

V1

Is Medial Meniscus Tear More Common In Acute Anterior Cruciate Ligament (ACL) Injuries?

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Introduction: Concomitant meniscal injuries associated with Anterior Cruciate Ligament (ACL) tears is common, however, the location of the meniscal tears differs based on the chronicity of ACL tears. The lateral meniscus injuries are more commonly seen in Acute ACL injuries, whereas medial meniscal injuries are more commonly associated with chronic ACL tears. We hypothesize that medial meniscus tears are more commonly seen in Acute ACL injuries in our institution.

Methods: This is a retrospective study of patients who underwent ACL reconstructions from January 2015 to December 2018 under Tan Tock Seng Orthopaedic Surgery Department. Findings on MRI scan of the affected knee performed within 6 weeks from the time of injury is deemed as acute injuries. We excluded patients without MRI scan, patients without date of injury and patients with concomitant Posterior Cruciate Ligament (PCL) injuries.

Results: A total of 352 patients are included in this study, 74 patients (21.02 %) are female and 278 patients (78.98%) are male. 109 patients (30.97%) with MRI scan of the affected knee performed within 6 weeks from the time of injury. 46 out of 109 (42.2%) patients have no concomitant meniscus injury. 26 patients (23.85%) have isolated medial meniscus injury whereas 25 patients (22.94%) have isolated lateral meniscus injury. The incidence of concomitant isolated medial meniscus injury is the highest at 34.57% (84/243) in chronic ACL injuries.

Conclusion: This study shows that the incidence of isolated medial or lateral meniscus tears associated with acute ACL injuries are equally common in our institution.

V2

The Risk Of Peroneal Nerve Injury In All-inside Lateral Meniscal Repair Through The Popliteus Tendon In The Actual Arthroscopic Knee Position

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Introduction: In the lateral meniscal repair, the knee capsule around the posterior horn is thin and separated from the meniscal body by a small gap. These problems pose technical difficulties in achieving secure suture fixation. Implant failure rates in previous studies have been reported at 14% and 23%. A surgical technique of placing a suture through the popliteus tendon (PT) has been developed and shown to provide good clinical outcomes with a low implant failure rate of 3.5%. However, because of limited knowledge on the optimal needle penetration depth, there are concerns of potential iatrogenic injury to the peroneal nerve (PN), which is located in close proximity to the lateral joint line in the posterolateral knee compartment.

Objectives: The objectives of this prospective study were to evaluate the risk of peroneal nerve (PN) injury in simulated arthroscopic all-inside lateral meniscal repair with sutures placed into the popliteus tendon (PT) with 14-mm and 18-mm needles and to determine the optimal needle penetration depth.

Materials and methods: Twenty-nine axial magnetic resonance images (MRI) of postoperative knees with articular distension and in a figure of four position were used. In each case, the depth of the PT was divided into four equal parts with measurements performed at the 25%, 50% and 75% marks according to their anteroposterior arrangement. Simulated repairs were performed with anchor placement through each division point with 14-mm and 18-mm straight needles via the anteromedial (AM) and anterolateral (AL) portals. Distances from the needle tip following full insertion into the PT to the PN and from the anterior PT border to the posterior knee capsule were measured to determine PN injury risk and ideal needle lengths.

Results: Among the 29 knee MRI image measurements, there were no incidences of deemed PN puncture injury. The average distances from the needle tip of the 14-mm needle were significantly greater than the 18-mm needle in all the simulated repairs ($P < 0.02$), except at the 25% point in the AM approach. When using the 14-mm needle, capsule underpenetration was encountered in 3 knees (10.3%) with suture placement at the 25% point during the AM approach, and in 1 knee (3.4%) at the 50% and 75% points in the AM approach and all the repairs from the AL portal. The average distances from the anterior border of PT to the posterior knee capsule at the 25%, 50%, and 75% division points on the PT in the AM approach are 7.7 ± 2.7 mm, 7.9 ± 2.5 mm, and 7.6 ± 2.8 mm, respectively, while in the AL approach are 8.4 ± 2.9 mm, 8.1 ± 2.8 mm, and 7.6 ± 2.7 mm.

Conclusion: Simulated all-inside lateral meniscal repair with suture placement into the PT with 14-mm and 18-mm needles was found to be safe. The measurements in this study can be used to determine potential PN injury risk in relation to the PT and the appropriate needle length for safe lateral meniscal repairs.

V3

Deep Learning Model For Grading Metastatic Epidural Spinal Cord Compression On Staging CT

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Introduction: Metastatic epidural spinal cord compression (MESCC) is a devastating complication of advanced cancer. MRI is the current gold standard imaging test, but it is expensive and not suitable for screening. Staging CT scans are commonly performed for cancer diagnosis and treatment follow-up, and represent a window of opportunity for earlier diagnosis

of MESCC. Deep learning (DL) models for automated MESCC classification on staging CT were developed to aid earlier diagnosis.

Materials and Methods: Retrospective collection of staging CT scans and corresponding MRI spines from patients with suspected MESCC was conducted from September 2007 to September 2020. Exclusion criteria were scans with instrumentation, no intravenous contrast, extensive motion artefacts and non-thoracic coverage. The internal CT dataset split was 84% for training/validation and 16% for testing. An external CT test set from a different institution was also utilised. Internal training and validation sets were labelled by radiologists with spine imaging specialization (6 and 11 years of experience), and were used to develop a DL model for MESCC classification on CT. The spine imaging specialist (11-years expertise) labelled the staging CT test sets (axial portal venous phase images) in conjunction with the matched MRI spines (axial T2-weighted images) to serve as the reference standard. MESCC was classified using a modified Bilsky MESCC scale; normal/no epidural disease, low-grade (epidural disease with no contact of the spinal cord), and high-grade disease (spinal cord contact or compression). For evaluation of the DL model performance, internal and external test sets were independently reviewed by four radiologists; two spine specialists (Rad1 and Rad2, 7 and 5 years of experience, respectively) and two body radiologists with experience in oncological CT scan assessment (Rad3 and Rad4, 3 and 5 years of experience, respectively). Inter-rater agreement (Gwet's kappa) and sensitivity/specificity/AUCs were calculated.

Results: Overall, 420 CT scans were evaluated from 225 patients (mean age=60 ±11.9[SD]); 354 (84%) CT scans were used for training/validation and 66 (16%) CT scans were used for internal testing. The external test set consisted of 43 CT scans from 32 patients (mean age=60 ± 13[SD]). The DL model showed almost-perfect inter-rater agreement for three-class MESCC grading with kappas of 0.87 (p<0.001) and 0.84 (p<0.001) on the internal and external test sets, respectively. On the internal test set the DL model inter-rater agreement (κ=0.87) was superior to Rad 2, a spine imaging specialist (κ=0.80) and Rad 3, a body radiologist (κ=0.72) (both p<0.001). The DL model kappa of 0.84 on the external test set was also superior to Rad 3 (κ=0.72) (p<0.001). For detection of high-grade MESCC the DL model showed high kappa/sensitivity/specificity/AUC of 0.94/93.4/95.47/0.94 on the internal test set and 0.95/96.6/96.0/0.96 on the external test set, respectively.

Conclusion: A DL model for detection of metastatic epidural spinal cord compression (MESCC) on CT showed comparable or superior inter-rater agreement compared to radiologists on internal and external testing. This DL model could provide earlier diagnosis and treatment of MESCC, resulting in improved patient outcomes including preservation of ambulation.

V4

Changes In Limb Length Following High Tibial Osteotomy – A Mathematical Model

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Introduction: The purpose of this study is to retrospectively assess the correlation between height of opening wedge and correction angles against changes in limb length in High Tibial Osteotomy (HTO), and to derive a mathematical model that describes this relationship. Our hypothesis is that opening wedge height and correction angles have a positive correlation with changes in limb length in HTO patients.

Materials and Methods: The medical records and imaging of 91 HTO patients were retrospectively evaluated for pre- and post-operative tibial lengths, limb lengths, hip-knee-ankle angles (HKA), medial proximal tibial angles (MPTA), posterior tibial slope (PTS), and planned and actual correction angles. HTO patients with pre- and post-operative lower limb radiographs in the anterior-posterior and lateral views were included. The exclusion criteria consisted of HTO patients who were operated on by other surgeons, concurrent distal femur osteotomy in the same setting, other previous unilateral lower limb surgeries prior to HTO and failure to follow-up with post-operative x-rays. Using SPSS 28 Software, linear regression was performed. A line of best fit was derived, and Pearson's correlation coefficient (r) and coefficient of determination (R²) were computed. Chi-squared test was performed, and results with P<0.05 were considered statistically significant.

Results: There is a positive correlation between opening width (r=0.609, p<0.001), planned correction angle (r=0.732, p<0.001), and actual correction angle (r=0.350, p<0.001), when each of these were plotted against change in limb length. There is a positive correlation between opening width (r=0.433, p<0.001), planned correction angle (r=0.569, p<0.001), and actual correction angle (r=0.285, p<0.01), when each of these were plotted against change in MPTA. There was no significant change in PTS. Based on the linear regression model, it was determined that $y = 0.0499x - 0.001$, where x is planned correction angle (radians), and y is percentage change in limb length. Also, $y = 0.0304x + 0.0023$, where x is actual correction angle (radians), and y is percentage change in limb length.

Conclusion: Size of opening width, and planned and actual correction angles both show a positive and significant correlation against change in limb length and MPTA. Our study is the first to showcase a mathematical model that links planned and actual correction angles to post-operative change in limb length. This will be of both clinical and surgical benefit in predicting limb length outcomes in HTO patients. Further studies are required to investigate the reasons for variation in post-operative change in limb length, and improve the accuracy of the mathematical model.

V5

Minimally Invasive Fixation For Displaced Calcaneal Fractures With Intraoperative 3D O-Arm Imaging: A Mid-Term Prospective Study On Functional Outcome

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Introduction/Objectives: Surgical fixation of calcaneal fractures is challenging due to its unique anatomy and therefore preoperative CT scans are crucial for surgical planning when there is extensive comminution or intra-articular involvement. With advances in technology, 3D O-arm imaging has become more readily available. We aimed to evaluate the outcomes of displaced calcaneal fractures treated with minimally invasive screw fixation with intraoperative 3D O-arm imaging.

Materials and Methods: Five patients with displaced calcaneal fractures underwent minimally invasive screw fixation with intraoperative 3D O-arm imaging. Patients were kept non weight bearing for a total of 6 weeks, followed by partial weight bearing for 2 weeks then full weight bearing. Fracture union was assessed clinically and with serial x-rays. SF-36, Visual Analogue Score (VAS) and AOFAS Hindfoot Score were assessed.

Results/Discussion: All five patients were men with a mean age of 34.6 ± 12.3 years (range 23- 53 years), followed up for an average of 21.4 months (range 20-23 months). One fixation was revised intraoperatively after noting fracture malreduction on O-arm. All fractures united. Mean SF-36 subscale scores were PF 91 ± 10.8 , RP 70 ± 32.6 , RE 66.7 ± 40.8 , VT 75 ± 20 , MH 88 ± 11.7 , SF 87.5 ± 21.7 , BP 76 ± 21.3 and GH 84 ± 16.4 ; mean VAS was 0.6 ± 0.9 (range 0-2) and mean AOFAS was 86.4 ± 12.3 (range 65-94) at final follow-up.

Conclusion: There was benefit from intraoperative 3D imaging which allowed for immediate correction of fracture malreduction. Minimally invasive screw fixation with intraoperative 3D O-arm imaging for displaced calcaneal fractures showed good outcomes at short term follow.

V6

Granulated Frozen Nitrogen Ethanol Composite (FNEC70) as a Cryogen for Adjuvant Treatment of Giant Cell Tumours of Bone

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Introduction: Liquid Nitrogen (LN2) is a commonly used adjuvant used to reduce local recurrence after curettage of giant cell tumour of bone (GCTB). The difficult handling characteristics and extreme cold of LN2 results in extensive collateral freezing and a high risk of complications. We describe the use of a 70% ethanol-based solution as a novel cryogen and report our experience and clinical outcomes.

Technique description: The GCT tumour cavity was fenestrated and thoroughly curettaged. A commercially available 70% ethanol solution was mixed into liquid nitrogen using a drip-in or stir-in technique to produce solid FNEC70 granules of 3-5mm diameter. Pre-freezing of the cavity with LN2 was performed for larger cavities at the discretion of the operating surgeon. Granules were packed into the tumour cavity for 5 minutes and allowed to thaw. The cavity was then filled with polymethylmethacrylate cement.

Case series: Thirteen cases underwent FNEC70 treatment. Follow up was 2 to 5 years. Two cases experienced local recurrence. One patient sustained a pathological fracture at 4 months post-surgery. No patient had major wound complications.

Conclusion: Frozen hexanol is a novel cryogen with promising clinical results. Further laboratory studies have been undertaken to investigate the thermal properties of FNEC70 and refine the surgical technique.

07

Single Position Prone Oblique Lumbar Interbody Fusion (OLIF) – Case Illustration And Technical Considerations

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Background: Oblique lumbar interbody fusion is a powerful method to treat various spinal conditions, and is frequently combined with posterior instrumentation. This is often performed in two positions, with the patient first in lateral then turned prone. Studies have explored the option of single position surgery to improve surgical efficiency and cut operative costs. This has conventionally been performed in lateral, however, there are some limitations involved. This case illustrates employing a single prone position for a patient undergoing oblique lumbar interbody fusion (OLIF) with subsequent posterior decompression and instrumentation. The benefits of this procedure over the conventional techniques are highlighted in this case.

Case presentation: We present the case of a 75 years old Female presenting with thoracic myelopathy over T11/12 and concurrent L2-4 spinal stenosis. She underwent OLIF of L2/3 and L3/4, posterior decompression of T11/12 and L2/3, and posterior instrumented fusion from T10-L4 via a single prone position. We aim to describe the benefits of this approach, and raise up some of the challenges encountered through our experience.

Discussion: Single position prone OLIF offers increased benefits compared to the already powerful single position lateral surgery, including allowing for option of posterior decompression when indicated, and surgeon familiarity when inserting pedicle screws. Single position prone OLIF is a novel approach and offers improved efficiency over current surgical options.

V8

Lower Socioeconomic Status (SES) Predisposes to Poorer Perioperative Quality of Life in Hip Fracture Patients

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Introduction/Objectives: Hip fractures, constituting the highest morbidity and mortality burden amongst the elderly, are expected to increase exponentially in our fast-aging local population. Socioeconomic status (SES) is known to have overarching effects on well-being, but specific effects on hip fracture patients remain poorly understood. This study aims to examine the effect of SES, using hospital ward class status as a surrogate, on physical function and health-related quality of life in patients with surgically managed hip fractures.

Materials and Methods: A retrospective cohort of 445 patients who sustained unilateral, isolated, low energy proximal femoral fractures was prospectively followed up. Group PTE and SUB consisted of patients under private and government subsidised ward classes respectively. An independent observer (trained physiotherapist) evaluated the Parker Mobility Score (PMS) and EuroQol-5Dimensions (EQ-5D) scores pre-morbidly, and postoperatively at 3 months, 6 months and 1 year. Chi squared tests and Student's t tests were used to examine the extent which SES affects each score.

Result/Discussion: There were 53 patients in Group PTE and 392 (88.1%) patients in Group SUB. Both were similar in terms of age, gender, Charlson Comorbidity Index, and fracture type. PMS in Group PTE was significantly higher than in Group SUB at all time points – pre-fall, 3 months, 6 months and 1 year ($P = 0.00188, 0.0397, 0.00337$ and 0.0279 respectively). Both groups experienced a significant drop at 3 months, followed by an improvement at 1 year ($P < 0.01$), albeit with scores still below baseline. There were no significant differences when comparing the change in scores in both groups, from baseline to 3 months, 6 months and 1 year ($P = 0.199, 0.465$ and 0.262 respectively). EQ-5D between both groups were comparable pre-fall and at 1 year ($P = 0.392$ and 0.166), though it was significantly higher in Group PTE at 3 and 6 months ($P < 0.01$). Both groups experienced a significant drop at 3 months ($P < 0.01$), though Group SUB recovered significantly at 1 year ($P < 0.001$). The subsidised group had a significantly greater dip in scores from baseline to 3 months and 6 months ($P = 0.0145$ and < 0.01) but managed to recover and match Group PTE at 1 year ($P = 0.257$). The differing trends for EQ5D, as opposed to that for PMS, can be possibly because the former also evaluates physical function and mental health, on top of mobility assessed by the latter. A possible explanation is that private patients have better financial resources and social support (i.e., family, domestic helpers) to cope perioperatively, when mobility is suboptimal. On the contrary, it is critical for subsidised patients to maintain mobility independence due to a relative lack of such support whilst recovering from hip fracture surgery.

Conclusion: This study demonstrates that lower SES predisposes to a poorer perioperative quality of life in hip fracture patients, but comparable outcomes can be achieved at the 1 year mark.

V12

Sulcus Deepening Trochleoplasty Versus Bereiter Trochleoplasty For High Grade Trochlear Dysplasia: A Systematic Review And Meta-Analysis For Clinical Outcome And Recurrent Instability

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Introduction: Trochlear dysplasia is a condition which the femoral trochlea has an abnormal shape and function. This condition occurs in less than 2% of the population, however, up to 85% of patients with recurrent patellar instability have trochlear dysplasia. Trochleoplasty aims to change the shape of the trochlea in order to stabilize an unstable patella. Several trochleoplasty procedures have been proposed. The aim of this study was to compare clinical outcomes and recurrent instability after surgery between sulcus deepening trochleoplasty (Lyon Procedure/ Dejour Technique) and bereiter trochleoplasty in patients who underwent different surgical trochleoplasty.

Materials and Method: We conducted a metaanalysis to compare two methods often used in trochleoplasty which is Bereiter and Sulcus deepening trochleoplasty based on PRISMA guidelines, in terms of clinical outcome and recurrent instability for high grade trochlear dysplasia. Searching on five databases found eleven eligible studies with 520 total subjects to be analysed. Studies will be qualitatively and quantitatively evaluated using Review Manager 5.4 or equivalent.

