cases without rotational instability. We investigated whether there were differences in the surgical outcomes between the two groups immediately post-surgery and at three months post-surgery. We measured the radiographic indicator and compared clinical outcomes.

#### **Results / Discussion**

Mean age at diagnosis was 5.7 years (range, 3–11 years) and the mean follow-up duration was 2.8 years (range, 1.0 – 4.8 years). The patients in Group A were 24 and in Group B were 22. There was no difference in demographic data. We did not find any differences in the radiographic parameters and clinical scores between two groups. We thought that rotational force by abducting the shoulder 90 degrees and internally rotating the shoulder 90 degrees is extremely rare in daily life.

#### **Conclusion**

If satisfactory reduction is achieved in both the externally rotating lateral view and AP view, a positive result in the IRST does not have a significant impact on not only the radiologic outcome but also the clinical outcome.

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#### **A two-stage posteromedial release surgery for neglected Congenital Talipes Equinovarus (CTEV)**

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#### **Introduction / Objection**

A 12-year-old boy was referred to our centre for chronic deformity bilateral feet. Patient had defaulted treatment during infancy due to logistic and parental issues. Patient walked with dorsal aspect of his feet. The feet showed hyperkeratotic dorsal skin, with severe clubfoot deformity. We scheduled patient for posteromedial release surgery for both feet.

#### **Materials & Method**

Following Turco incision, the TA, tibialis posterior, flexor digitorum/hallucis tendons were identified and lengthened using Z-plasty. The posterior neurovascular bundle was then identified and mobilized. At this point, we noted that the posterior tibial artery (PTA) was located far anteriorly and tightly attached to tibial bone. The rest of structures were released afterward. Upon manipulation and casting post procedure, we identified that toe circulation of both feet was compromised with ankle in plantigrade. Therefore, we immobilized the feet with above knee cast and ankle in 30 degree plantarflexion (stage 1). 3 weeks later, we went in again for second manipulation and reapplication of cast with ankle in plantigrade (stage 2). Distal circulation of both feet was normal.

#### **Results / Discussion**

In this era, soft tissue release surgery of posteromedial structures is now reserved for neglected, resistant and complex cases. This procedure could jeopardize the blood supply to foot especially the PTA. Variations and insufficiency in pedal circulation in CTEV have been long acknowledged. Puri in a systematic review suggested 70% of CTEV patients have an anomalous pedal circulation, with the main blood supply is from the PTA (Puri et al., 2018). Imaging modalities such as arteriography, Doppler ultrasound and MRI are proposed as pre-operative adjuncts prior to surgery.

#### **Conclusion**

Malposition of PTA, tethering of the artery to the bone, and stretching of the vessel upon casting might lead to vascular injury during this surgery. Good knowledge on variation in pedal circulation, pre-operative serial casting and two-stage surgery are recommended.

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#### **A RARE CASE OF EXOPHYTIC ULCERATIVE JUVENILE XANTHOGRANULOMA (JXG) IN INFANCY**

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#### **Introduction / Objection**

Giant JXG is an infrequent variant of non-Langerhans cell histiocytosis. In this instance, we are sharing a case with a typical presentation of Giant JXG

#### **Materials & Method**

5-month-old child presented with a rapidly growing lesion on the upper calf with bleeding upon contact. The child had no significant prior medical history or systemic illnesses. Upon clinical examination, noted solitary fungating mass at the left proximal calf measuring 5cm x 4cm x 3cm, with red discoloration and bleeds upon touch. Imaging studies suggested infantile hemangioma. Surgical resection was performed, and the patient was discharged home a few days after the procedure. Histopathological examination showed the lesion was composed of histiocytes which are moderately pleomorphic with the presence of touton giant cells.