Result: There were no differences in sulcus angle, return-to-sport rate, and satisfactory rate between both techniques. Both IKDC score and Kujala score shown good outcomes, but not significantly different. IKDC score was not different after analysis between Bereiter and Sulcus deepening technique with mean difference of 23.43 (95% CI 19.64–27.21) and 27.12 (95% CI

20.77–33.48), respectively. Pooled improvement of IKDC score on both subgroups was 24.39 (95% CI 21.14–27.65). Pooled analysis of ten studies found that Kujala score was not different between groups with Bereiter technique and Sulcus deepening technique shown mean difference of 22.98 (95% CI 19.05–26.91) and 30.86 (95% CI 24.06–37.66), respectively. Total pooled mean difference of both groups was 25.87 (95% CI 21.70–30.05). Both techniques provided less of recurrent instability, and satisfaction rate.

Conclusion: None of the surgical techniques analysed highlighted a real superiority. Clinical relevance shown that both techniques have good clinical outcome, less of complication and recurrent instability for high grade trochlear dysplasia.

V14

Comparison Effectiveness Analysis In Jakarta And Peripheral City For Anterior Cruciate Ligament Rupture's Study In Indonesia (Cetjap Asin Sstudy): Preliminary Results

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Introduction: The optimal management of an anterior cruciate ligament (ACL) rupture in Indonesia is unknown. This study aimed to suggest the preferred strategy for treating an ACL rupture in the Indonesian population.

Materials and Methods: We conducted an observational-cohort prospective study (ClinicalTrials.gov ID: NCT04748328) involving 30 young, active adults with acute ACL rupture in which we compared two strategies: early ACL reconstruction (ACLR) and structured rehabilitation with the option of later ACL reconstruction if needed (rehabilitation). The primary outcome was the change from baseline to 1 year in the average score on the International Knee Documentation Committee (IKDC)- Subjective Knee Form. Secondary outcomes included results on the Lachman test, Euroqol- 5 Dimension (EQ5D), Anterior Cruciate Ligament- Return to Sports Injury (ACL-RSI), and the score on the Tegner Activity Scale.

Results: Of the 30 subjects involved in this study, 15 patients were assigned to an early ACL reconstruction. The other 15 underwent rehabilitation. Of 15 assigned to rehabilitation, 12 (80%) underwent delayed ACL reconstruction; the other three underwent rehabilitation alone. The absolute change in the mean IKDC score from baseline to 1 year was 49 points for those assigned to an early ACL reconstruction and 44 for those assigned to rehabilitation (absolute between-group difference, 5 points; 95% confidence interval, 0.5 to 8.8, p=0,03). There were no significant differences between the two treatment groups with respect to secondary outcomes. Adverse events were common in both groups. The results were similar when the data were analyzed according to the treatment received.

Conclusion: In young, active adults with acute ACL ruptures, a strategy of early ACL reconstruction was not superior to a strategy of rehabilitation plus optional delayed ACL reconstruction. However, the latter strategy did not substantially reduce the frequency of surgical reconstructions in Indonesia.

V15

Sling or Filling Effects: Does Surface Restoration from Coracoid Transfer after Latarjet Procedures Matter?

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Introduction: Successful Latarjet procedures depend on many factors, amongst which are graft union and subsequent restoration of the glenoid surface. Coracoid graft union has been studied, however remodelling of the glenoid has not been studied extensively.

Materials and Methods: We highlight three open Latarjet cases in which post-operative arthroscopy (for different indications) revealed united coracoid grafts with restoration of native glenoid shape as early as 6 months post-operatively. In one of the cases, the sling effects of the conjoined tendons from the united coracoid graft prevented dislocation of the shoulder even though clinically the patient was apprehensive. Further stability in this patient was restored after revision capsular plication, done arthroscopically.

Results: Even though coracoid grafts undergo extensive osteolysis, stability of the shoulder remains intact via the sling effects of the transferred conjoined tendons, as illustrated in two of the three cases.

Conclusion: All three cases showed good union of the coracoid graft and restoration of the native glenoid shape. Coracoid grafts also showed propensity towards resorption especially in its upper part even though union rate is good. Residual instability symptoms may arise from other causes such as prominent hardware and loosened capsular plication.

V17

Predictors Of Clinical Outcomes In Necrotizing Fasciitis: A 10 Year Study

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Introduction: Necrotizing fasciitis (NF) is a rapidly progressive disease associated with significant morbidity and mortality. Few studies have reported the risk factors for adverse outcomes in NF. Our study aims to investigate the risk factors associated with various clinical outcomes of NF, to better guide decision making and patient counselling regarding outcomes during the crucial initial phase of this time sensitive disease process.

Methods: A retrospective review of patients diagnosed with NF of the upper and lower extremities over a 10-year period from January 2008 to December 2017 in our tertiary institution was performed. Patient demographics, clinical parameters, microbiological data, and clinical outcomes were collected and analyzed using multivariate regression analysis. The primary clinical outcomes analyzed were mortality, major amputation (proximal to the wrist or ankle), prolonged ICU stay (>7 days), and prolonged hospital stay (>30 days).

Results: 191 patients were included in the study with a mortality rate of 17%, with predictors for mortality being age > 65 years (OR: 3.04, p=0.024), female gender (OR: 3.04, p=0.017), peripheral vascular disease (OR: 8.94, p=0.003), renal impairment (OR: 5.10, p=0.002), MAP<60mmHg (OR: 3.06, p=0.040), and bacteremia (OR: 3.11, p=0.032). 61 patients underwent major amputation and the risk factors were peripheral vascular disease (OR:4.45, p=0.042), lower limb involvement (OR:5.67, p<0.001), soft tissue gas on x-ray (OR:5.78, p=0.013), and bacteraemia (OR:5.20, p<0.001). The predictors for prolonged ICU admission were female gender (OR: 2.55, p=0.016) and creatinine>140µmol/L (OR: 3.44, p=0.002).

Conclusion: Predictors of mortality included elderly age > 65, female gender, peripheral vascular disease, renal impairment, decreased mean arterial pressure and bacteraemia. Predictors of major amputation were peripheral vascular disease, lower limb involvement, bacteraemia, hemoglobin<11g/dL and hyperglycemia with glucose>20mmol/L. Factors such as these will assist us in identifying patients with higher probabilities of specific outcomes when they present at an early stage of the disease process, to allow for more accurate patient counselling and management of expectations regarding outcomes of patients with NF.

V18

5 Strand Hamstring Tendon Autograft In Anterior Cruciate Ligament Reconstruction Using Single Bundle Technique In Filipinos – A Retrospective Study

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Introduction/Objectives: ACL tear is a common injury in athletes. Surgical treatment is through reconstruction using autografts. Many options are available for grafts but the hamstrings are the most common. Advantage of quadrupled autograft is elimination of donor-site morbidity disadvantage of other autografts while achieving same biomechanical/clinical results but studies show significant size variability increasing risk of failure. Graft exceeding 8mm diameter is associated with significant decrease in the risk of failure. Ability to predict graft size of the hamstrings and having a back-up plan when quadrupled hamstring tendon graft does not meet the required size is advantageous. Authors looked at characteristics of 5 strand hamstring autograft in Filipino population when used in ACLR.

General Objective: To describe graft and population who underwent a 5 stranded hamstring autograft ACLR

Specific Objectives: To determine average size of harvested 5 strand hamstring autograft. To determine anthropometric and demographic factors affecting graft size

Materials and Methods: Retrospective study of patients who underwent ACLR using 5 strand hamstring autograft. Records review of graft size, anthropometric and demographic variables was done.

Result/Discussion: 13 Filipino patients with ACL tear had ACLR using the 5 strand hamstring tendon autograft. 9 (69%) are males. Approximately 38% of the patients were operated <3mos after their injury. 62% were obese patients. Mean age was 25yrs(SD 4.2). Mean height was 167cm(SD 9.61) and mean weight was 77kg(SD 24). Mean BMI was 27(SD 7.05). Mean graft diameter was 82mm(SD 80) and mean graft length was 80mm (SD 8.16). Average graft diameter was 82mm while the mean graft length was 80mm. Longest graft(100mm) was on a 170cm high patient weighing 134kg while shortest graft(70mm) was on a 155cm patient weighing 53kg. Thickest graft was harvested on a 175cm patient weighing 97kg while thinnest graft(70mm) was on a 154cm patient weighing 48kg. Mean BMI of overweight patients was 82.5mm length/ diameter while those with normal BMI, average graft length/diameter were 77.5mm. Many had their ACLR either <3mos after injury or >1yr. The patient who had the shortest and thinnest graft had the longest delay in surgery at 84mos. Longest graft patient(100mm) had ACLR within a month. Average diameter among those who had their ACLR<3mos (mean 1.06mos) after the injury was 82mm while if operated >1yr

(mean 45.6 mos) was 76mm. Majority of patients were injured while participating in sports. Longest graft was obtained in an active patient while shortest grafts were obtained on sedentary patients.

Conclusion: 5 strand hamstring autograft is a viable option to achieve an acceptable graft size that lower the risk of failure. Variables may be observed to predict if you will have an adequate graft. Higher BMI, earlier ACLR after injury in physically active patients are good candidates to undergo ACLR using the 5 strand hamstring autograft.

V19

The Novel Use Of Custom 3-dimensional (3D)-printed Polycaprolactone (PCL)-tricalcium Phosphate (TCP) Synthetic Bone Scaffolds (Osteopore®) In The Management Of Critical-sized Bone Defects For Patients With Open Lower Limb Fractures – A Case Series

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Introduction: Critical sized 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.

Materials and Methods: 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: 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.

V21

Early Ambulation In Low Distal Tibia Fractures: Made Possible With Intramedullary Nailing?

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Introduction: The surgical treatment of distal tibia fractures with an intramedullary implant can be complex and challenging. Historically, intramedullary nailing (IMN) was performed for diaphyseal fractures or where the fracture line did not extend into the joint. Where there were concerns of inadequacy of distal fixation or the presence of intra-articular extension, these fractures were traditionally treated with plate osteosynthesis. With the advent of newer generation nails along with adjunctive techniques, increasingly, low distal tibia fractures are treated by IMN. The benefits conferred include immediate or early weight bearing and better preservation of the soft tissue envelope, as opposed to non-weight bearing plus a higher incidence of wound complications where plate osteosynthesis is performed.

Objective: We aim to determine if using IMN in low distal tibia fractures and allowing immediate or early weight bearing post operatively leads to adverse outcomes.

Methodology: A retrospective analysis of all consecutive patients from January 2019 to January 2022 with IMN of distal tibia fractures was performed. Inclusion criteria includes distal tibia fractures with fracture lines extending to at least 25 mm from the plafond or with intra-articular extension who were allowed early weight bearing post operatively. We excluded pathological fractures, peri-implant fractures, ipsilateral lower limb fractures or other concomitant traumatic injuries that will preclude immediate/early weight bearing post operatively. Outcomes we studied were the incidence of malunion or non-union, time to union and wound infection rates.

Results: 10 patients fit the inclusion and exclusion criteria. There were no cases of surgical site infection. There were no cases of malunion or non-union. The average time to union was 3.5 months.

Conclusion: With proper technique, low distal tibia fractures can be safely managed with IMN in carefully selected patients. The benefits include immediate or early weight bearing and lower incidence of wound complications.

V23

Appropriate Choice Of Hinge Site Reduces Rate Of Hinge Fractures In Distal Femoral Closing Wedge Osteotomies

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Background: High rates of hinge fractures have been reported in literature for distal femoral closing wedge osteotomy (DFCWO), resulting in correction loss and significant morbidity for patients. The authors report the appropriate location of the hinge point to reduce the incidence of hinge fractures when performing DFCWO.

Methods: An IRB-approved prospective single surgeon series of 40 DFCWO was performed at a tertiary institution between 2019 and 2021. Both medial and lateral DFCWO are studied. The hinge point in all cases was positioned one centimetre from the femoral cortex, at the level 2 to 3 millimetres above the contralateral epicondyle, below the metaphyseal flare and along the gastrocnemius origin (Figure 1). Incidence of hinge fracture was assessed intraoperatively as well as via postoperative radiographs at 2, 4 and 8 weeks after surgery. Radiographs were studied by two independent assessors to assess for hinge fracture and union. In the event of suspected hinge fracture, delayed union, computer tomography scan of the knee was employed.

Results: 40 cases of DFCWO were performed, consisting of 17 cases of medial DFCWO and 23 cases of lateral DFCWO. The overall incidence of hinge fracture in this series is 7.5% (3 out of 40). A single case of intraoperative fracture occurred intraoperative due to overzealous intent to incorporate an extension osteotomy. Two other cases occurred postoperatively and were detected on follow up. Union was achieved in all three cases without loss of correction. All patient reported significant improvements in clinical outcomes postoperatively.

Discussion and Conclusion: The hinge placement described, harnesses the biomechanical properties of metaphyseal bone. In addition, the origin of medial and lateral gastrocnemius heads confers considerable elasticity – thereby making it an ideal site for the hinge. Appropriate hinge placement significantly reduces incidence of hinge fractures in DFCWO.

V24

Shouldering The Pain: A Case Series Of Shoulder Injury Related To Vaccine Administration (SIRVA) Post COVID-19 Vaccinations

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Introduction: Shoulder injury related to vaccine administration (SIRVA) has been well described in the setting of influenza vaccinations, however there is limited literature regarding SIRVA in the setting covid 19 vaccinations. We present a case series of patients with SIRVA in our local patient population setting. We aim to describe the patient characteristics and injury type seen in SIRVA post COVID-19 vaccinations so as to identify possible risk factors which may influence future patient care and prevention.

Methods: A retrospective study of a series of cases of SIRVA post COVID-19 vaccination that presented to a single shoulder surgeon at a single center were collated between April 2021 and October 2022. Patients included had developed shoulder pain after the vaccination which did not resolve within one month of conservative treatment. Patient characteristics such as age, gender, BMI were analyzed. As were the symptoms they presented with, any diagnostic imaging, treatment administered, COVID-19 vaccination history, side and site of vaccination.

Result: A total of 9 cases (N=9) were collated over a 10-month period. The average patient age was 56.58 years old. Male to female ratio was (1:8). Average BMI was 24.4. Of the 9 cases of SRIVA, 8 were post Pfizer-BioNTech COVID-19 vaccine (Tozinameran) and 1 was post Moderna COVID-19 vaccine (Elasomeran). Only 1 patient had SIRVA after the first dose of the vaccination as opposed to the other 8 patients who had SIRVA after their second or third doses of the vaccine. Of the SIRVA suffered, 7 were cases of adhesive capsulitis and 2 were cases of rotator cuff tendinosis. None of the patients have required surgical intervention thus far. All cases were initially trialed on a period of observation and physiotherapy and majority improved (6/9). Of the 3 remaining, 2 patients were given steroid injections to the shoulder of which 1 improved after. The 2 remaining patients had some degree of improvement, but not fully and are still on follow up.

Conclusion: In our series, all patients developed prolonged SIRVA despite appropriate vaccination techniques. Most patients responded well physiotherapy although the recovery time taken can be prolonged. Our cases series is too small a number to conclude anything definitive, however it does raise an inkling of suspicion of a preponderance of SIRVA in female patients who have had the Pfizer-BioNTech COVID-19 vaccination, in particular adhesive capsulitis. It also appears that there may be some immune mediated phenomenon, seeing that most of the SIRVA develop after second or third dosages of the vaccine. These group of patients may benefit from appropriate counselling on possible SIRVA prior to having the vaccination.

V25

New Evidence On Patella Resurfacing In Modern Total Knee Arthroplasty For All Inflammatory Arthritis In A Mixed Asian Population

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Introduction/ Objectives: Current consensus advocates for routine patella resurfacing (PR) during total knee replacement (TKR) in patients with inflammatory arthritis, but the evidence remains limited in Asians. Patella resurfacing at primary surgery may address pain generators in the patellofemoral compartment and possibly reduce need for revision surgery especially in this subgroup with a younger patient population. However, this procedure raises concerns of patella-related complications, given the tendency for patients with inflammatory arthritis to be more osteoporotic and have thinner patellas. Existing literature predominantly encompasses patients with rheumatoid arthritis without including other inflammatory arthropathies. Furthermore, most studies focusing on this topic were conducted more than 10 years ago, before the use of newer patella-friendly implant designs. The aim of this study is to evaluate short-term postoperative outcomes and complication rates of PR in patients with inflammatory arthritis undergoing primary TKR in Asian population.

Methods/ Materials: A retrospective study of our institution's registry data was performed on all patients with inflammatory arthritis who underwent primary TKR in our institution between August 2017 to December 2021. Cases were categorized into resurfaced patella (PR, n=25) and non-resurfaced patella (PNR, n=31) groups. Demographics, operative data, patient reported outcome measures, and complications were compared.

Results/ Discussion: Both groups had similar age, body mass index, American Society of Anaesthesiologists score. PR group consisted of 72% rheumatoid arthritis(RA) cases while NPR group had 71.0% RA cases. Other cases of inflammatory arthritis include of systemic lupus erythematosus, psoriatic arthropathy, gout, pseudogout and juvenile idiopathic arthritis. Duration of surgery was similar in both groups (PR: 115.89±31.47 vs PNR: 122.84±50.40, p=0.71).

There was no statistically significant difference in their preoperative range of motion (ROM) (PR:95.32±23.57 vs PNR:105 ±19.54, p=0.11), Oxford Knee Score (OKS) (PR:24.96±7.81 vs PNR:23.26±10.31, p=0.53), Knee Society Scoring System Knee score (KS-KS) (PR:44.63±17.40 vs PNR:49.27±17.74, p=0.33) and Knee Society Function Score (KS-FS) (PR:40.86 ± 27.30 vs PNR:47.67±26.97, p=0.33). Outcomes between PR and PNR groups at the 1 year mark in terms of ROM (PR:112.68±18.14 vs PNR:114.57±16.49, p=0.46), OKS (PR:41.54±3.91 vs PNR:41±4.65, p=0.95), KS-KS (PR:84.51±13.17 vs PNR:89.22±9.26, p=0.10) and KS-FS (PR:73.63±18.27 vs PNR:78.7±19.30, p=0.17) were similar. Postoperative complication (PR:16% vs PNR:12.9%, p=0.74) and reoperation rates (PR:16% vs PNR:6.45%, p=0.25) were also similar in both groups. There was no patella-related complication identified in either group.

Conclusion: In the current series, there is no statistically-significant difference in 1-year postoperative functional and ROM outcomes as well as complication and reoperation rates between PR and PNR groups in patients with inflammatory arthritis.

V26

Pneumothorax After Shoulder Arthroscopy: Who Holds The Responsibility? A Case Study And Literature Review

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Background: Shoulder arthroscopy is an increasingly common procedure used for diagnostic and therapeutic purposes in patients with shoulder conditions. Despite its widespread use, there is a relative paucity of information regarding the risk of intra/post-operative pneumothorax.

Objectives: Our aim of this case report is to discuss a case of pneumothorax post shoulder arthroscopy. Our literature review aims to evaluate possible factors associated with pneumothorax and identify mechanisms that caused this rare complication.

Case Report: We report the case of a 75-year-old male non-smoker, who underwent shoulder arthroscopy of the left shoulder without regional anaesthesia and in the left lateral position. The general anaesthesia and operation were uncomplicated. However, he desaturated post-operatively and was found to have pneumothorax on examination and chest X-ray. A chest tube drain was inserted promptly into right chest and subsequently he had an uncomplicated postoperative course.

Study design & method: PubMed and Cochrane database search was carried out using the terms shoulder arthroplasty, pneumothorax, pneumomediastinum, and subcutaneous emphysema. The inclusion criteria were (1) full-text papers and (2) English language or English-translated articles.

Results: 32 articles were identified and thoroughly reviewed. Based on our inclusion and exclusion criteria, 14 articles which included 20 cases of pneumothorax during or after shoulder arthroscopy were included. 80% (16/20) of pneumothoraces occurred postoperatively. In the articles which specify the side of pneumothorax, 91% (10/11) occur on the ipsilateral side of the arthroscopy. 88% (7/8) of pneumothoraces occurred when subacromial decompression was performed. 56% (9/16) occurred in patients placed in the lateral decubitus position. Only 30% (6/20) occurred in current or ex-smokers and only 25% (5/20) had a pre-existing lung condition. Overall, of the articles that posit a mechanism, 75% (9/12) deem the pathogenesis to be multifactorial.

Conclusion: The cause of pneumothorax post shoulder arthroscopy is multifactorial - this includes patient factors, type of anaesthesia, intraoperative positioning and arthroscopic decompression. Majority of pneumothorax cases were detected postoperatively. Although there are no clear risk factors, subacromial decompression and lateral decubitus is associated with pneumothorax in the ipsilateral lung. Timely recognition of this complication allows for appropriate intervention and prevention of life-threatening sequelae of pneumothorax.

V27

Return To Work Following Knee Arthroplasty: A Retrospective Review In Urban Asian Population

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Background: An increasing number of working adults undergo knee arthroplasty in Singapore. There is limited data concerning Southeast Asian patients returning to work (RTW) following surgery. Our aim was to identify and study factors influencing patients who RTW following total (TKR) or unicondylar knee replacement (UKR).

Methods: Patients who underwent TKR or UKR between August 2017 to March 2020 in our center were included in this study. Outcomes include RTW, duration prior to RTW, and RTW of the same nature.

Results: 441 patients underwent TKR (295 women, 146 men, mean age 67.3 years) and 69 underwent UKR (48 women, 21 men, mean age 61.1 years). Patients who underwent TKR returned to work earlier (mean 83.7 ± 27.1 days) compared to UKR (mean 94.4 ± 42.3 days). 90.0% of TKR patients RTW compared to 95.5% who underwent UKR. Of patients who RTW, 94.3% of the TKR group returned to employment of the same nature compared to 92.9% of UKR patients. Patients who RTW were of a Younger age ($p = 0.03$), white collared workers ($p = 0.04$), and had independent pre-operative ambulatory status ($p < 0.01$). Patients who RTW of the same nature were of the subsidized paying class ($p < 0.01$) and had better post-operative Knee Society Scores ($p = 0.04$).

Conclusion: Younger and independently ambulating patients may have better capacity for rehabilitation and RTW post arthroplasty surgery.

V28

Metal vs Non-metal Fixation Methods For Patellar Fractures: A Systematic Review And Meta-analysis Of Clinical And Radiographic Outcomes

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Introduction/Objectives: Patellar fractures, constituting high morbidity in the form of severe pain and impairment of joint function, debilitate our working population. Traditional fixation methods mainly utilise metal implantation such as Kirschner wires and tension bands, but their disadvantages include the need for removal by reoperations and concerning post-op complication rates. Thus, some have begun to trial with non-metal materials such as resorbable sutures and achieved preliminary results. This paper aims to meta-analyse the clinical and radiographic outcomes of non-metal fixation methods in treating patellar fractures compared to a control metal fixation group.

Materials and Methods: After systematically searching for studies from 9 English or Mandarin electronic databases including Cochrane Library, EMBASE, Medline, PubMed and CNKI, 1269 studies were identified. A total of 19 clinical studies (1612 patients) with an adequate level of evidence that compared clinical (scores in standardised scoring systems, incidence of reoperations, and incidence of postoperative complications) or radiographic (time to union and incidence of secondary loss of reduction) outcomes of metal and non-metal fixation methods for patellar fractures was finally included in this meta-analysis.

Result/Discussion: Clinically, the reduction in reoperations (OR = 0.22, 95% CI [0.10, 0.51], $P = 0.0003$), direct (OR = 0.17, 95% CI [0.08, 0.33], $P < 0.00001$) and indirect (OR = 0.50, 95% CI [0.27, 0.93], $P = 0.03$) implant-related postoperative complications in the non-metal group compared to the metal group was significant. Radiographically, the decrease in time to union (SMD = -0.79, 95% CI [-1.11, -0.47], $P < 0.00001$) in the non-metal group compared to the metal group was significant. The remaining results showed no statistically significant difference. Given the higher re-operation rates in metallic fixation, one may also opt for non-metal methods from an economic and safety viewpoint. Nevertheless, more homogenous studies that standardise the compared treatment modalities and treated fracture configurations can be evaluated before declaring non-metallic fixation methods as standard treatment for patellar fractures.

Conclusion: This meta-analysis concludes that non-metallic internal fixation had similar if not superior outcomes compared to their metallic counterparts, without the latter's metal-related postoperative complications and thus resulting in improved postoperative clinical rehabilitation.

V29

Outcomes Of Adhesive Capsulitis With Hydrodilatation In Diabetic Patients

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Background: The primary aim of this retrospective study was to evaluate the efficacy of shoulder hydrodilatation in the treatment of shoulder adhesive capsulitis when comparing between diabetic and non-diabetic patients. The secondary aim is to evaluate the efficacy of hydrodilatation in our local population.

Methods: Patients with clinical or radiological diagnosis of adhesive capsulitis and underwent shoulder hydrodilatation in our local institution from Jan 2021 to Dec 2021 were included in this study. Hydrodilatation was performed under ultrasound guided by our specialised musculoskeletal radiologists. Evaluation using visual analog scale (VAS) was used for pain and passive range of motion (forward flexion and external rotation) were documented pre-hydrodilatation, 1 month and 6 months post hydrodilatation.

Results: A total of 106 shoulders with adhesive capsulitis and underwent shoulder hydrodilatation during this study period. Diabetic group (n=38) had 5 shoulders lost to follow-up while non-diabetic group (n=67) had 2 shoulders lost to follow up. Comparison between diabetic and non-diabetic group (DM vs Non-DM), there was no clinical significance in VAS score, forward flexion and external rotation at pre-hydrodilatation and at 1 month post-hydrodilatation. However, at 6 months post-hydrodilatation, non-diabetic group had significantly better outcomes in (DM vs Non-DM) VAS score 1.84 ± 1.56 vs 0.83 ± 1.11 ($P < 0.001$), passive forward flexion 136.8 ± 24.3 vs 148.5 ± 18.5 ($P < 0.02$) and passive external rotation 45.6 ± 15.6 vs 52.2 ± 13.7 ($P < 0.04$). Additionally, when comparing between time frames in each individual groups, there was significant improvement in VAS score, passive forward flexion, and passive external rotation from pre-hydrodilatation to 1 month and from 1 month to 6 months post hydrodilatation respectively

Conclusion: Hydrodilatation provides good outcome in pain relief and improvement in range of motion in both diabetic and non-diabetic group in the short term. However, diabetic patients showed poorer outcomes at 6 months post-hydrodilatation when compared to non-diabetic patients. Thus, clinicians may require extended follow-up or further management for diabetic patient with frozen shoulder.

V30

Primary Cuff Repair Augmented With Balloon Spacer In A Majority Massive Rotator Cuff Tear Series - A Short Term Outcome And Imaging Study

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Background: Massive rotator cuff tears remain a challenge for shoulder surgeons who grapple with finding an excellent surgical alternative to the conventional reverse shoulder arthroplasty. When repaired, these have a high chance of failure and poor outcomes. The Inspace balloon spacer (OrthoSpace, Kfar Saba, Israel) is made of poly-L-lactide (PLLA), a biodegradable synthetic material that aims to restore the normal shoulder biomechanics.

Hypothesis/Purpose: We aim to explore the outcomes of patients with a majority massive rotator cuff tears treated with primary cuff repair augmented with balloon spacer.

Study Design: Retrospective Case Series

Methods: A total of 34 consecutive patients who had undergone rotator cuff repair and additional augmentation of Inspace balloon spacer at our institution from January 2019 to December 2020 were enrolled into the study. Medical records of these patients were systematically reviewed and data on age, gender, sex, BMI, inciting injury, Imaging studies such as Ultrasound/MRI, Intra-operative findings, surgical technique, post-operative progress in terms of pain, and outcome scores were examined.

Results: The mean age of our patient series is 65.3 years old, and the majority of patients (n=17, 59%) had a massive cuff tear, with the rest (41%) having large cuff tears. There was significant fatty atrophy seen in the majority of the patients (80%) exhibiting at least a grade 3 Goutalier fatty atrophy. Most of the patients underwent a primary cuff repair using the dual row suture bridge technique augmented with a balloon spacer (n=22, 76%). Whereas six patients underwent a superior capsular reconstruction (21%) and one patient underwent a partial repair (3%) for irreparable tears along with subacromial balloon spacer deployment. Patients in our series showed improved outcome scores at six months with a mean 11.7 point increase in Constant Score ($p = 0.065$), mean 7.6 point increase in UCLA score ($p < 0.001$), and mean 5.1 point improvement in Oxford score ($p = 0.054$). Patients in our series also exhibit a significant reduction in pain scores from 7.5 to 2.7 ($p < 0.001$). Of note, 50% of post-imaging studies (n=8) showed the absence of a balloon suggestive of disintegration at six weeks mark.

Conclusion: The use of subacromial balloon spacer on top of a primary repair has shown favourable short-term outcomes. We believe this is contributed by the effects of balloon spacer on the cuff repair, such as reducing peak compression pressure and increasing bone tendon interposition. Our series of post-operative images suggest that balloon disintegration may occur as early as six weeks.

V31

Early Physiotherapy Referral For Lower Back Pain Reduces Healthcare Utilisation For Advanced Imaging And Specialist Spine Surgery Consultations

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Introduction: Lower back pain (LBP) is one of the costliest Orthopaedic conditions and physiotherapy is the treatment of choice for the majority of patients. There is a focus of efforts to reduce costs in advanced imaging, particularly magnetic resonance imaging (MRI), for uncomplicated LBP due to high associated costs and increasing use despite no evidence of benefit to patients in the absence of specific indications. The aim of this study was to compare the healthcare utilisation rates for LBP between patients presenting with early (prior to specialist review) and routine (after specialist review) physiotherapy.

Methods: Consecutive patients referred to specialist spine surgery for LBP in 2021 were retrospectively reviewed (n=311). Baseline demographics, healthcare utilisation rates and clinical outcomes were compared between those who attended early physiotherapy (EPT) before spine surgery consultation vs routine physiotherapy (RPT) only after specialist consultation.

Results: There were no significant differences in baseline demographics or clinical outcomes of VAS pain scores, EQ-5D scores and surgery rates between the EPT(n=183) and RPT(n=128) groups. At 6-months follow-up, EPT was associated with significantly lower MRI imaging rates (p=0.026), number of specialist spine surgery consultations (p<0.001), and physiotherapy sessions (p=0.001) (Table 1).

Table 1 Comparison of outcomes between EPT and RPT groups

	EPT (n=183)	RPT (n=128)	p-value
Healthcare Utilisation Outcomes			
Number of specialist spine surgery consultations	1.7 ± 0.7	2.2 ± 1.1	<0.001*
Number of PT sessions	1.2 ± 0.5	1.4 ± 0.7	0.001*
Open date given at first SOC visit	11.5% (21)	13.4% (17)	0.725
MRI performed	68.1% (124)	78.7% (100)	0.026*
CT performed	1.1% (2)	3.9% (5)	0.105
Admission	0.5% (1)	2.3% (3)	0.191
Clinical Outcomes			
Final VAS score	1.8 ± 2.2	3.0 ± 2.6	0.951
Improvement in VAS score	3.0 ± 2.9	3.3 ± 4.2	0.463
Proportion of patient who achieved MCID (VAS)	49.2%	33.3%	0.524
Final EQ-5D score	0.911 ± 0.1	0.937 ± 0.1	0.722
Improvement in EQ-5D score	0.601 ± 0.4	0.746 ± 0.4	0.396
Spinal injections	2.7% (5)	2.4% (3)	0.578
Spine surgery	1.6% (3)	3.2% (4)	0.448

EPT patients had a decreased likelihood of MRI imaging (OR=0.865, 95%CI: 0.757–0.990), additional specialist consultations (OR=0.770, 95%CI: 0.655–0.905) and additional physiotherapy sessions (OR =0.835, 95%CI: 0.553–1.261) (Figure 1).

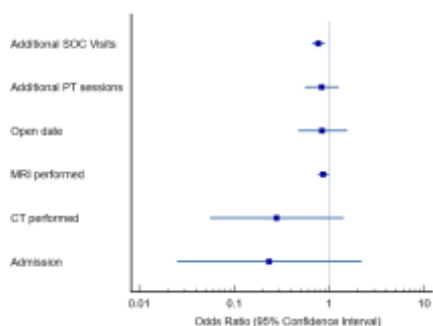
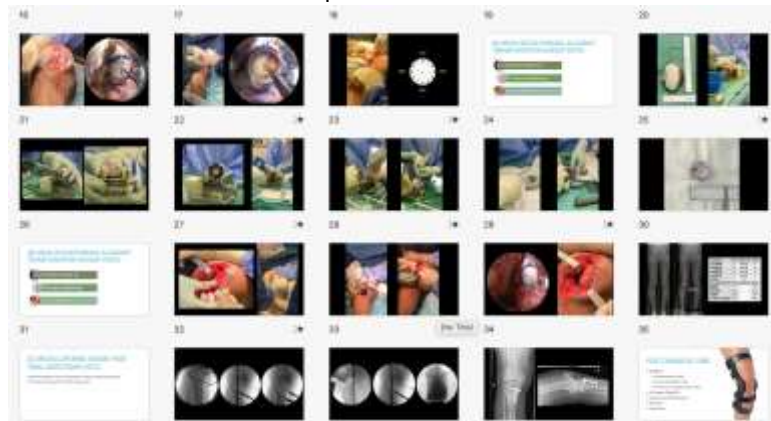


Figure 1 Likelihood of receiving specific services during the 1-year follow-up period based on timing of physical therapy

Conclusions: In conclusion, early physiotherapy reduces 1) overall treatment duration from first referral by the primary physician, 2) number of advanced imaging ordered (and thus associated imaging costs), 3) total number of clinic and therapy sessions, 4) and is safe and does not worsen patient symptoms. These findings support the implementation of early physiotherapy for patients with LBP, to reduce healthcare utilisation and associated costs for patients, providers and healthcare systems.

Osteochondral allograft (OCA) transplantation has been used to treat a wide spectrum of cartilage deficiencies in the knee, including spontaneous necrosis of the knee^{1,2}. Studies that report outcomes after OCA transplantation have shown reliable improvement in pain and return to daily activities of living³⁻⁵. We describe a single plug, press-fit technique for OCA transplantation with concomitant high tibial osteotomy (HTO) to treat femoral condyle chondral defects in a varus knee. There are pearls and pitfalls to this technique and attention should be paid to correction of concomitant joint pathology and malalignment to facilitate osteointegration and survivorship of the allograft plug into host bone. Appropriate surgical timing and prompt allograft implantation help to maximise chondrocyte viability.

Presentation Slides & Technique Videos



V33

Evaluation Of The Placement Of Intervertebral Cages And It's Effect On Fusion And Subsidence Rates In Oblique Lumbar Interbody Fusion

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Introduction: Oblique Lumbar Interbody Fusion (OLIF) is a minimally-invasive approach that utilizes an oblique surgical approach. Fusion rates have been described to be better in OLIF groups while subsidence has been described to be a common complication following OLIF (as high as 18.7%). Both can cause persistent symptoms, implant failure, and the need for revision surgery. Excessive cage height has been attributed to increased subsidence rates. There is limited literature on the relationship between OLIF cage placement and the rate of pseudoarthrosis and subsidence. The objective of our study is to assess the relationship between cage height and cage placement with rates of pseudoarthrosis and subsidence in patients who underwent surgery via the OLIF approach.

Materials and Methods: This is a retrospective review of patients who underwent OLIF from L1 to L5 in our tertiary centre by a single surgeon with a minimum of 12-months follow-up. These patients underwent OLIF for lumbar degenerative disease, spinal stenosis and spondylolisthesis. Radiological data was analysed by 3 independent observers not involved in the surgery, blinded to each other's analysis, and underwent standardization and calibration beforehand. Cage placement was assessed in the anteroposterior (AP) and medial-lateral (ML) planes. The degree of cage rotation from the midline was also assessed on axial images on computed tomography (CT) scans. Cage height was measured on radiographs and compared to measurements recorded in peri-operative notes. Post operative CT scans were used to radiologically assess fusion with the Bridwell Criteria and cage subsidence with the Marchi Classification.