#### **Results / Discussion**

JXG represents a prevalent type of non-Langerhans cell histiocytosis commonly found in infant below 1 year old with spontaneous resolution over years. Some theories suggest the cause of JXG is a reactive condition. Histiocytes, foam cells and touton cells are seen histopathologically. Giant JXG (>2cm) It is the rare subtype, mostly exist at the cutaneous level around the head and neck region with solitary lesion. The commonest extracutaneous presentation is at intramuscular. Giant JXG has variety of clinical presentation. Yellowish plaque is the commonest presentation followed by nodular, nodular ulcerated and macular. Very rare that the Giant JXG presented with ulcer, tumour or exophytic lesion. According to Malika A. Ladha et al, 16% of 51 cases of Giant JXG experienced local symptoms either bleeding or pain. In situations involving extracutaneous lesions that are symptomatic, cases of incomplete resection, or unresectable lesion, a combination of approaches including surgery, chemotherapy, radiotherapy and immunosuppression can be beneficial.

#### **Conclusion**

The presence of an unusual exophytic giant JXG led to concerns about a potentially malignant soft tissue tumor. Surgical resection is advantageous for both cosmetic and accurate histopathological evaluation.

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#### **Knowledge, Attitude and Perception (KAP) of patients with regards to metallic implants usage in Orthopaedic surgery**

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### **Introduction / Objection**

Surgical implants are commonly used in Orthopaedic surgery. Both metallic and non-metallic implants can be used. It is currently not well established if modern patients prefer non-metallic implants over metallic implants. The aim of this study was to determine the knowledge, attitude and perception (KAP) of patients with regards to metallic implant usage during Orthopaedic surgery.

### **Materials & Method**

A questionnaire was designed to determine the KAP of metallic implant usage of outpatient Orthopaedic patients. 100 participants from a single institution were recruited. Demographic data was collected and participants answered questions involving misconceptions and facts of metallic implants to assess their KAP.

### **Results / Discussion**

The self-perceived awareness regarding metallic implants was low with a median score of 3 (IQR 1,9) (1 – unaware, 10 – fully aware). There was no difference between younger and older patients (> 50 years). Educational levels did not significantly affect self-reported or actual knowledge. 17% of the participants stated that they preferred to use non-metallic implants. The most significant concerns were surgical costs (51%), post-operation discomfort (50%) and potential immunogenic rejection of metallic implants (50%).

### **Conclusion**

There is a low rate of self-perceived awareness regarding metallic implants amongst patients. A significant percentage of patients would rather use non-metallic implants. Improved surgical counselling is recommended to reduce misconceptions regarding the use of metallic implants.

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### **A Novel Teaching Program for the Percutaneous Achilles Tendon Tenotomy for Children with Clubfoot**

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### **Introduction / Objection**

The percutaneous achilles tendon tenotomy in clubfoot may be one of the more challenging procedures to teach Orthopedic Trainees. Difficulties include the danger of the cutting the neurovascular bundle behind the medial malleolus, the condition of the child who may be struggling or is uncooperative and the inherent difficulty in the ability to describe the "feel of the cut" as the blade is pushed through the Achilles tendon.

### **Materials & Method**

A percutaneous achilles tendon tenotomy training program was devised. Training program included a lecture regarding the theoretical basis behind the tenotomy which included the visualization of the step by step procedure and a check list of what materials were needed. The second part of the program used a novel way of simulating the percutaneous achilles tendon tenotomy using chicken feet. This new teaching modality enables the trainee to get the "feel of the cut" using the chicken feet model. A questionnaire on the tenotomy training program was then given to all participants. The questionnaire involved feedback on the theoretical aspect (indication, material preparation and visualization of all steps of the procedure) and the practical aspect of the tenotomy (identification of landmarks, simulation of the feel of the cut)

### **Results / Discussion**

15 novice orthopedic resident physicians underwent the training program and answered the feedback questionnaire. Majority of them reported that the theoretical aspect of the program helped prepare them for the actual tenotomy in a child with clubfoot. Majority of them reported that the feel of the cut in the chicken tenotomy model was the same as the one in real child with clubfoot. All of them recommended this new training program to others who treat clubfoot.

### **Conclusion**

This novel teaching program helps prepare the trainee in terms of the theoretical and practical aspects of the percutaneous achilles tendon tenotomy procedure.