Results: 56 patients were included (107 levels). There were 17 males (30.4%) and 39 females (69.6%). The mean age was 67.4 ± 7.74 years old. We assessed cage placement in the AP and ML planes as well as the degree of rotation from the midline. (AP $1.88\text{mm} \pm 2.56$; ML $0.69\text{mm} \pm 1.48$; Rotation $3.18^\circ \pm 2.87$). In the AP plane 46 (43%) were in the anterior 1/3, 59 (55%) in the middle 1/3 and 2 (2%) in the posterior 1/3 of the vertebral body. In terms of rotation, all cages were placed within 10° of the midline. The mean Bridwell Criteria score was 1.25 ± 0.52 and the mean Marchi Classification grade was 0.35 ± 0.83 . There was no evidence of correlation between cage placement and fusion rates (AP: $p=0.611$; ML: $p=0.585$; Rotation: $p=0.114$) as well as subsidence rates (AP: $p=0.535$; ML: $p=0.512$; Rotation: $p=0.730$). We also found that cage height did not have any correlation with fusion ($p=0.157$) and subsidence rates ($p=0.700$).

Discussion and Conclusion: Our study reaffirms that OLIF has been shown to have good fusion rates. We demonstrated that a small degree of malpositioning and cage height is not associated with a significantly higher risk of pseudoarthrosis and subsidence. However, our positive findings may be skewed by high rates of fusion and low rates of subsidence in our subjects. Our study shows that OLIF remains a promising approach to lumbar interbody fusion.

V37

Older Female Patients, Higher ASA Scores, And Presentation During The COVID-19 Pandemic Negatively Impacted Pre-morbid SF-36 Domains In Hip Fractures Patients

Introduction: Our study aims to study the effect the COVID-19 pandemic on the premorbid quality of life (QoL) of hip fracture patients. We hypothesize patients who are older and sicker, and presenting during the COVID-19 pandemic will have poorer premorbid QoL.

Methods: We reviewed prospectively collected data of 1440 surgically managed hip fracture patients aged 60 years and above with a proximal femur fracture admitted between 1 January 2018 to 31 December 2021. The study cohort was divided into three groups: Pre-COVID group (n = 723) from year 2018 to 2019; Early-COVID group (n = 374) from year 2020; Late-COVID group (n = 343) from year 2021. We collected basic demographic data, types of fracture and surgery performed. Pre-morbid QoL of each patient were assessed using the Short Form 36 Health Survey (SF-36) and its Physical Composite Score (PCS) and Mental Composite Score. Multiple linear regression analysis was performed on each domain of the SF-36, the PCS and the MCS against demographic data, type of fracture and surgery, and period of admission.

Results: Type of fracture and surgery were not predictive of SF-36 scores. Older patients had significantly poorer scores in the "Physical functioning" (p <0.001) and "Role limitations due to physical health" (p <0.001) domains and PCS. Female patients had lower scores in the "Physical functioning" (p = 0.001), "Bodily pain" (p = 0.002), "Social functioning" (p = 0.007) and "Mental health" (p = 0.007) domains, and both PCS (p = 0.009) and MCS (p = 0.015). Poorer scores were seen in non-Chinese patients in the "Physical functioning" (p = 0.014), "Role limitations due to physical health" (p = 0.005) and "Social functioning" (p = 0.021) domains and PCS (p = 0.005). Patients with higher ASA had poorer SF-36 scores in PCS (p <0.001) and MCS (p <0.001) and the domains of "Physical functioning" (p <0.001), "Role limitations due to physical health" (p <0.001), "General health" (p <0.001), "Vitality" (p <0.001), "Social functioning" (p <0.001), "Role limitations due to emotional problems" (p <0.001) and "Mental health" (p <0.001). In addition, patients who presented during the COVID-19 pandemic showed significantly lower scores in the following domains: "Physical functioning" (p <0.001), "Role limitations due to physical health" (p = 0.012), "General health" (p = 0.001), "Vitality" (p <0.001) and "Mental health" (p = 0.015) domains, and in PCS (p = 0.011) and MCS (p = 0.001).

Discussion and Conclusion: ASA status was the most likely factor to influence a hip fracture patient's SF-36 score and therefore predict the patient's premorbid QoL. This is likely due to the greater number and poorer control of comorbidities associated with a higher ASA status, leading to greater morbidity and poorer perception of one's health. Older, female and non-Chinese patients were more likely to have lower scores in some domains, which could be attributed to factors such as lower health literacy, poorer access to healthcare or alternative health beliefs. With the shift in focus by public institutions on acute care from chronic care, along with the implementation of socially restrictive policies, it is likely that hip fracture patients presenting during the pandemic were more deconditioned and socially reclusive, explaining their poorer premorbid QoL. Age, gender, ethnicity, ASA status and the COVID-19 pandemic affect the premorbid quality of life of elderly hip fracture patients, and should be considered in value-driven care assessment and downstream health resource allocation.

V39

Influence Of Pre-operative Proximal Humerus Diaphyseal Cortical On The Post-operative Outcomes After Reverse Shoulder Arthroplasty

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Introduction: Cortical thickness of the proximal diaphysis in the humerus had been described by Tingart et al to be a reliable measure bone mineral density and quality. We seek to examine the influence of pre-operative diaphysis cortical thickness, on the post-operative outcomes following reverse shoulder arthroplasty (RSA).

Materials and Methods: A retrospective study was performed on 65 patients who underwent a reverse shoulder arthroplasty between 2011 and 2019 were included in our study. 2 independent reviewers measured the combined cortical thickness (CCT) on shoulder radiographs taken preoperatively. These patients were followed up and evaluated post-operatively at 3, 6, 12 and 24 months. Functional outcomes were assessed with the Constant shoulder score (CSS), University of California at Los Angeles Shoulder rating scale (UCLASS), Oxford shoulder score (OSS), Visual Analogue Scale (VAS), Satisfaction score (SAT) and range of motion of forward flexion (ROM-FF) and abduction (ROM-ABD). Statistical analysis was performed by dividing the patients into 2 groups based on their CCT: a higher CCT group (>3.8mm) and a lower CCT group (<3.8 mm).

Results: There were 58 patients in the lower CCT group and 7 patients in the higher CCT group. The mean CCT in our patient cohort was 2.85 ± 0.68 mm. There was no statistically significant difference in outcomes between the groups at 2 years follow-up for the CSS (P = 0.929), OSS (P = 0.429), UCLASS (P = 0.802), ROM-FF (P = 0.841), ROM-ABD (P = 0.633), VAS (P = 0.477), and SAT (P = 0.801). Differences at shorter time intervals were not significant either.

Discussion: In our study, we found that outcome scores of patients with low and high CCTs after RSA were similar. RSA complications such as peri-prosthetic or scapular fractures, instability and notching have been previously described in literature; these events will subsequently negatively impact outcome score. There were no fracture complications within our study cohort, and only one reported case of instability leading to dislocation. The low complication rate in our patients - which we had expected to be higher in the lower CCT group due to their poor bone mineral density - could have led to comparable outcomes with the high CCT group. It is possible that factors other than bone mineral density play a more significant role in causing some of these complications. Scapular notching is largely due to surgical technique and implant factors. For prosthesis instability, joint

compressive forces through soft tissue tension, prosthesis socket depth and glenosphere size, are the main critical biomechanical predictors.

Conclusion: To the best of our knowledge, this would be the first study investigating the effect of pre-operative proximal humerus diaphysis cortical thickness, on RSA outcomes. Our study shows lower CCT does not correlate with poorer functional outcomes post-RSA.

V42

Early Use Of Concentrated Autologous Bone Marrow Aspirate Shortens Time To Union In High Energy Closed Tibia Shaft Fractures

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Introduction: Tibial shaft fractures as a result of high energy trauma are burdened with delayed and non-union risk. For closed tibia shaft fractures, studies have shown a mean union time of 5.5 months and non-union can occur in about 20% of such cases. Few studies have shown that injection of autologous mesenchymal stem cells (MSCs) to tibial shaft fracture sites at a delayed stage enhance union time in lower energy injuries. Rather than treating delayed union with additional procedure, the use of MSCs in acute setting of tibial shaft fracture fixation could reduce the time to union with reduced morbidity and economic burden.

Aim and Objectives: The purpose of the present investigation was to evaluate the efficacy and safety of early prophylactic percutaneous introduction of an aspirated bone marrow-enriched MSCs-graft into the fracture site, as compared with non-treatment. The primary objective was to assess time to union for high-energy close tibia fractures with early autologous bone marrow aspirate graft for high-energy close tibia fractures.

Materials and Methods: This is a pilot study in the form of a prospective cohort; with expected sample size of 15 patients. Consecutive patients from August 2021 – till date; presenting with close tibia fracture between age group of 21 – 65 years are included in the study. Those patients with open fracture, peri-articular fracture, pathological fracture or with concomitant other significant injury were excluded. All patients underwent autologous bone marrow aspiration and percutaneous injection at fracture site along with intramedullary nail procedure. The study patients had same rehabilitation method and were followed up as for a routine case of nail fixation for tibia shaft fracture. Clinical and radiological union was documented along with any complications arising as a result of MSCs harvest. These were compared to retrospective cohort of similar patients and difference in time to union was assessed along with time to return to function, number of clinic visits and morbidity.

Results: This is an ongoing study and we present pilot data of 8 patients with high energy close tibia shaft fractures; 3 females and 5 male patients with mean age of 30 years. All patients showed 100% union with no donor site or surgery related morbidity. Median time to union was 19.1±3.4 weeks (95% C.I 16.6 – 21.4 weeks) with all patients returned to work within 3 months. In comparison, in the retrospective cohort of 16 similar patients during the period of 2018 to 2021 there were 12.5% (2/16) delayed union cases with mean time to union of 20.8±6.6 weeks (95% C.I. 17.5 – 24 weeks). Two patients required additional procedures and the return to work time ranged from 3 months to 16 months. No patient had serious complications; except 2 with chronic pain. The median clinic visits for control group were 4 compared to 7 for study group; which were needed to estimate early time to union.

Conclusion: The pilot study is the first to show that early use of autologous MSCs indicate shorter time to union in close high energy tibial shaft fractures with low to no morbidity and can be considered for high risk patients. The cost of additional procedures and clinic visits can be avoided. However, the results need a good randomised control trial to consolidate the findings.

V45

A Case Report Of A Hinged External Ring Fixator For The Treatment Of Calcaneal Osteomyelitis With A Soft Tissue Defect

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Introduction: Calcaneal osteomyelitis with a concomitant heel soft tissue defect is a challenging condition to treat, with high rates of major limb amputation.

Material and Methods: This is a case report of a 42 year old female with heel gangrene and underlying calcaneal osteomyelitis which was unsuitable for flap coverage. She was pre-morbidly ambulant and had Diabetes Mellitus complicated by renal failure on haemodialysis. Ultrasound duplex studies showed superficial femoral artery stenosis for which she underwent successful angioplasty with good run-off to the foot. She underwent a partial calcaneotomy, extent of which was guided by areas of increased signal on T2 MRI. The first two attempts at closure of the heel wound with immobilization in a frontslab failed due to wound dehiscence. On the third attempt at wound closure, a hinged ring external fixator was placed with the foot in maximal equinus. 2 weeks after external fixation, gradual equinus correction was performed until a neutral, plantigrade foot was

achieved. The hinged external fixator was converted to a static construct at 2.5 months post-op for additional stability during weight bearing. At 3.5 months, the frame was removed and leg was placed in a below knee full cast with weight bearing allowed. At 2 weeks after removal, the cast was removed and patient allowed to weight bear.

Results: There was complete wound healing with removal of external fixator at 3.5 months. The patient was able to ambulate with a walking-stick with a painless, plantigrade foot. There was a proximal pin site wound infection which required formal debridement. There was no wound breakdown or recurrence of osteomyelitis at 6 month follow-up.

Discussion: A hinged external fixator with the foot initially in maximal equinus can allow for tension free closure of heel wounds. With the foot suspended in the circular frame, the wound was free from additional pressure or shear which contributed to the initial wound dehiscence. Gradual correction allows for the tissue to adapt to the tension across the wound, avoiding dehiscence while achieving a plantigrade foot. The rate of correction could be adjusted based on the wound. Initial correction was gradual at 1mm/day, which was accelerated to 2-4mm/day from the second month onwards when the wound had epithelized to decrease total frame time. The frame allows for weight bearing while correcting equinus deformity, reducing sarcopenia from immobility. She was able to participate and perform activities of daily living and hence discharged with the frame. The conversion of a hinged to a static ring fixator was performed in the outpatient clinic to confer additional stability during weight bearing. This was done without anaesthesia or the need to insert or remove any additional pins or wires.

Conclusion: A partial calcaneotomy with application of a hinged external fixator is a viable treatment option in the setting of patients with plantar heel ulcers and calcaneal osteomyelitis.

V50

Ultrasound Guidance Versus Anatomical Landmark For Ankle Arthroscopic Portal Insertions: A Cadaveric Study

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Introduction: Ankle arthroscopy can be used for a variety of ankle pathology including soft tissue and bony impingement, loose bodies, osteochondral defects, ankle fractures, osteoarthritis and instability. However, complication rates associated with ankle arthroscopy range from 3.4 to 9%, with half of them consisting of neurovascular and tendon injuries due to arthroscopic portal placement.

Purpose: To determine the safety and efficacy of using ultrasound in topographic marking of the neurovascular structures and tendons in the foot and ankle and identification of a safe zone for arthroscopic portal creation, compared to using anatomical landmarks.

Methods: Twelve cadaveric samples were divided into two groups of six. The first group underwent ultrasound assessment by a board certified radiologist, who identified zones of safety for ultrasound guided insertion of anteromedial, anterolateral and posteromedial arthroscopic portals. Ankle arthroscopy was then performed. The other group underwent similar ankle arthroscopy assessment utilizing conventional anatomical landmarks. Straws were used to delineate arthroscopy portal tracts. The cadaveric samples were then dissected. Distance was measured between the portals and important structures: anterolateral portal and superficial peroneal nerve (SPN) as well as extensor digitorum longus (EDL); anteromedial portal and the great saphenous vein (GSV) as well as tibialis anterior (TA); and posteromedial portal and flexor hallucis longus tendon (FHL).

Results: No neurovascular structures or tendons were injured in all twelve cadaveric samples. Compared with the non-ultrasonography group, the group that underwent ultrasonography assessment had statistically significant larger distance of the SPN, EDL and TA from the anterolateral and anteromedial arthroscopic portals (p values = 0.045, 0.046 and 0.025 respectively). No difference was found between the distance of the GSV from the anteromedial arthroscopic portal, as well as the distance of the FHL from the posteromedial arthroscopic portal.

Conclusion: Ultrasound assessment and topographic identification of the safe zone for ankle arthroscopic portal creation is a safe and effective process that may reduce the risk of iatrogenic injury to neurovascular structures and tendons in anterior and posterior ankle arthroscopy.

V51

Neonatal Transfemoral Amputation Following Congenital Limb Deficiency Secondary To Twin-to-Twin Transfusion Syndrome

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Introduction: Congenital limb deficiency are birth defects with aplasia or hypoplasia of bones of the limbs. The occurrence is 7 out of every 10000 newborns. The causes varied from chromosomal abnormalities, teratogens, intra uterine abnormalities and genetic disorders. Twin-to-twin transfusion syndrome (TTTS), oligohydramnios, amniotic band syndrome as part of intra uterine abnormalities, may lead to isolated limb deficiencies. The reported cases in the region are limited. We reported a case of a twin

baby with twin-to-twin transfusion syndrome, who developed congenital limb deficiency with soft tissue underdevelopment and necrosis distal to knee, and underwent transfemoral amputation.

Report: This is a second twin baby boy of monochorionic diamniotic twin pregnancy. He was born via emergency caesarean section for twin-to-twin transfusion syndrome (Quintero stage 3) with abnormal doppler at 27 weeks 3 days of gestation, weighted 1kg as a recipient twin. Antenatally mother had hyperthyroidism in pregnancy on treatment. Delivery was uncomplicated. Immediately after birth, he was noted to have gross deformity over right lower limb. The tibia and fibula were protruded with under developed soft tissue. There were multiple constriction bands at the level of knee and leg with dangling part distal to the constriction band. It was pale and discolored. The vascular examination revealed the posterior tibia artery and dorsalis pedis artery pulse were not palpable. Radiographs showed under-developed femur, tibia and fibula, dislocation of ankle joint with dysplastic tarsal bone. Routine ultrasound was performed and detailed scan on 23 weeks of gestation noted abnormal doppler with discrepancy up to 40%. Hence the diagnosis of TTTS (Quintero 3) were established. There were no abnormalities detected on the lower extremities of either twin. The baby then underwent a transfemoral amputation of right lower limb at level of proximal thigh after the definitive demarcation. The operation was uneventful with controlled hemorrhage. It also requires excellent anesthetic and pediatric support in preparing the patient perioperatively. There were various causes of intra-uterine gangrene of the limb. Prenatal ultrasound able to detect TTTS using flow velocity doppler signals. Incidence of in-utero acquired limb ischemia higher in monochorionic twins. Prenatal ultrasound may not detect limb defects especially in twin pregnancy.

Conclusion: Congenital limb deficiency is uncommon and can have devastating consequences to patient and family. The ultimate treatment maybe higher-level amputation of affected extremity, until definitive demarcation awaited.

V52

Functional Evaluation Of Lower Extremity Soft Tissue Sarcomas: A Short To Mid-term Post-operative Analysis

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Background: Soft tissue sarcomas (STS) are rare malignancies of the mesodermal origin. Extremity sarcoma can deteriorate functionality. Operative treatment of lower limb STS can result in good functionality after surgery.

Objectives: The aim of this study is to investigate the short to mid-term postoperative functional outcomes in patients with lower extremity STS.

Methods: This study was performed in a single tertiary hospital from 2016 to 2020. The clinical outcome measure used were the Musculoskeletal Tumor Society (MSTS) scoring system and the Toronto Extremity Salvage Score (TESS). Data on functional outcomes were collected prospectively. Patients with lower limb soft tissue sarcoma who underwent operative treatment were reviewed at 1- and 2-years post-surgery. They were assessed via the MSTS and TESS questionnaires.

Results: A total of 46 patients were recruited. There were 20 (43%) females and 26 (57%) males. The mean age was 61.3 ± 15.4 years. The mean TESS score at 1-year post surgery was 92.8 ± 8.9 . The mean MSTS score at 1-year post surgery was 86.7 ± 16.2 . At 2-years post-surgery, the mean TESS score was 94.2 ± 8.5 whilst the mean MSTS score was 86.4 ± 15.2 . There was no significant improvement of either the TESS score ($p=0.99$) or MSTS score ($p=0.15$) from 1-year to 2-year post surgery.

Conclusion: Patients who underwent operative treatment for lower extremity sarcomas had a good functional outcome at 1-year post surgery. Whilst the functional outcome tended to improve at 2-year post surgery, there was no significant difference between both time points.

V53

Utility Of Robotic-assisted Total Knee Arthroplasty In The Presence Of Extra-articular Deformity

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Introduction: Performing total knee arthroplasty (TKA) in the setting of significant extra-articular deformity remains a technically challenging endeavour, with distorted bony anatomy and pre-existing hardware often compromising optimal implant placement with conventional TKA techniques. The introduction of robotic systems for TKA has led to improvements in the accuracy and reproducibility of bone resection and component placement, allowing surgeons to overcome many of the limitations of conventional TKA techniques in this setting.

Methods: We reviewed a series of 12 robotic-assisted TKAs performed on patients with underlying tibial metaphyseal and diaphyseal deformities, distal femoral deformities, and retained implants. All patients underwent a single-stage primary TKA with the MAKO robotic system, with pre-operative planning based on a 3D CT model of the patients' knees. Patients were followed up for two years post-operatively with standard weight bearing radiographs of the knees, full length lower extremity radiographs,

as well as functional scores. Cost-effectiveness analysis was performed for selected cases, evaluating the cost of a single-stage robotic assisted TKA against a two-stage conventional TKA.

Results: All 12 patients underwent a single-stage robotic-assisted TKA without need for revision at the time of latest follow up. Radiographically, an average mechanical axis correction of 8.7 degrees was achieved, and all patients were noted to have significant improvements in functional scores and quality of life measures at the two-year follow up mark. Significant cost savings were demonstrated for cases that utilised the MAKO robotic system to perform a single-stage TKA instead of a conventional two-stage procedure.

Conclusion: Our experience demonstrates the utility of robotic-assisted TKAs in achieving optimal and cost-effective surgical outcomes in the setting of complex extra-articular deformities, with the aid of enhanced pre-operative surgical planning and intra-operative surgical feedback and guidance through the MAKO robotic system.

V54

Outcomes Of Delayed Soft Tissue Coverage In Gustilo 3B And 3C Lower Extremity Fractures: A Regional Hospital's Experience

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Introduction: Management of open fractures of the distal leg and foot pose a huge challenge even to the experienced orthopaedic surgeon. These complex injuries are associated with increased complications and bear significant socioeconomic impact, including increased long term cost, longer return to employment, and poorer quality of life. Current literature demonstrates that delayed soft tissue coverage for Gustilo 3 open fractures of extremities have increased complication rates. Meeting the recommended time frame for coverage is however, often not possible. Delays can occur due to patient factors (the unstable polytrauma patient) and environmental factors (lack of manpower and facilities). This in turn may lead to poorer patient outcomes.

Objective: We aim to determine the infection rates in patients with delayed coverage, and secondarily sought to measure complications of prolonged recumbency, which we postulated may occur due to delay in operation and mobilisation.

Materials and Methods: A retrospective analysis of all consecutive patients from January 2018 to March 2022 with Gustilo 3B and 3C fractures of the distal tibia, ankle, and foot who underwent a free flap coverage procedure was performed. We excluded patients with ≤ 1 initial debridement performed, less than 6 months of follow up, and those with locoregional flaps. Data collected included basic demographic and anthropometric data, smoking status, comorbidities, mechanism of injury, injury severity score, time to debridement, fixation, and flap procedure from arrival in hospital, number of debridement procedures, and the development of complications - specifically soft tissue infections, osteomyelitis, and complications associated with prolonged recumbency including deep vein thrombosis and pulmonary embolism, pressure injuries, and pneumonia.

Results: 12 patients fit the inclusion and exclusion criteria, with a mean follow up duration of 13.2 months. The mean time to free flap procedure was 17.5 days. 1 patient had coverage performed within 7 days of the index injury, with the other 11 having this performed beyond this time. Only 1 patient (8%) belonging to the ≥ 7 days group developed a soft tissue infection, and none of the patients in either group developed osteomyelitis or other complications of prolonged recumbency.

Conclusion: Contrary to the published literature, delayed soft tissue coverage for open fractures of the distal lower limb did not yield a very significant infection rate. These lower infection rates may be due to: (i) multiple debridements performed (mean of 4 debridements in our study), (ii) consultant-led debridements, which may be more meticulous and extensive, (iii) the use of adjuncts (antibiotic cement beads in debridements, local vancomycin powder and gentamicin-collagen sponge in surgical fixations).

V56

Scapular Notching Post- reverse Shoulder Arthroplasty In An Asian Population

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Introduction: Reverse Shoulder Arthroplasty (RSA) is a procedure that is being performed for an increasing number of indications such as rotator cuff arthropathy, glenohumeral arthritis, proximal humeral fractures or irreparable rotator cuff tears. Scapular notching is defined as a radiographic observation post-RSA pertaining to a bony defect in the scapular neck. The study aims to determine the incidence of scapular notching, possible predictive factors, and its influence on post-operative patient reported outcomes, in our Asian population.

Materials and Methods: A retrospective study was carried out on patients who underwent RSA at Singapore General Hospital from January 2011 to December 2019. Patients underwent follow-up at 3,6,12, and 24 months post-surgery. Outcome measures collated included: Constant shoulder score (CSS), University of California Los Angeles Shoulder rating scale (UCLASS), Oxford shoulder score (OSS) and range of motion of forward flexion and abduction. 1-year post-operative radiographs were evaluated for presence of notching. Patients were divided into 2 groups: notching vs non-notching, and statistical analysis was carried out.

Results: There were 137 patients and 142 shoulders in this study; 5 patients had bilateral RSAs (operated at different settings). The overall incidence of scapular notching within 1-year was 25 (17.61%). Based on the Nerot-Sirveaux Classification: 14 were Grade 1, 6 were Grade 2, 4 were Grade 3, and 1 was Grade 4. The median 2-year post-op CSS Score was significantly higher in patients without scapular notching [69 (IQR 62-76) vs 51 (IQR 40-65), $P < .001$]. Median 2-year post-op UCLA Score was also significantly better in those without notching [29 (IQR 26-32) vs 25 (IQR 22-31); $P = 0.046$]. The median 2-year post-op OSS was at 16 (IQR 13-21) and was significantly better in patients without scapular notching [15 (IQR 12-20) vs 24 (15-35); $P < .001$]. There were no significant differences between notching vs non-notching, in terms of the 1-year forward flexion and abduction, or any correlation with notching and the implant Neck-Shaft Angle.

Discussion: Within our study cohort, the overall incidence of scapular notching among the subjects was 17.61%. Patient without scapular notching post-RSA had statistically significant better 2 years post-operative functional outcome measures compared to those with notching, highlighting the clinical implication of its occurrence. There was insufficient evidence to demonstrate an association between scapular notching with age, glenoid height, sex, or implant type. Patients undergoing RSA should be thoroughly counselled for the risk of scapular notching in the long term and its relation with poorer functional outcomes. Certain considerations can be taken intra-operatively, such as careful placement of the glenoid component, to reduce the occurrence of notching.

Conclusion: Scapular notching negatively affects 2 year functional outcomes post-RSA.

V59

Skin From The Knee Within - A Curious Case Of Intra-articular Sebaceous Cyst In The Knee Joint

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Introduction: An epidermal cyst is a common benign lesion that occurs within subcutaneous tissue. It generally develops from a trauma leading to the implantation of an epithelial element. Prevalent sites of the lesion are the trunk, neck, face, hand, and foot. An acquired epidermoid cyst could arise as a result of iatrogenic injury adjacent to the skin or subcutaneous tissue. We present a rare unusual case of epidermoid (sebaceous) cyst within the knee joint after an arthroscopic procedure.

Case report: A 35 year old gentle man presented with pain and locking of the right knee. He had previously undergone an arthroscopic anterior cruciate ligament reconstruction. Following recovery, he complained of recurrent swelling, locking and occasional pain in the knee with activities. MRI of the knee was performed which showed a medial femoral condyle cartilage loss and a simultaneous presence of 1x1.5cm homogenous non enhancing loose body in the supra patellar pouch. This was reported as a possible chondral loose body. He underwent arthroscopic debridement and removal of loose body with subchondral micro-fracture. Arthroscopic appearance of the loose body resembled a synovial cyst which upon entry showed presence of sebaceous material. Histology confirmed the cyst to be epidermoid cyst. The patient recovered well after the procedure.

Conclusion: The above is a very rare case of sebaceous cyst within the knee joint which likely occurred as a result of dermal implantation during initial arthroscopic procedure. One must be cautious about penetrative percutaneous procedures involving joint.

V60

Anatomic Risk Factors For Shoulder Re-dislocation After Arthroscopic Bankart Repair: A Case-control Study Comparing Failure And Non-failure Groups In An Asian Population

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Introduction/Objectives: Arthroscopic Bankart repair is currently the gold standard for treating glenohumeral dislocations. Post-arthroscopic Bankart repair failure/redislocation rates are influenced by several risk factors. Despite the limited evidence, one potentially important group of risk factors are pre-operative anatomic defects and their sizes. Thus, this study aims to assess the parameters of anatomic defects such as glenoid bone loss, Hill-sachs lesion and labral tear size and evaluate their contribution to post-operative instability after a primary repair.

Material and Methods: Between May 2010 to May 2015, 169 patients with on-track Bankart lesions underwent primary arthroscopic Bankart repair, of which there were 14 cases of post-Bankart failure. Using a case-control design, this study matched the 14 failure cases with 14 non-failure cases based on age and gender. Patient demographics, pre-operative radiological parameters (including percentage/size of glenoid bone loss and Hill-sachs lesion) and intraoperatively determined extent of labral tears were compared between the failure and non-failure groups. Chi-square test, Student t test and Fisher variance were used for analysis.

Result/Discussion: All patients were male with a mean age of 21.01±4.97. The mean duration to primary Bankart repair in failure and non-failure groups was 15.7±12.4 weeks and 18.95±11.99 weeks respectively. The mean number of post-operative dislocations was 1.90 ± 1.51, with post-op to recurrence time being 12.77 ± 7.3 months. Significantly greater glenoid bone loss

(9.4% vs 3.2%, $p=0.044$; and $2.66\pm 2.24\text{mm}$ vs $0.84\pm 1.39\text{mm}$, $p=0.024$) and labral tear size ($5.92\pm 1.14\text{mm}$ vs $5\pm 0.96\text{mm}$, $p=0.039$) was found in the failure group. However, there was no significant difference in mean volume of Hill-Sachs lesion between the two groups ($5.92\pm 1.14\text{mm}$ vs $5\pm 0.96\text{mm}$, $p=0.739$). Additionally, there was no significant difference between the two groups for all other pre-operative data.

Conclusion: In the treatment of traumatic recurrent anterior shoulder instability, extensive glenoid bone loss and labral tears are risk factors for post-arthroscopic Bankart failure. Pre-/intra-operative quantification of these factors can help guide management. However, the size of Hill-Sachs lesion from this study's population did not affect the risk of post-arthroscopic Bankart failure. Thus, in cases of on-track Hill-Sachs lesions, arthroscopic Bankart repair remains the gold standard treatment and should not change based on the size of Hill-Sachs lesion.

V61

Non-selective NSAIDs Provide Good Clinical Outcomes And Do Not Increase Retear Rates Post-arthroscopic Rotator Cuff Repair: A Systematic Review And Meta-analysis

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Background: Arthroscopic rotator cuff repairs are known to be associated with substantial pain and post-operative pain management is critical in overall patients' outcomes. Non-steroidal anti-inflammatory drugs (NSAIDs) are commonly used oral medications post rotator cuff repair and can reduce opioid usage. However, controversies arise due to its postulated effect on postoperative tendon healing. Even though there are studies evaluating the use of multimodal pain management protocols post rotator cuff repair, the evidence of safety and efficacy of NSAIDs remains unclear. Therefore, this study aims to investigate the effect of NSAIDs on re-tear rates and clinical outcomes.

Methods: A systematic search of four databases (PubMed, EMBASE, Scopus and Cochrane Library) was conducted, identifying studies that compared cohorts with post-rotator cuff repair NSAIDs use versus Control groups without NSAID use. Meta-analysis was conducted for Retear rate as well as pain and functional outcomes (Visual analogue scale (VAS) and American Shoulder and Elbow Surgeons Shoulder (ASES) score). Subgroup analysis was conducted for re-tear rates to determine the overall treatment effect of selective COX-2 inhibitors.

Results: Six studies were included in the meta-analysis. The total baseline cohort size was 916, with 443 (48.3%) patients in the NSAID group and 473 (51.6%) patients in the Control group. There were no significant differences in the baseline characteristics between the two groups. Meta-analysis showed that there were no significant differences between Retear rates ($p=0.71$), early and late post-operative VAS score ($p=0.10$ and $p=0.10$ respectively) and latest ASES score ($p=0.31$). However, subgroup analysis of re-tear rates revealed a statistically significant difference between the subgroup including selective COX-2 inhibitor versus non-selective COX inhibitor ($p<0.01$).

Conclusion: Non-selective NSAIDs use in post-arthroscopic rotator cuff repair pain relief is safe and can potentially reduce opioid consumption without increasing re-tear rates. Selective COX-2 inhibitors should be used with caution as they might lead to higher re-tear rates than non-selective NSAIDs. However, more comparative studies on COX-2 inhibitors are required to verify this.

V62

Does Rotator Cuff Tear Morphology Affect Clinical Outcomes Post-surgical Repair In Large To Massive Tears?

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Introduction: Rotator cuff tear morphology (RCTM) is an important predictor for rotator cuff outcomes and can influence the corresponding repair technique. While the literature on RCTM has been growing, there is still a paucity of evidence investigating its association with clinical outcomes, especially in large to massive tears, where failure rates and clinical outcomes remain suboptimal. This study aims to evaluate the effects of RCTM on clinical outcomes in large to massive tears, using an updated classification system proposed in this study.

Methodology: Patients who underwent arthroscopic repair of large to massive, full thickness rotator cuff tears were retrospectively analysed. The tear pattern was classified at the time of surgery as Type IA, Type IB, Type IIA and Type IIB. Primary outcome measures were Oxford Shoulder Score (OSS), Constant Shoulder Score (CSS), University of California at Los Angeles Shoulder Score (UCLASS) followed-up at 6, 12 and 24-months as well as re-tear rates at latest follow-up. Clinical outcome was compared across all 4 types (Type IA to Type IIB). Analysis of Variance and Student's t test were used to compare continuous, parametric data. Categorical variables were analysed via Pearson's chi-squared test.

Results: In total, 109 patients were included in the study with a mean age of 65.5 ± 9.4 . The prevalence of each tear morphologies from Type IA to IIB was 22.0%, 34.9%, 27.5% and 15.6% respectively. All four groups showed statistically

significant improvement from pre-operative to post-operative scores in all 3 outcome measures at 24 months ($p < 0.001$ for all). No significant difference in primary outcome or retear rates were detected between all 4 groups.

Conclusion: RCTM does not influence clinical outcomes post-arthroscopic rotator cuff repair at mid-term follow-up. This study proposes a robust and updated system to classify large to massive rotator cuff tears, along with its corresponding repair technique.

V63

The Flexion-valgus Type Unicondylar Tibial Plateau Depression Fracture Pattern: A Novel Anterolateral Approach

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Objective: The approach to pure depression fractures (PDF) of the posterolateral tibial plateau (PTP) is classically a posterior approach via a metaphyseal osteotomy window with elevation of the depressed articular fragment. Other posterolateral approaches have been described but have been criticized for affecting reduction quality, and risks to the common peroneal nerve.

Materials and Methods: In this case series, we describe a standard anterolateral approach with a window osteotomy through the metaphysis. Elevation of the PTP fracture is done through the osteotomy site.

Results: The standard anterolateral approach avoids limitations of posterior or posterolateral approaches. Adequate reduction and good fixation of PDF of the PTP is attained.

Conclusion: The anterolateral approach with osteotomy of the lateral condyle is reproducible and familiar. This avoids the need for a fibula osteotomy and the risks of neurovascular injury, while allowing adequate visualisation and fracture reduction.

V66

Using Wrist-worn Activity Tracker To Monitor Recovery After Total Knee Arthroplasty

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Introduction/Objectives: Physical activity level is often used as a surrogate marker in signaling success or patient dissatisfaction after primary total knee arthroplasty (TKA). Conventional patient-reported outcome scores may fail to reflect dynamic trends in physical activity level in the early post-operative period. The purpose of this study is to evaluate the use of a consumer level wrist-worn patient activity tracking device to measure specific data points relevant to patient recovery after TKA.

Methods and Methods: Twenty six patients who were planned for primary TKA were recruited in a prospective, single-arm, pilot study at a single institution. Patients were provided with a patient activity tracker (FitBit Ionic) and a paired mobile device which transmit data to a secure cloud storage system (ConnectedLife) managed by a vendor. Data points were captured from 1 week pre-surgery 3 months after surgery. Activity level measurements include average daily steps, floors climbed, distance, and comprehensive stride level analysis for length, duration and pattern comparison. Data analytics software provided by the vendor converts collected data to graphical illustrations of physical activity level.

Results/Discussion: Sensor-derived accelerometry data obtained round the clock allowed functional recovery of patients to be profiled based on mobility trends. Stride-level analysis of individual patients allowed both patients and clinicians to receive tangible feedback and track individual physical activity level progression. In addition, stride pattern analysis provided day-to-day inference of gait patterns. Physical activity was reduced the first weeks after surgery, but with large inter-individual variations in recovery profiles. No complications were noted.

Conclusions: This study demonstrates a novel method of using wrist-worn patient activity tracking devices in translating the physical activity level into data points for assessment of functional recovery after TKA. This may augment standard of care patient-reported outcome measures in reflecting patient satisfaction after TKA.