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### **An Analysis of Octogenarian Patients Undergoing Knee Replacement with Enhanced Recovery Protocols as Compared to Their Younger Counterparts**

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### **Introduction / Objection**

Enhanced Recovery After Surgery (ERAS) protocol for total knee arthroplasty has been widely adopted due to its success in reducing length of hospital and postoperative complication rate. The concern has remained over whether old age should be a criterion of exclusion. This study was conducted to determine the safety and outcomes of ambulatory TKA for octogenarians.

### **Materials & Method**

A retrospective study was conducted to compare length of hospital stay, complication rate, readmission rate, 3-month post-operative functional outcomes including Oxford Knee Scores (OKS) and Knee Society Clinical and Functional Scores (KSS and KSFS), and overall experiences of Asian patients aged 80 and above 1) for ambulatory surgery (n=16) and non-ambulatory surgery (n=36) 2) with the outcomes of their younger counterparts (n=147) using 2021-2023 data in the Tan Tock Seng Hospital Orthopedic Department Knee Registry Database. Minimal clinically important difference (MCID) cutoffs were 5 for OKS, 6.4 for KSFS and 5.9 for KSS. Patients were required to rate on a scale of 0 to 10 for satisfaction and whether the surgery had met their expectation.

### **Results / Discussion**

Clinically significant improvements were noted in 3-month post-op functional scores in the ambulatory octogenarian, non-ambulatory octogenarian, and ambulatory younger counterpart groups compared to preoperative functional scores respectively. The ambulatory octogenarian group has shorter length of stay, lower complication



and readmission rates, and better 3-month post-op functional score than the non-ambulatory octogenarian group. The ambulatory octogenarian group had longer length of stay, lower complication and readmission rates and comparable 3-month post-op functional scores to the ambulatory younger counterparts. Satisfaction rates and rates of expectation met were comparable between octogenarians and younger patients who went through ambulatory TKAs.

### Conclusion

Although ambulatory TKA is commonly advocated for younger patients, our study showed that in those above 80, ERAS TKA is non-inferior, and safe for carefully selected octogenarians.

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### Predictive factors of short inpatient stay following Total Knee Replacement (TKR)

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### Introduction / Objection

Enhanced Recovery after Surgery (ERAS) protocols adopt a multidisciplinary approach in perioperative care to reduce the length of hospital stay. This study aims to identify predictive factors that result in short inpatient stay following TKR with an ERAS program.

### Materials & Method

Retrospective analysis was performed on a consecutive series of patients who underwent unilateral TKR by a single surgeon in National University Hospital between August 2019 and December 2021. Patient demographics, comorbidities and length of stay were collected using Electronic Medical Records. Patients were divided into 2 groups according to the length of hospital stay; short-stay was defined as Length of Stay (LOS) within 1 day or less, while standard-stay was defined as LOS exceeding 2 days or more. Statistical analysis was performed using R version 4.3.1.

### Results / Discussion

99 patients were included in the study, comprising 45 short-stay patients and 54 standard-stay patients. Short-stay patients were significantly younger (mean age 66.1, 95%CI[64.5,67.7],  $p=0.0212$ ) than standard-stay patients (mean age 69.2, 95%CI[67.1,71.2]) and had lower mean BMI (26.98, 95%CI[25.52,28.45],  $p=0.021$ ) than standard-stay patients (29.31, 95%CI[27.96,30.66]). A significantly higher proportion of short-stay patients (84.4%, 95%CI[73.4,95.5],  $p=0.00132$ ) were pre-morbid community ambulant without aids than standard-stay patients (51.9%, 95%CI[38.1,65.6]). There was no significant difference in gender, race, smoking, ASA score and Charlson Comorbidity Index (CCI) ( $p>0.05$ ). Preoperatively, short-stay patients had significantly higher median KSS-function (55.0, 95%CI[46.4,56.0],  $p=0.0063$ ) than standard-stay patients (50.0, 95%CI[34.3,46.4]) and higher median WOMAC scores (62.9, 95%CI[59.0,66.1],  $p=0.0159$ ) than standard-stay patients (57.6, 95%CI[51.6,59.6]). Multivariate logistic regression revealed the following significant factors: Age<75 ( $p=0.0293$ ), BMI<25 ( $p=0.00688$ ), pre-morbid community ambulant without aids ( $p=0.0402$ ).