V67

3D Printed Polycaprolactone Mesh Augmentation In The Treatment Of Clavicle Fracture Non-unions

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Introduction/Objectives: Clavicle non-unions are rare, occurring at an incidence of around 0.1-5% in those treated conservatively and around 2.6% in those managed surgically, however, they can affect patients' quality of life significantly causing chronic pain and functional disability. Some authors advocate the use of autologous and allogeneic bone grafting to improve fracture healing rates. We were made aware of Osteomesh (Osteopore International, Singapore), a 3D printed polycaprolactone (PCL) mesh that has been used successfully in the repair of orbital floor fractures and in craniofacial surgery. It is a bio-reabsorbable implant that functions to act as a scaffold to allow for bony ingrowth and subsequent bone formation prior to undergoing hydrolysis and resorption over a period of 18 to 24 months. There have been no studies to date describing its usage in the treatment of fracture non-unions. We aim to demonstrate the surgical technique and clinical and radiological

outcomes of the utilization of a flexible meshed plate with allogenic cancellous bone graft as an adjunct to plate fixation for the treatment of clavicle non-union.

Materials and Methods: A retrospective study of patients with clavicle non-union fractures who underwent a novel technique of open reduction and internal fixation with 3D printed polycaprolactone mesh augmentation was performed. Outcome measures of shoulder range of movement (ROM), Visual Analogue Scale (VAS) pain score, the American Shoulder and Elbow Surgeons (ASES) score, and the Constant-Murley score were compared pre-operatively and 1 year post-operatively. Serial post-operative radiographs were analysed for evidence of fracture union. Any post-operative complications were also observed.

Result/Discussion: A total of 3 patients were recruited in this study. All of the patients were male with a mean age of 30 (range 21-40) years. Patients had improvements post-operatively in their shoulder ROM, baseline VAS pain, ASES scores, and Constant-Murley scores compared to pre-operatively. There were no peri-operative complications of wound complications, infections, non-union or delayed union observed. Patients demonstrated callus formation on radiographs by 3 months post-operatively and evidence of fracture union by 1 year post-operatively.

Conclusion: Based on our study, we have found that patients with symptomatic clavicle fracture non-union can be safely and successfully managed surgically with the augmentation of 3D PCL mesh and allogenic bone grafting. Our patients reliably demonstrated clinical and radiographical union and improvements in pain, shoulder ROM, ASES scores, and Constant-Murley scores with this treatment with no complications. Osteomesh in conjunction with allograft can be considered as a safe, effective and easily performed adjunct in the treatment of bony defects and non-union.

V68

A Novel Method Of Analyzing Authorship Trends; Applied In The Review Of A Major Orthopedic Journal

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Background: Several studies have attempted to study authorship trends across different medical journals, observing a temporal trend of increasing numbers of authors per publication. These observations may have been restricted by their methodology; limited to the ability of the study teams in analysis samples of articles at 10-year intervals. Capitalizing on improved indexing of medical literature, we introduce a technique of journal analysis that allows the complete review of all articles published by a Journal, to study a potential association between increased authorship trends and an increasing trend of multi-centre publications.

Methods: Extracting metadata for all publications from *The Journal of Bone and Joint Surgery* (JBJS) over a 60-year period from 1st Jan 1960 – 31st Dec 2019, we describe a technique to tabulate all the publications for analysis. Statistical trend tests and correlation analysis were applied to investigate association between increased authorship per publication and the increase in multi-centre publications.

Results: A total of 26,877 unique articles from the Journal were PubMed indexed for the given time period, of which 21,651 unique publications were included in the analysis of authorship trends. Of these, 242 publications were found to be multi-centre studies. Statistical tests for monotonic trends found a statistically significant ($p < 0.0001$) progressive annual increase in number of authors per publication. There was correlation ($r^2 = 0.8089$) between the increasing proportion of multi-centre studies with the rise in the proportion of publications involving more than 10 authors over the study interval.

Conclusion: There has been a steady annual increase in the number of authors per publication over the last six decades in JBJS. In part, it appears to have been influenced by the increase in multi-centre collaborative publications over the years. Whilst the purported existence of gift authorship cannot be disproven from our study, increasing popularity of multi-centre studies may be a plausible explanation for the increased authorship per publication in recent years.

V69

Predictors Of Adverse Events After Surgical Stabilization Of Thoracolumbar Spine Fractures

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Study Design: A retrospective cohort study of patients with surgically treated thoracolumbar fractures.

Purpose: This study aims to describe the incidence of adverse events after surgical stabilization of thoracolumbar spine injuries and to identify predictive factors for the occurrence of adverse events.

Overview of Literature: Thoracolumbar spine fractures are frequently present in blunt trauma patients and are associated with significant morbidity. Adverse events may occur due to the initial spinal injury or secondary to surgical treatment. There is a lack of emphasis on the adverse events that may occur after operative management of thoracolumbar fractures

Methods: This is a retrospective review of 199 patients with surgically treated thoracolumbar fractures treated between January 2007 to January 2018. The potential risk factors for the development of adverse events as well as the development of common complications were evaluated by univariate analysis, and multivariate logistic regression analysis was then performed to identify independent risk factors predictive of the above.

Results: Overall rate of adverse events was 46.7%, 83(41.7%) patients had non-surgical adverse events while 24(12.1%) had surgical adverse events. The most common adverse events were urinary tract infections in 43(21.6%) patients, and hospital acquired pneumonia in 21(10.6%) patients. On multivariate logistic regression, a TLICs score of 8-10 (Odds Ratio 6.39, CI 2.33-17.51), the presence of polytrauma (Odds ratio 2.64, CI 1.17-5.99) and undergoing open surgery (Odds Ratio 2.31 CI 1.09-4.88) were significant risk factors for adverse events occurring. The absence of neurological deficit was associated with a lower rate of adverse events (Odds ratio 0.47 CI 0.31-0.70).

Conclusions: This study suggests the presence of polytrauma, preoperative Asia score and TLICs score are predictive of adverse events in patients with operatively treated thoracolumbar fractures, it may also demonstrate the role of MIS surgical methods in reducing adverse events in these patients.

V70

Does Rotator Cuff Tendon Thickness, Rather Than Depth Of Tear, Affect Functional Outcomes After Arthroscopic Rotator Cuff Repair?

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Introduction: Previous studies on rotator cuff tears have examined both clinical and radiographic parameters which may influence post-operative clinical outcomes. While rotator cuff tears are frequently classified by size (small, medium, large or massive) or depth (partial or full-thickness cuff tears), there is currently no literature available examining the objective thickness of the rotator cuff itself, and its impact on post-operative outcomes. We hypothesize that cuff thickness is positively associated with clinical outcomes after arthroscopic rotator cuff repair in patients with full-thickness, small- to mid-sized rotator cuff tears.

Materials and Methods: We prospectively recruited patients who underwent arthroscopic repair of small to medium full-thickness rotator cuff tears at our institution. These patients were followed up for a minimum of 2 years post-operatively. Basic biodata, as well as Visual Analog Scale (VAS) for pain, Constant-Murley Score (CMS), UCLA Shoulder Score (USS), and Oxford Shoulder Score (OSS) at 3 different time points (pre-operatively, 1 year post-operatively, and 2 year post-operatively) were collected. Cuff thickness was measured by independent blinded radiologist on pre-operative ultrasonographic images. Multiple linear regression was used to examine the effect of tendon thickness, as well as other variables such as age and gender, on VAS, CMS, USS, and OSS at 2 years post-operatively.

Results/Discussion: We recruited 63 patients who were followed up for a minimum of 2 years for this study. There were 22 male and 41 female patients, and the cohort had a mean age of 68 (10) years. Mean tendon thickness measured was 5.0 (1.6) mm, and mean tear size was 1.5 (0.6) cm. Linear regression analysis demonstrated no relationship between age and tendon thickness. Multiple linear regression analysis revealed that age, tendon thickness and tear size had no effect on VAS, CMS, UCLA, and OSS scores at 2 years post-operatively. Contrary to our hypothesis, tendon thickness did not appear to have any effect on clinical outcomes at 2 years post-operatively.

Conclusion: Post-operative sonographic evaluation may shed further light on whether cuff thickness plays a role in tendon healing and retear rates, which are known to have poor correlation with clinical outcomes as well.

V71

The Use Of Adjustable Versus Fixed Loop Suspensory Device For Fixation Of ACL Graft Shows No Difference In Clinical Outcomes In An Asian Population

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Introduction/Objectives: Anterior cruciate ligament reconstruction (ACLR) is a common and highly successful orthopaedic procedure. Stable fixation is paramount to prevent early graft failure during early rehabilitation. Yet, there is currently no gold standard for the fixation of ACL grafts. There are many fixation methods available. This study aims to compare the outcomes of fixed- (FLD) versus adjustable loop device (ALD) graft fixation with 2-year follow-up in patients undergoing primary ACLR.

Materials and Methods: Records of 105 consecutive patients who underwent primary ACLR using either FLD or ALD fixation performed by a single performing surgeon were reviewed. Outcome measures were knee range of motion, KT-1000 arthrometer testing, Lysholm knee score and Tegner activity scale. Patients were assessed preoperatively and postoperatively at regular intervals of 6, 12 and 24 months.

Results/Discussion: Both groups (FLD vs. ALD) were similar in demographics. There were 59 patients (FLD: n = 20 vs. ALD: n = 39) available for evaluation at the 2-year follow-up. No significant differences between the groups in the clinical results were

detected at the respective testing intervals. Furthermore, ALDs have the potential advantages of having a smaller tunnel size/dead space (resulting in potentially less bungee and windshield wiper effect) and being technically easier to use than FLDs.

Conclusion: FLDs and ALDs for suspensory fixation of autologous ipsilateral ACL grafts in ACLR had similar clinical outcomes with a minimum of 2-year follow up.

Study design: Retrospective cohort study; Level of evidence 4.

V72

A Prospective Randomized Controlled Trial Comparing Extracorporeal Shockwave Therapy And Physiotherapy In The Treatment Of Acute Plantar Fasciitis

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Introduction/Objectives: We aimed to evaluate whether the addition of early extracorporeal shockwave therapy (ESWT) to physiotherapy improved outcomes in patients with acute plantar fasciitis.

Materials and Methods: We conducted a randomised controlled trial in a tertiary hospital in Singapore. Eligibility criteria were patients ≥ 21 years old presenting from April 2017 to November 2019 with untreated plantar fasciitis for < 1 month with no prior physiotherapy. Exclusion criteria included history of plantar fasciitis, calcaneal fractures, chronic steroid use, pregnancy, chronic limb injuries and risks for venous thromboembolism. Patients were randomized using a random number generator into either Group A (ESWT + physiotherapy) or Group B (physiotherapy only). Visual Analogue Scale (VAS), SF-36 and AOFAS scores were measured at baseline and 3-months. T-tests were performed for statistical significance.

Result/Discussion: 46 patients were eligible for the trial. 10 were lost to follow up. 15 in Group A and 21 in Group B were treated and assessed. Mean age was 51.6. Baseline VAS scores were Group A (5.5 ± 2.3) and Group B (6.1 ± 2.1) ($p=0.451$). There was no significant difference in 3-month VAS scores between Group A (4.7 ± 2.2) and Group B (5.2 ± 2.6) ($p=0.543$). Baseline AOFAS scores were Group A (72.7 ± 12.8) and Group B (73.9 ± 14.2) ($p=0.801$). There was also no significant difference in 3-month AOFAS scores between Group A (76.7 ± 5.1) and Group B (77.2 ± 13.4) ($p=0.876$). No significance difference in SF-36 scores were seen at 3-months between the two groups.

Conclusion: The addition of early ESWT to physiotherapy did not result in better outcomes compared to physiotherapy alone for acute plantar fasciitis.

V73

No Difference In Clinical And Patient Reported Outcomes When Retaining The Posterior Cruciate Ligament In The Medial Congruent System

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Introduction: Total knee replacement (TKR) is a highly successful surgery for severe osteoarthritis of the knee. Medial pivot TKR prostheses have been developed to mimic the medial pivot kinematics of the knee and have been shown to provide improved stability and better patient satisfaction. Most medial pivot TKR systems have different polyethylene designs for either retaining or sacrificing the posterior cruciate ligament (PCL). The Medial Congruent (MC) system uses the same polyethylene design regardless of the status of the PCL. It is unknown whether retaining the PCL will improve outcomes post operatively in TKRs with MC implants.

Materials and Methods: This is a retrospective review of a single-surgeon's registry data comparing 26 MC with PCL retained and 13 MC with PCL sacrificed TKRs.

Results: Both groups were similar in terms of age, gender, BMI, and American Society for Anaesthesiology score ($p \geq 0.05$). There was no significant difference in their preoperative range of motion (ROM), Oxford Knee Score (OKS), Knee Society Scoring System Function Score (KS-FS) and Knee Score (KS-KS). At 1 year the ROM and outcome scores (ROM: $114^\circ \pm 10^\circ$ vs $114^\circ \pm 13^\circ$, $p=0.81$; OKS: 40 ± 4 vs 41 ± 3 , $p=0.98$; KS-FS: 77 ± 16 vs 73 ± 16 , $p=0.42$; KS-KS: 89 ± 10 vs 90 ± 7 , $p=0.97$) were similar. Similar proportions of patients achieved the minimum clinically important difference for each outcome score (OKS: 96% vs 100%, $p=0.74$; KS-FS: 61% vs 92%, $p=0.04$; KS-KS: 88% vs. 100%, $p=0.28$).

Conclusion: The MC implant has good post operative outcome scores regardless of whether the PCL was retained or not. The MC implant is designed to allow for a degree of posterior femoral rollback by mechanically substituting the function of the PCL with increased constraint in the medial compartment. This could explain why there is little difference in stability with the preservation or sacrifice of the PCL. As preserving the PCL does not improve post operative outcomes, surgeons may routinely sacrifice the PCL in the MC system. This is advantageous as it eases the balancing when performing the TKR. Our findings are

limited by a small sample size in the MC with PCL sacrificed group. We intend to present data with a greater number of subjects in the MC with PCL sacrificed group at the actual conference.

V74

Faster Improvement In Outcome Scores In Posterior Stabilised Total Knee Arthroplasty Compared To Medial Congruent System With Posterior Cruciate Ligament Retained

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Introduction: Most studies comparing medial pivot to the posterior stabilised (PS) systems sacrifice the PCL. It is unknown whether retaining the PCL in the Medial Congruent (MC) system may provide further benefit compared to the more commonly used PS system.

Methods: A retrospective review of a single-surgeon's registry data comparing 44 PS and 25 MC with PCL retained (MC-PCLR) TKAs was performed.

Results: Both groups had similar baseline demographics in terms of age, gender, body mass index, and American Society for Anaesthesiology score. There was no significant difference in their preoperative range of motion (ROM) ($104^\circ \pm 20^\circ$ vs. $102^\circ \pm 20^\circ$, $p=0.80$), Oxford Knee Score (OKS) (27 ± 6 vs. 26 ± 7 , $p=0.72$), and Knee Society Scoring System (KS) Function Score (KS-FS) (52 ± 24 vs. 56 ± 24 , $p=0.62$). The preoperative KS Knee Score (KS-KS) was significantly lower in the PS group (44 ± 14 vs. 54 ± 18 , $p<0.05$). At 3-months postoperation, the PS group had significantly better OKS (38 ± 6 vs. 36 ± 6 , $p=0.02$) but similar ROM ($111^\circ \pm 14^\circ$ vs. $108^\circ \pm 12^\circ$, $p=0.25$), KS-FS (73 ± 20 vs. 68 ± 23 , $p=0.32$) and KS-KS (87 ± 10 vs. 86 ± 9 , $p=0.26$). At 12-months postoperation, both groups had similar ROM ($115^\circ \pm 13^\circ$ vs. $115^\circ \pm 11^\circ$, $p=0.99$), OKS (41 ± 5 vs. 40 ± 5 , $p=0.45$), KS-FS (74 ± 22 vs. 78 ± 17 , $p=0.80$), and KS-KS (89 ± 10 vs. 89 ± 11 , $p=0.75$). There was statistically significant improvement in all parameters at 1-year postoperation ($p<0.05$). The PS group had significant improvement in all parameters from preoperation to 3-month postoperation ($p<0.05$), but not from 3-month to 1-year postoperation ($p \geq 0.05$). The MC-PCLR group continued to have significant improvement from 3-month to 1-year postoperation ($p<0.05$).

Discussion: The MC provides stability in the medial compartment while allowing a degree of freedom in the lateral compartment. Preserving the PCL when using MC may paradoxically cause an undesired additional restraint that slows the recovery process of the patients after TKA.

Conclusions: Compared to MC-PCLR, a PS TKA may expect significantly faster improvement at 3 months post operation, although they will achieve similar outcomes at 1-year post operation.

V78

Current Trends In Cervical Spine Surgery And 30, 90-day Outcomes– A Single Institution Comparative Study Of Two Time Periods

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Topic: The aim of this study is to investigate the national epidemiological incidence and trends of cervical spine surgical procedures from 2004 to 2020.

Introduction: The rate of cervical spinal fusion surgery has been increasing significantly. However there is paucity of literature describing trends of 30 and 90 day follow-up of patients undergoing cervical spine surgery. We intend to add literature from our institutional registry to further understand the trends of cervical spine surgery. Moreover, we aim to compare the trends in cervical spine surgery throughout the past 2 decades

Methods: Patients who underwent cervical surgery for cervical pathology from 2004 to 2020 were identified for this study. Comprehensive chart review was performed to record demographics and clinical patient profile. Data was obtained from our institution's spine registry during a period of January 1, 2004, to December 31, 2020. The patients were divided into two time periods, of that being 2004 to 2011 and 2012 to 2020 for comparison.

Results: A total of 1,345 cervical spine operations were performed in our institution from 2004 through 2020. There were a significantly greater number of anterior cervical spine surgeries done throughout both timeframes. Length of stay in hospital were also significantly lesser for anterior approach compared to posterior approaches ($p=0.00$). Throughout both time periods, there was an overall decrease in intra-operative blood loss, implant failure rates, wound infection, respiratory compromise, esophageal tears, dysphagia and airway complications. There was also an overall reduction in 30 and 90-day mortality compared throughout the cohorts, with no significant difference between the two approaches.

Conclusion: Our single institution study is one of the first to compare cervical spine surgery throughout two different time durations. This serves as a stepping-stone to evaluate the various techniques made to improve the outcomes of cervical spine surgery. We also identify various risk factors associated with increased mortality, morbidity and readmission within the 30 and 90 day peri-operative period

The Fate Of Retained Femoral Component During Revision Total Hip Replacement: A Meta-analysis And Systematic Review

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Background: Aseptic loosening of the previously retained component and recurrent dislocation are two main concerns following isolated acetabular revision. However, a paucity of literature has sought to quantify outcomes and re-revision rates. Therefore, we performed a meta-analysis and systematic review to estimate the re-revision rate following isolated acetabular revision.