### Conclusion

In conclusion, predictive factors for short-stay after TKR include age<75, BMI<25 and being pre-morbid community ambulant without aids. ASA score and preoperative comorbidities were not found to significantly affect the odds of short-stay after TKR.

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### Impact of Direct Anterior Approach Versus Other Approaches on Hospital Stay and Discharge Destinations in Bipolar Hemiarthroplasty for Hip Fractures

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### Introduction / Objection

Hip fractures are associated with significant morbidity and mortality. It places clinical and financial burden on the patients, hospitals, rehabilitation and community services. This study aims to evaluate the impact of direct anterior approach (DAA) versus other approaches (OA) on hospital stay and discharge destination in patients who underwent bipolar hemiarthroplasty for hip fractures.

### Materials & Method

Data of this study was obtained from a single tertiary institution's hip fracture registry. All patients who underwent bipolar hemiarthroplasty for hip fracture between July 2022 and August 2023 were included in this study. The cases were categorized into DAA and OA groups. Student's t-test and Mann Whitney U test were performed on continuous variables with or without normal distribution respectively. Mann Whitney U test was also performed on ordinal data while Pearson's chi-square test were used for nominal categorical variables.

### Results / Discussion

A total of 238 patients were included in this retrospective study; DAA (n=22), OA (n=216). Age, gender, pre-morbid ambulatory status, Clinical Frailty Scale, Abbreviated Mental Score and American Society of Anesthesiologist score were similar in both groups ( $p>0.05$ ). All patients were allowed to weight bear as tolerated after surgery. Length of stay in DAA group is  $9.45 \pm 5.41$  days versus OA group  $10.83 \pm 5.44$  days,  $p=0.131$ . 13.6% of DAA patients and 6.9% of OA patients were discharged home from acute hospital postoperatively ( $p=0.112$ ).

### Conclusion

DAA patients had a shorter LOS and greater proportion of patients were able to be discharged home after their stay in acute hospital as compared to OA. However, this result did not reach statistical significance. Nonetheless, this result can potentially translate to cost saving from a shorter LOS and reduce healthcare burden as more patients are able to be discharged for home after surgery.

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### Direct Anterior Approach Versus Other Approaches for Bipolar Hip Hemiarthroplasty in Hip Fractures: Short Term Functional Outcomes

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### **Introduction / Objection**

Direct anterior approach (DAA) is a widely recognised approach for elective hip surgery. However, literature on outcomes of DAA in bipolar hip hemiarthroplasty in hip fractures remains limited. The aim of this study is to compare the short-term functional outcomes of patients who underwent bipolar hip hemiarthroplasty using the direct anterior approach (DAA) with those who used other approaches (OA) to the hip.

### **Materials & Method**

This is a retrospective study conducted in a single tertiary institution. Data was obtained from the institution's hip fracture registry database. All patients that underwent bipolar hip hemiarthroplasty for hip fracture between January 2018 to June 2022 were included in this study. Propensity score matching (PSM) was performed by accounting for age, gender and pre-fracture Modified Barthel Index Scores, utilizing the nearest neighbour method to obtain 1:3 matching ratio.

### **Results / Discussion**

A total of 787 patients were included in this study (37 DAA, 750 OA cases). PSM yielded 35 DAA cases and 105 OA cases. Age, gender, premorbid mobility status, American Society of Anesthesiologist score, premorbid Modified Barthel Index (MBI) (DAA: 87.49 ± 12.10 vs OA: 88.73 ± 11.87, p=0.593) and Parker Mobility Index (PMS) (DAA: 5.49 ± 2.64 vs OA: 5.69 ± 2.91, p=0.720) were similar in both groups. MBI pre-discharge (DAA: 42.57 ± 20.52 vs OA: 33.46 ± 19.397, p=0.022) yielded statistically significant results. However, MBI (DAA: 69.03 ± 24.91 vs OA: 69.85 ± 26.50, p=0.873) and PMS (DAA: 2.63 ± 2.20 vs OA: 2.92 ± 2.60, p=0.548) scores 6 months post-operation yielded similar results. Results of 6 month post-operation mobility status and use of walking aids were similar in both groups.