Methods: The PubMed, EMBASE, Cochrane Library, and Web of Science databases were searched until June 2019. Data were extracted by two independent investigators, and consensus was reached with the involvement of a third. Rates of re-revision from twenty studies were aggregated using random effects models after a double arcsine transformation and were grouped by study- and population-level characteristics.

Results: Re-revision rates following isolated acetabular revision were reported in 20 studies involving 1601 cases. The pooled re-revision rate was 7.8% (95%CI: 5.0% to 11.2%) with an average 8-year follow-up. Asian studies reported a lower re-revision rate (3.5%) compared with the rest of the world (11.9%, $P < 0.01$). Approximately 0.8% (95% CI: 0.1% to 2.0%) of isolated acetabular revision cases underwent re-revision due to aseptic loosening of the femoral component, while 0.6% (95% CI: 0.2% to 1.2%) underwent re-revision due to dislocation. Studies with longer follow-up reported a relatively higher rate of aseptic loosening of the femoral stems. The pooled re-revision rate due to aseptic loosening was 0.9% (95% CI: 0% to 3.5%) in cemented stems and 0% (95% CI: 0% to 0.3%) in cementless stems.

Conclusion: Based on this exploratory analysis, isolated acetabular revision generally has a low risk of failure due to recurrent dislocation or aseptic loosening of the previously well-fixed femoral stem.

Triamcinolone-acetonide Extended-release For The Management Of Osteoarthritis Of The Knee

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Introduction: Injections are commonly administered for Osteoarthritis Knee (OAK) pain. Triamcinolone-Acetonide Extended-Release (TA-ER) was FDA approved on 10/6/17. It is effective and safe for initial and repeat use. Early onset and sustained duration of action are characteristic. As OAK progresses, responsiveness may diminish. Total knee arthroplasty (TKA) may become necessary. This study follows a longitudinal cohort of patients injected with TA-ER.

Methods: TA-ER was administered in a single practice to patients with symptomatic clinical and radiographic OAK, unresponsive to non-surgical modalities, and desiring to avoid or delay TKA. Repeat injections were offered after at least 3 months when pain recurred. Intervals between injections and before TKA were calculated.

Results: 285 patients received 784 injections into 377 knees (L385, R389) during 603 encounters from 8/31/18—6/10/21. Age at initial injection was 73 years (R 45—98) and BMI was 28.8 kg/m² (R18.55—54). There were 177 (62%) females, and 108 (38%) males. Kellgren-Lawrence Radiographic Grade was 3-4. 141 patients had a single injection in one or both (58) knees; 92 (32%) patients had bilateral injections. 144 patients (51%) received 405 repeat injections in 180 knees: 80 knees had 1 repeat injection, 46 had 2, 26 had 3, 11 had 4, 17 had > 5, and one patient had 10 repeat injections bilaterally. Mean interval between first injection and first repeat injection was 24.4 weeks (R8.6-130). Overall mean interval between injections per knee was 21 weeks (R11-90.4). Only 59 (21%) patients (63 knees) progressed to TKA. For 39 knees receiving a single injection, mean interval to surgery was 36.2 weeks (R12.9-137.3). For the 24 knees with repeat injections, mean interval between initial injection and TKA was 72.2 weeks (R23.2-141.7). For all knees, the interval between TKA and the injection immediately preceding surgery was 34.5 weeks (R12.9-137.3). No injection or perioperative complications including infection occurred.

Discussion and Conclusion: This real-world study documents the initial experience in a single practice with TA-ER for OAK. 51% of patients chose repeat injection(s); only 21% required a TKA, which was delayed by 36 weeks with one injection, and 72 weeks with multiple. TA-ER is a valuable tool for treating painful OAK, and with repeated injections may provide prolonged pain relief prior to TKA.

Establishing A Hospital-based Outpatient Joint Replacement Unit During COVID-19

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Introduction: In an effort to continue elective total hip arthroplasty (THA) and total knee arthroplasty (TKA) under pandemic conditions, an outpatient surgical unit (OSU) was established up at our tertiary care institution. Appropriate support services were redirected from the inpatient units to support postoperative mobilization protocols and expedited discharge. This study aims to describe our early experience with this outpatient joint replacement unit.

Methods: We retrospectively studied patients that underwent THA or TKA from January to June 2021, which represented the first six months of the OSU. The primary outcome was the frequency of same-day or next-day discharge after total joint arthroplasty. The most common reasons for delayed discharge were also analyzed. The secondary outcome was 90-day readmissions.

Results: There were 211 patients with 122 THAs and 89 TKAs. Mean age was 65.2 years (SD: 9.8 years) and mean BMI was 27.8 (SD: 4.8). Same-day discharges occurred in 37% of patients, with higher rates in the THA cohort (50%) than the TKA cohort (19%). Ninety-one percent of patients were discharged by postoperative day one, with similar rates for THA (92%) and TKA (91%). Of the 18 patients not discharged within one day of surgery, ten (56%) were discharged within two days and all were discharged within one week postoperatively. The most common reasons for delay were pain control/difficulty mobilizing (5 patients), postoperative hypotension (5 patients), and nausea/vomiting/dizziness (5 patients). Patients requiring specialized inpatient services included cardiac workup (2 patients), urinary retention requiring urologic consultation (1 patient), and treatment for acute DVT (2 patients). There were no readmissions within 90-days of surgery.

Discussion and Conclusion: This study demonstrates successful implementation of a hospital-based outpatient joint replacement unit in the setting of the COVID-19 pandemic. In addition to efficiently and safely discharging over 90% of patients by postoperative day one, this hospital-based OSU provided a safety net for transfer and prompt medical attention for patients requiring inpatient stays and resulted in avoiding ED admissions within 90 days.

V82

Evaluating Rheumatoid Arthritis As A Risk Factor For Early Complications After Total Joint Arthroplasty

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Introduction: This study aims to provide an updated assessment of the risk of 30-day complications after total hip arthroplasty (THA) and total knee arthroplasty (TKA) in rheumatoid arthritis (RA) patients relative to primary osteoarthritis (OA) controls using the most recent five-year sample (2015-2019) of the National Surgical Quality Improvement Program (NSQIP).

Methods: Patients undergoing primary THA or TKA were included using Current Procedural Terminology (CPT) codes. Three groups were formed based on ICD 10 diagnostic codes: primary osteoarthritis (OA), rheumatoid arthritis without rheumatoid factor (RA—without RF), and rheumatoid arthritis with rheumatoid factor (RA—with RF). Outcomes were 30- day readmission and reoperation.

Results: For TKA, there were 217,208 patients in the OA group, 502 patients in the RA—without RF group, and 2939 patients in the RA—with RF group. Readmissions were higher in RA patients (RA—with RF: 3.5% vs RA—without RF: 3.6% vs OA: 3.0%, $p=0.047$). Return to the operating room was also higher in RA patients (RA—with RF: 2.3% vs RA without RF: 1.8% vs OA: 1.0%, $p<0.001$). For THA, there were 136,824 patients in the OA group and 91 patients in the RA group. Readmissions were higher in patients with RA than those with OA (3.3% vs 3.1%) as were reoperations (2.2% vs. 1.7%). All RA patients with complications had RA with RF (readmission: RF 3/48 [6.3%] vs. no RF 0/43 [0%]; reoperations: RF 2/48 [4.2%] vs. no RF 0/43 [0%]). No differences in readmission or reoperation between groups were statistically significant.

Discussion and Conclusion: Rheumatoid arthritis, with or without rheumatoid factor, remains a significant risk factor for early postoperative complication after total knee arthroplasty. The effect of RA on short term complications after total hip arthroplasty is unclear.

V83

Deep Learning Model For Classifying Metastatic Epidural Spinal Cord Compression On MRI

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Background: Metastatic epidural spinal cord compression (MESCC) is a devastating complication of advanced cancer. Magnetic Resonance Imaging (MRI) is the most accurate modality for diagnosis but this is limited by increasing demand and a decline in the number of radiologists. A deep learning (DL) model for automated MESCC classification on MRI could aid earlier diagnosis and referral.

Purpose: To develop a DL model for automated classification of MESCC on MRI.

Materials and Methods: Patients with known MESCC diagnosed on MRI between September 2007 and September 2017 were eligible. MRI studies with instrumentation, suboptimal image quality, and non-thoracic regions were excluded. Axial T2-weighted

images were utilized. The internal dataset split was 82% and 18% for training/validation and test sets, respectively. External testing was also performed. Internal training/validation data were labelled using the Bilsky MESCC classification by a musculoskeletal radiologist (10-year experience) and a neuroradiologist (5-year experience). These labels were used to train a DL model utilizing a prototypical convolutional neural network. Internal and external test sets were labelled by the musculoskeletal radiologist as the reference standard. For assessment of DL model performance and interobserver variability, test sets were labelled independently by the neuroradiologist (5-year experience), a spine surgeon (5-year experience), and a radiation oncologist (11-year experience). Inter-rater agreement (Gwet's kappa) and sensitivity/specificity were calculated.

Results: Overall, 215 MRI spine studies were analyzed [164 patients, mean age = 62 ± 12(SD)] with 177 (82%) for training/validation and 38 (18%) for internal testing. For internal testing, the DL model and specialists all showed almost perfect agreement (kappas = 0.92–0.98, p < 0.001) for dichotomous Bilsky classification (low versus high grade) compared to the reference standard. Similar performance was seen for external testing on a set of 32 MRI spines with the DL model and specialists all showing almost perfect agreement (kappas = 0.94–0.95, p < 0.001) compared to the reference standard.

Conclusion: A DL model showed comparable agreement to a subspecialist radiologist and clinical specialists for the classification of malignant epidural spinal cord compression and could optimize earlier diagnosis and surgical referral.

V84

Minimal Clinically Important Difference (MCID) Of The Oxford Shoulder Score For Arthroscopic Rotator Cuff Repair At 5 Years Post-operatively

Merrill Lee Singapore

Introduction: Rotator cuff tears are among the most common disorders of the shoulder girdle requiring surgical management, and arthroscopic rotator cuff repair has proven to be an effective and cost-efficient treatment option for rotator cuff tears which have failed conservative management. The effectiveness of rotator cuff repairs can be determined not only by evaluation of symptoms and clinical examination, but patient-reported outcome measures (PROMs) as well. The interpretation of PROMs is challenging as statistical significance does not necessarily equate to clinical relevance; hence the Minimal Clinically Important Difference (MCID) is an important instrument in guiding surgeons on the minimum threshold for a clinically relevant change in PROMs to have perceivable benefits or harm to a patient. While the MCID for various validated shoulder scores such as the Oxford Shoulder Score (OSS) have been reported at 1 and 2 years post-operatively, there are no studies proposing the MCID of the OSS at 5 years post-operatively. Hence, the purpose of this study is to determine the MCID of the OSS at 5 years post-operatively in a cohort of patients who have undergone arthroscopic rotator cuff repair.

Methodology: This study was approved by the hospital's ethics committee. Prospectively collected data of 123 patients who underwent arthroscopic rotator cuff repair performed by a fellowship-trained shoulder surgeon in a single high-volume institution between 2015-2017 was retrospectively reviewed. All patients sustained symptomatic rotator cuff tears proven with either ultrasound or Magnetic Resonance Imaging (MRI). All patients were assessed by trained physiotherapists pre-operatively, as well as at 6 months, 2 years, and 5 years post-operatively. Functional outcome was assessed by the Oxford Shoulder Score (OSS). Patients' satisfaction was captured on a Likert scale of 1-6 with 1 being totally satisfied and 6 being the most dissatisfied. Expectation fulfilment was captured on a Likert scale of 1-7 with 1 representing all expectations fulfilled, and 7 representing no expectations fulfilled at all. The MCID for OSS was determined through 2 methods: an anchor-based linear regression approach as well as a distribution-based approach. Mean (standard deviation; sd) was used to summarise the OSS and the mean change in the patients' OSS over time was estimated with 95% confidence intervals. For the anchor-based linear regression approach, the patients' satisfaction and expectation fulfilment were used as anchors. The MCID was determined using the slope of the line of simple linear regression analysis with the change in OSS as the dependent variables against patient satisfaction and expectation fulfilment. For the distribution-based approach, the standard-deviation (SD) estimate of the MCID was determined as 0.5*SD of the 5-year OSS, with 0.5 taken to represent a moderate effect size.

Results: A total of 123 patients who underwent arthroscopic rotator cuff repair were included in this study. There were 58 male and 65 female patients, and the mean age was 56.6 (SD 10.4) years among males and 59.2 (SD 9.6) years among females (overall 58.0 (SD 10.4) years). The mean pre-operative OSS was 29.8 (SD 10.5). The mean OSS at 6 months, 2 years and 5 years post-operatively were 19.4 (8.5), 14.4 (5.5), and 14.0 (4.9) respectively. At 5 years post-operatively, the MCID of OSS identified by the anchor-based linear regression approach for satisfaction was 2.8 (95% CI 2.0 - 3.6), and that for expectation fulfilment was 2.6 (95% 1.9 – 3.3) (Table 1). The MCID of OSS identified by the distribution-based approach was 2.5.

Discussion and Conclusion: This study was able to determine statistically significant MCID values for OSS at 5 years after arthroscopic rotator cuff repair through 2 different statistical approaches - the anchor-based linear regression approach and the distribution-based approach. Taking the higher value to be the minimum change in score required, the proposed MCID for OSS at 5 years post-operatively is 2.8. There is a paucity of literature with regards to outcomes of arthroscopic rotator cuff repair beyond 2 year post-operatively, hence this value can be used as a benchmark for the interpretation of the OSS beyond the 2 year mark to determine whether an observed change holds any clinical benefit to the patient; furthermore, it can also be used to conduct power analyses for future comparative studies.

Table 1: 5-year MCID of OSS determined by the Anchor-based longitudinal regression approach

	MCID (95% CI) of OSS	p-value
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Satisfaction	2.8 (2.0, 3.6)	<0.001
Expectation	2.6 (1.9, 3.3)	<0.001

V85

Functional Outcomes And Quality Of Life After Unicompartmental Knee Arthroplasty (UKA) In Patients Below 55 Years Of Age – A Minimum 15 Year Follow-up Study

Merrill Lee Singapore

Introduction: Current published literature has reported impressive post-operative outcomes in patients who have undergone UKA. However, there are few studies examining the outcomes of patients 55 years and younger, as they are typically excluded if surgeons adhere strictly to classic Kozinn and Scott indications. The purpose of this study was to determine if good functional recovery and quality of life could be maintained at a minimum of 15 years post-operatively, which would suggest that age need not be treated as a strict contraindication for surgeons considering UKA as an option for surgical management.

Methodology: This study was approved by the hospital's ethics committee. Prospectively collected registry data of 122 fixed-bearing UKAs performed by 2 senior surgeons in a single high-volume institution between 2004-2007 was retrospectively reviewed. All patients were assessed by trained physiotherapists pre-operatively, as well as at 6 months, 2 years, 10 years, and 15 years post-operatively. Functional outcome was assessed using the Oxford Knee Score (OKS), as well as both the Functional Score (FSC) and Knee Score (KSC) from the Knee Society Clinical Rating Scale. Quality of life was assessed using the Short Form 36 Health Survey (SF-36) and its composite scores (Physical Component Summary (PCS) and Mental Component Summary (MCS)). Patient satisfaction was captured at 15 years post-operatively. Number of patients who required revision surgery (for any cause) was also captured. Propensity scores matching was used to adjust for confounding variables of body mass index (BMI) and gender, allowing matching of UKAs performed in patients younger than 55 years to those performed in patients 55 years and above in a 1:1 ratio. Within each group, repeated measures ANOVA with post-hoc Bonferroni correction was then performed to determine the presence of a significant time effect in patient-reported outcomes and quality of life. An independent samples t-test was performed thereafter to look for differences in aforementioned patient outcomes between the 2 groups.

Results: Prior to propensity score matching, there were 46 UKAs performed in patients younger than 55 years old, and 76 UKAs performed in older patients. Propensity score matching resulted in 46 UKAs performed in patients younger than 55 years old (Group A), and 46 UKAs performed in older patients (Group B). The mean age of patients in Group A was 51 years (range, 44 – 54 years), whereas the mean age of patients in Group B was 61 years (range, 55 – 84 years). The means of variables captured over different time points can be seen from Table 1. For both Groups A and B, statistical analysis revealed a significant time effect on the OKS, FSC, KSC, and PCS, but not the MCS. Statistically significant improvements were seen in the OKS, FSC, KSC and PCS from pre-operative values to that at 6 months post-operatively, but not thereafter. There was no significant time effect on MCS at any point post-operatively. The time effect on OKS is reflected in Figures 1A and 1B. For Groups A and B, patient satisfaction rate at 15 years were 93.5%. Comparison between the 2 groups revealed that at 15 years post-operatively, there was no statistically significant difference in both functional scores (OKS, FSC, KSC) and quality of life score (PCS and MCS) ($p>0.05$). With the numbers available for all UKAs with minimum 15-year follow-up, the cumulative revision rate was 4.3% ($n=2$) for patients younger than 55 years, and 6.6% ($n=5$) for older patients. The difference in survivorship was not statistically significant ($p=0.552$).

Discussion and Conclusion: At 15 years post-operatively, patients who underwent UKA at a younger age (below 55 years old) continue to exhibit high satisfaction rates as well as good functional outcomes, quality of life scores, and implant survivorship. The most significant improvement in both functional outcomes and quality of life occurs at 6 months post-operatively and plateaus thereafter, regardless of age. We conclude that younger patients (aged 55 years and below) should not be excluded from the benefits of undergoing UKA where necessary.