### **Conclusion**

DAA significantly improves functional outcomes in the early post-operative period compared to OA. Further study with longer term follow up is needed to analyse the long term functional outcomes of these two approaches.

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### **Open Knee Dislocations: A Narrative Review of Diagnostic modalities, Treatment options and Outcomes**

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### **Introduction / Objection**

An open knee dislocation (OKD) is a severe injury involving the open dislocation of the tibiofemoral joint and is often associated with significant intra/extra-articular injuries. There is currently no consensus on both acute and definitive management. The aim of this narrative review is to review the existing literature on OKD to identify optimal diagnostic approaches, and management strategies.

### **Materials & Method**

A multi-database search was performed using the search terms 'open dislocation of knee', 'open knee dislocation\*', 'knee dislocation'. The inclusion criteria was: studies with details of each individual case (including their demographics, management, and outcomes). Exclusion criteria was: non-native knees or poorly detailed cases.

### **Results / Discussion**

12 papers were included, with a total cohort of 35 patients. The most common mechanism of injury was secondary to road traffic accidents (26/35, 74%). The median age of the patients was 34 years (range: 16–70 years) with a male predominance (24/35, 69%). Based on Schenk classification, there were 2/16 (12%) KD-I, 7/16 (44%) KD-III and 7/16 (44%) KD-IV. Soft tissue injury was significant, with 21/35 (60%) of OKD being staged Gustillo 3B or 3C. 8/35 (23%) of patients reported requiring a secondary soft tissue coverage procedure. Associated injuries included fractures 21/35 (60%), neurological 12/35 (34%), and vascular injuries 15/35 (43%). An average number of 4 debridements were performed. Application of external fixation occurred in 17/35 (49%) patients and 23/35 (66%) patients underwent a staged approach to their treatment. 12/35 (35%) of patients had wound infections with 3/12 (25%) of patients with infections undergoing amputation. Whilst 9/35 (26%) achieved adequate outcomes and return of function, 26/35 (74%) patients achieved suboptimal outcomes.

### **Conclusion**

OKD is a severe injury, often associated with KDIII/KDIV ligamentous injuries and other associated injuries. In view of the high infection rate and complications, patients will require adequate acute management before definitive treatment can commence.

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### **Significant heterogeneity regarding clinical characteristics and definitions of multi-directional instability of the shoulder: A systematic review**

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### **Introduction / Objection**

A variety of instabilities are grouped under multidirectional instability (MDI) of the shoulder. This makes understanding its diagnostic process, presentation and treatment difficult due to lack of evidence-based consensus. This review aims to propose a novel classification for subtypes of MDI.

### **Materials & Method**

A systematic search was performed on PubMed Medline and Embase. A combination of the following 'MeSH' and 'non-MeSH' search terms were used: (1) Glenohumeral joint[tiab] OR Glenohumeral[tiab] OR Shoulder[tiab] OR Shoulder joint[tiab] OR Shoulder[MeSH] OR Shoulder joint[MeSH], (2) Multidirectional[tiab], (3) Instability[tiab] OR Joint instability[MeSH]. Sixty-eight publications which met our criteria were included.

## Results / Discussion

There was a high degree of heterogeneity in the definition of MDI. Thirty-one studies (46%) included a trauma etiology in the definition, whilst 23 studies (34%) did not. Twenty-five studies (37%) excluded patients with labral or bony injuries. Only 15 (22%) studies defined MDI as a global instability (instability in all directions) whilst twenty-eight (41%) studies considered MDI to be instability in two directions, of which one had to include the inferior direction. Six (9%) studies included the presence of global ligamentous laxity as part of the definition. To improve scientific accuracy, the authors propose a novel AB classification which considers traumatic etiology and the presence of hyperlaxity when subdividing MDI.

## Conclusion

MDI is defined as symptomatic instability of the shoulder joint in two or more directions. A comprehensive classification system that considers predisposing trauma and the presence of hyperlaxity can provide a more precise assessment of the various existing subtypes of MDI.

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## Healthcare professional dress codes and its effect on perceived professionalism by patients

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## Introduction / Objection

Physician attire has been shown to influence patient experience. Scrub attire and formal office attire are interchangeably worn by physicians in our local setting. The aim of this study was to determine if the hospital scrub attire was as effective as formal attire in the domains of Professionalism, Friendliness, Aptitude, Empathy.

## Materials & Method

A single-center questionnaire study was conducted and a total of 100 participants were included. Orthopaedic surgery patients were recruited from the inpatient and outpatient setting. Patients completed a questionnaire in which they rated 22 photographs. The photographs comprised a series of randomly arranged vignettes, with each participating doctor appearing twice - Once in formals, once in scrubs. The doctors thus served as their own controls. Participants were asked to rate the depicted physicians based on the following 4 criteria - Professionalism, Friendliness, Aptitude, Empathy. Each criterion was rated on a 11-point scale (0-10). Comprehensive demographic information, including age, gender, and race, was collected.

## Results / Discussion

A total of 100 responses was collected (50 inpatient and 50 outpatient). The scrub attire was rated significantly better than formal attire in all categories: Professionalism [mean 7.55 (SD 2.03) vs. 6.79 (SD 2.47),  $p < 0.001$ ], Friendliness [mean 7.56 (SD 1.91) vs. 6.91 (SD 2.38),  $p < 0.001$ ], Aptitude [mean 7.52 (SD 1.91) vs. 6.80 (SD 2.38),  $p < 0.001$ ] and Empathy [mean 7.48 (SD 1.94) vs. 6.84 (SD 2.40),  $p < 0.001$ ]. The perceived age of the doctor did not affect any of the domain scores. Female doctors scored poorer in professionalism [mean 6.99 (SD 2.41) vs. 7.27 (SD 2.22),  $p < 0.05$ ] compared to male doctors, but this difference disappeared when analyzing only doctors wearing scrubs.

## Conclusion

Patients prefer doctors in scrub attire compared to formal attire. This preference appears to hold true across diverse doctor profiles. Scrub attire is recommended to improve the patient experience.

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## A novel image-based machine learning model with superior accuracy and predictability for knee arthroplasty loosening detection and clinical decision making

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## Background

Loosening is the leading cause of total knee arthroplasty (TKA) revision. This is a heavy burden toward the healthcare system owing to the difficulty in diagnosis and complications occurring from the delay management. Based on automatic analytical model building, machine learning, may potentially help to automatically recognize the risk of loosening based on radiographs alone. The aim of this study was to build an image-based machine-learning model for detecting TKA loosening.

## Methods

Image-based machine-learning model was developed based on ImageNet, Xception model and a TKA patient X-ray image dataset. Based on a dataset with TKA patient clinical parameters, another system was then created for developing the clinical-information-based machine learning model with random forest classifier. In addition, the Xception Model was pre-trained on the ImageNet database with python and TensorFlow deep learning library for the prediction of loosening. Class activation maps were also used to interpret the prediction decision made by model.

## Result

In the image-based machine learning loosening model, the precision rate and recall rate were 0.92 and 0.96, respectively. While for the accuracy rate, 96.3% for visualization classification was observed. However, the addition of clinical-information-based model, with precision rate of 0.71 and recall rate of 0.20, did not further showed improvement on the accuracy. Moreover, as class activation maps showed corresponding signals over bone-implant interface that is loosened radiographically, this confirms that the current model utilized a similar image recognition pattern as that of inspection by clinical specialists.

## Conclusion

The image-based machine learning model developed demonstrated high accuracy and predictability of knee arthroplasty loosening. And the class activation heatmap matched well with the radiographic features used clinically to detect loosening, which highlighting its potential role in assisting clinicians in their daily practice. However, addition of clinical-information-based machine-learning model did not offer further improvement in detection. As far as we know, this is the first report of pure image-based machine learning model with high detection accuracy. Importantly, this is also the first model to show relevant class activation heatmap corresponding to loosening location.