Table 1. Arithmetic means of variables captured in patient assessment					
Variables	Pre-operative	6 months post-operatively	2 years post-operatively	10 years post-operatively	15 years post-operatively
Group A (n=46)					
OKS	31 (7)	31 (7)	19 (4)	17 (3)	21 (6)
FSC	60 (14)	76 (15)	80 (15)	74 (15)	67 (21)
KSC	50 (14)	87 (9)	89 (8)	88 (10)	87 (13)
PCS	37 (11)	52 (7)	49 (11)	50 (8)	46 (10)
MCS	54 (10)	54 (7)	54 (10)	55 (9)	55 (9)
Group B (n=46)					
OKS	31 (7)	19 (4)	17 (5)	17 (3)	19 (7)
FSC	60 (14)	76 (15)	80 (15)	74 (15)	68 (21)
KSC	50 (14)	87 (9)	89 (8)	88 (10)	87 (13)
PCS	37 (11)	52 (7)	49 (11)	50 (8)	46 (9)
MCS	54 (10)	54 (7)	54 (10)	55 (9)	55 (11)

V86

Pathogens In Foot Infections, An Update To The Epidemiology In Singapore

Background and Aim: Foot infections are a prevalent global healthcare burden that is often managed with early and accurate antimicrobial therapy. Studies have been conducted to profile the epidemiology of pathogens to guide empirical antimicrobials. The variability of the pathogen profiles between these studies support the theory that endemic pathogen population is dependent on geographical and regional norms, whilst antimicrobial usage may also place selection pressure on the fauna, altering pathogen prevalence and antimicrobial susceptibility over time. This study aims to establish the current prevalence of clinically significant pathogens involved in the disease of foot infections in Singaporeans, compare it to previous local studies to decide whether pathogen profile changes with time, and compare to other global studies to decide whether empirical antimicrobial regimes can be derived from proxy studies.

Methods: Patients admitted to the orthopedic department of a single center for acute foot infections from 01 March 2015 to 17 July 2015 were included in this study. Excluded were the non-residents, patients with known chronic infections, patients with other concurrent sources of infections or those who were on antibiotics for other recent illnesses, and patients with only superficial infections. They were prospectively reviewed for the causative organisms, eventual choice of antimicrobials, and outcomes of recovery against progression to amputation. Tissue and/or bone cultures were obtained intraoperatively within 48 hours of admission and 1st dose of empirical antibiotic was given either at admission or at anesthetic induction in the operating theatre. Parameters assessed include age, gender, race, diagnosis of concomitant diabetes mellitus, HbA1c levels in the diabetics, and location of wound.

Results: This study had a higher proportion of male patients (62.3%), and patients of Malay (23.7%) and Indian (14.9%) ethnicity as compared to the general Singapore population. The average age of the patients enrolled in this study was 56.8 years. HbA1c levels ranged from 5.1% to 15.3%. The most prevalent pathogen involved was MSSA, occurring in 28.1% of the cases enrolled. It is followed by Group B Streptococcus and *P. aeruginosa* (19.3% each), *E. coli* (17.5%), and *M. morgani* and MRSA (13.2% each). The predominant antimicrobial involved in treatment was Augmentin (Amoxicillin and Clavulanate), used in 74.6% of the cases. It is followed by Clindamycin (25.4%), Ciprofloxacin (17.5%), Cloxacillin (16.7%), Vancomycin (14.0%), Cefazolin, (13.2%), and Tazocin, (11.4%) respectively. The other antimicrobials were involved in less than 10% of the cases.

Discussion and Conclusion: This study concludes that *S. aureus*, Group B Streptococcus, *P. aeruginosa*, *E. coli*, and *M. morgani* are significantly involved in acute foot infections in Singapore, in the year of 2015. Group B Streptococcus is rarely found to be involved in foot infections in other literature, thus inferring that no other country's pathogen profile in acute foot infections is a suitable proxy for the Singaporean population. This study observes that there may be a significant change of pathogen profile over the years, when compared to previous Singaporean studies conducted exactly a decade ago, which warrants further profiling studies in future. Augmentin was found to be most frequently used in the management of foot infections for the above pathogen profile, regardless of diabetic profile or number of organisms involved in the infection.

V87

Mycobacterium Fortuitum And Mycobacterium Abscessus Infections In The Foot And Ankle In Two Immunocompetent Patients

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Nontuberculous mycobacteria (NTM) infections of the musculoskeletal system are commonly missed due to its rarity and the absence of systemic symptoms. A high clinical index of suspicion is required to recognize such infections as they may occur in immunocompetent hosts. We present two cases of foot and ankle NTM infections involving *Mycobacterium fortuitum* and *Mycobacterium abscessus* in two such patients. The first case involves an 83-year old lady who presented with a two-month history of multiple foot abscesses initially treated at a rural hospital. She underwent drainage and debridement of her foot, with eventual cultures growing *Pseudomonas aeruginosa* and *Mycobacterium abscessus*. She was initially treated with clarithromycin and doxycycline. At one year follow-up review, her wound healed completely. The second case involves a 55-year old man who presented with infection following midfoot fusion and anterolateral thigh flap for an open complex fracture dislocation of his right foot. Cultures eventually grew *Mycobacterium fortuitum* and he was treated with cefoxitin, clarithromycin and doxycycline. 10 months after his initial injury, the infection has cleared and his flap was clean. Through these 2 cases, we hope to highlight the unusual presentations of such infections and illustrate that with a high initial index of suspicion and appropriate treatment, these infections can be treated successfully.

V88

Orthopaedic Resident Burnout: A Literature Review On Vulnerability, Risk Factors, Consequences And Management Strategies

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Introduction: Orthopaedic surgery is physically demanding. Surgeons may have to work long unpredictable hours especially during residency training. This arduous task comes with the risk of burnout leading to negative repercussions to the surgeon and the patient. In view of strategising peer support, we intend to review the literature and analyse whether orthopaedic resident burnout is a global issue. We also intend to derive common strategies to tackle burnout at individual and organisational levels.

Materials and Methods: A literature search was carried out in the databases including PubMed, Scopus, SciELO, and Google Scholar to shortlist studies dealing with orthopaedic residency and related burnout. Those studies that used the Maslach Burnout Inventory (MBI) for quantifying burnout were collectively interpreted. Other studies were reviewed to analyse the vulnerability, risk factors, consequences and management strategies related to burnout.

Results: Among a total of 72 titles shortlisted, eight studies independently reported burnout among orthopaedic surgery residents/trainees and used MBI as a tool for assessing burnout. Based on the three subscales of MBI, 37.2% had high degree of emotional exhaustion (EE), 48% had high degree of depersonalisation (DP) and 33.1% perceived low personal accomplishment. This signifies the high prevalence of burnout among orthopaedic residents/trainees.

Conclusion: Burnout among orthopaedic surgery residents seems to be a universal problem. Risk factors could be multifactorial, influenced by clinical competency and workhome environment. This can be tackled at the individual level by being aware of burnout syndrome, involving in adequate physical activity and spending quality social time; and at the organisational level by duty hour limitation, professional appreciation and mentorship programme.

V89

Experience In Distinctive Surgical Technique Of ACJ Fixation Without Biologic Graft – A Desirable Patient’s Functional Outcome

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Introduction: We share our experience on 5 cases of open surgical fixation of chronic ACJ dislocation (grade 3 and above) without using biologic graft. A similar special technique of tightening the ACJ intraoperatively were applied in all cases. Patients are 20 – 50 years old, sustained MVA with ACJ injury grade 3B and above (100 % displacement). All cases were operated within 6 to 48 weeks of injury.

Methods / surgical technique: Patients lied supine under GA with silicone bag was placed under the operated shoulder. Two incisions were made which are 6 cm horizontally on superior aspect of shoulder, corresponds the lateral end of clavicle, ACJ and medial acromial process and 4 cm vertically on the anterolateral shoulder, corresponds to the coracoid process. Disrupted ACJ and coracoid process were reached. All have fibrotic torn AC ligaments with complete joint disruption. Pectoralis minor insertion and coracohumeral ligament attachments on coracoid process were partially cleared for better surgical works. Implants: two dog bones, one fiber tape, one or two swivel lock bio screws (Arthrex) were used, without biologic graft is involved. A vertical hole was drilled in the lateral end clavicle, 3.5 to 4 cm medial to the AC joint. Another vertical hole was drilled at the base of coracoid process with the help of jit and image intensifier. Transverse small holes were drilled antero-posteriorly; one at lateral end of clavicle (1.5 to 2 cm from the AC joint) and another one at medial acromion process (2 to 3 cm from the AC joint). Lateral end clavicle excision (1 cm) was performed in all the cases. Fixation technique: fiber tape was passed through the drilled holes;

- On coronal plane – supero- inferiorly reconstructing CC ligament, from lateral end of clavicle to base of coracoid process,
- On axial plane – with the remaining limbs of fiber tape, it was passed through the transverse holes on both distal clavicle and acromion process, creating a ‘cross X’ construct with anterior and posterior links - reconstructing AC ligament

Swivel lock was used as final tightening at the clavicle / acromion process. Aim of this technique is reduction of ACJ and maintaining of its stability with minimal rotatory motion is allowed at the ACJ. Reduction is confirmed under image intensifier prior to final tightening of fiber tape and swivel lock fixation. Physiotherapy was prescribed post operatively, focusing on early passive ROM, improving active ROM, increasing shoulder strength and upper limb functions. Post OP clinic appointment were given at 2, 4, 6, 12, 24 and 52 weeks.

Results / Outcome: Evaluation is done at one, three, six and 12 months. None shows superior re-displacement of the joint at 12 months on radiographs. Functional outcome of shoulder was scored using UCLA & Quick DASH at 6 & 12 months with all patients exhibit excellent functional outcome.

Discussion: Many surgeons use biologic graft (semitendinosus) to anatomically reconstruct conoid and trapezoid ligaments. However, many have experienced the re-displacement of fixation after some period (*jack-up* issues), with or without biologic graft use. In this technique, only fiber tape and dog bones were used to reconstruct both CC and AC ligaments. Avoidance of harvesting biologic graft will provide less scars, shorter timing of surgery and prevent graft complication issues.

Conclusion: This distinctive open ACJ fixation without the use of biologic graft provides excellent functional outcome to the shoulder. Reconstructing CC and AC ligaments remain paramount in this technique. It is affordable, decent surgical fixation techniques with great stability construct. Ultimately it can prevent re – displacement of fixation in future.

V90

A PearlDiver Analysis Of Complication Rates Within The First Six Months After Elective, Primary Total Hip Replacement

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Introduction: Dislocation, pulmonary embolism (PE), and periprosthetic joint infection (PJI) are devastating complications reported to occur most frequently within the first six months after Total Hip Arthroplasty (THA). A number of improvements to both surgical technique and implant design have been implemented since these findings were reported in the orthopedic literature nearly two decades ago. The purpose of this study is to provide an updated analysis of complication rates in order to better inform post-operative care.

Methods: Patients who underwent Primary THA between 2015-2019 for osteoarthritis, rheumatoid arthritis, or osteonecrosis were queried using the PearlDiver database. Only Medicare patients between the ages of 65-100 who remained active in the database for 6 months following THA were included in this study. The 6-month post-operative period was divided into thirty-day periods and the incidence of dislocations, PE, and PJI occurring within each period was analyzed as the primary outcome. Rates of complications were compared to a historical control group of Medicare patients who underwent Primary THA for the same indications between 1995-1996.

Results: There were 37,898 THAs in the recent THA group and 58,521 THAs in the historical THA control group. Dislocation rates were significantly lower in the recent THA group (1.7% vs. 3.9%, $p < 0.001$). Pulmonary embolism had a significantly higher incidence in the recent THA cohort relative to historical controls (1.5% vs. 0.9%, $p < 0.001$). Periprosthetic joint infection occurred at a higher rate in the recent THA group as well. (0.6% vs. 0.2%, $p < 0.001$)

Discussion and Conclusion: Surgical techniques and prosthetic design and size have all evolved since 1995-1996 which may explain the reduction in dislocations. It is unclear why PE and PJI have increased since the original study. While these findings may be attribute to a more robust outcome recording or improved diagnostic techniques, further study is warranted.

V91

Scarf Osteotomy For Hallux Valgus Surgery – Determining Indications For An Additional Akin Osteotomy Using Functional Outcomes

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Introduction: There is a lack of clear indications as to carrying out additional Akin osteotomy in addition to Scarf osteotomy. Recent studies have shown that a proximal distal phalangeal articular angle (PDPAA) of >8 degrees as an indication to carrying out additional Akin osteotomy correlates with better radiological outcomes with lesser risk of recurrence. Our study aimed to validate carrying out the additional Akin osteotomy at a PDPAA >8 degrees while looking into functional outcomes which have not been studied.

Methods: Patients who underwent Scarf and combined Scarf and Akin osteotomy in our institutional registry was identified. Patient reported outcome measures were compared between patients who underwent Scarf and combined Scarf and Akin osteotomy. The Visual Analogue Scale (VAS), American Orthopedic Foot and Ankle Score (AOFAS), Short Form-36 Physical Component Score (PCS) and Mental Component Score (MCS) were measured preoperatively and across a follow up period of 2 years.

Results: A total of 212 cases were identified. At a PDPAA >8 , there was no difference in VAS, AOFAS, PCS and MCS between patients that had isolated Scarf osteotomy and those that received combined Scarf and Akin osteotomy preoperatively, and at 6 months. However, at 2 years postoperatively, patients that received Scarf and Akin osteotomy had a significantly better AOFAS score as compared to patients with isolated Scarf osteotomy (82.3 ± 15.3 vs 88.4 ± 13.0 , $p = 0.0224$). On the contrary, at a PDPAA <8 , patients who underwent combined Scarf and Akin osteotomy had a significantly lower VAS score at 6 months (1.16 ± 2.16 vs 0.321 ± 1.09 , $p = 0.00633$) and 2 years (0.698 ± 1.73 vs 0.333 ± 1.46 , $p = 0.0466$). They also had a higher AOFAS score at 6 months (80.7 ± 14.3 vs 85.4 ± 12.5 , $p = 0.0123$) and 2 years (83.0 ± 14.0 vs 90.7 ± 9.9 , $p < 0.0001$).

Conclusion: PDPAA >8 degree can serve as a valid indication to carrying out additional Akin on top of Scarf osteotomy based on functional outcomes. However, further studies should investigate a PDPAA threshold that is lower than 8 degrees, which can potentially allow more patients to receive the additional Akin osteotomy that can bring better functional outcomes.

V92

A Novel Practical Method To Predict Anterior Cruciate Ligament Hamstring Graft Size Using Pre-Operative MRI

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Introduction/Objectives: Predicting hamstring graft size pre-operatively for the surgical reconstruction of the anterior cruciate ligament (ACL) is important as it may help pre-empt an insufficient diameter in graft size intra-operatively, which may lead to graft failure. While there are multiple published models for the prediction of the hamstring graft pre-operatively using magnetic resonance imaging (MRI) picture archiving and communication systems (PACS), most are not feasible and practical. Our study aims to (1) practically predict the ACL hamstring graft size in a numerically continuous manner, by surgeons or surgical

assistants of all levels of training, using the pre-operative MRI from any native MRI PACS system (2) determine the degree of correlation between the predicted and actual graft size using our prediction method, and (3) determine the performance of our prediction method in terms of specificity, sensitivity and discriminative ability, if we define an adequate actual graft size as $\geq 8\text{mm}$.

Materials and Methods: A retrospective review of 112 patients who underwent primary ACL reconstruction with quadrupled hamstring semitendinosus-gracilis grafts at a tertiary institution between January 2018 and December 2018 was conducted. Two independent and blinded evaluators with no prior radiology posting experience measured the cross-sectional lengths and breadths of both semitendinosus and gracilis grafts using standard MRI PACS for all included patients. Data of the actual graft sizes used intraoperatively were also extracted.

Result/Discussion: We found that the graft diameter can be predicted in a numerically continuous manner as $\sqrt{2 * (AB + CD)}$, where A and B refer to the semitendinosus cross-sectional length and breath respectively, and C and D refer to the gracilis cross-sectional length and breath respectively. The Pearson's correlation coefficient between the predicted and actual graft diameter was 0.661 ($p < .001$), which shows a moderate positive correlation. Our method yields a high specificity of 92.6% and a moderate sensitivity of 67.2% if we define an adequate actual graft size as $\geq 8\text{mm}$. A logistic regression model was performed is significant ($p < .001$), with the odds of the actual graft diameter being adequate increases by 12.8 for each additional mm of the predicted graft diameter (95% CI [5.2, 38.2]), and an area under receiver-operating characteristic (ROC) curve plotted with the respective logistic regression models shows good discrimination (AUC = 0.856). This is the first method that allows the predicted graft sizes to be calculated as a continuous numerical manner, as opposed to a dichotomous result.

Conclusion: We have presented a modified, practical method to predict the ACL hamstring graft size with high specificity using pre-operative MRI measurements that does not require any specialized software or methods, and can be reliably done even by junior members of the surgical team.

V94

Clinical And Functional Outcomes Of Augmented Repair Versus Primary Repair In Anterior Cruciate Injury: A Systematic Review And Meta-analysis

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Introduction: The consensus gold-standard surgical treatment of anterior cruciate ligament (ACL) rupture is arthroscopic reconstruction. There has been a renewed interest in primary repair, and in particular, augmented repairs of the ACL. The aim of this systematic review and meta-analysis is to compare the long-term clinical outcomes of augmented ACL repair against primary ACL repair without augmentation.

Materials/Methods: As per PRISMA guidelines, 11 studies comparing functional outcomes of augmented repair against primary repair in Cochrane, Embase, PubMed and Scopus were identified. Clinical outcomes included were (1) number of revisions, (2) incidence of osteoarthritis (Ahlbäck Classification), (3) pivot shift test, (4) Lachman test (5) KT-1000 arthrometer.

Results: We found that patients undergoing augmented ACL repair were less likely to undergo subsequent revision surgery, as compared to primary ACL repair (Risk Ratio=0.42; 95% CI: 0.27-0.65; $p < 0.05$). In terms of clinical stability, a positive pivot shift test was less likely to be found in augmented repair versus primary repair (RR=0.69, 95% CI: 0.56-0.85, $p < 0.05$). Grade 1+ Lachman test was also less likely to be found in augmented repair (RR=0.83, 95% CI: 0.69-1.00, $p < 0.05$). More significantly, a Grade 2+ and 3+ Lachman test was less prevalent in augmented repair group (RR=0.61, 95% CI: 0.41-0.91, $p < 0.05$), compared to primary repair. Instrumented laxity testing via KT-1000 arthrometer also provided similar results for ligamentous stability, favoring the augmented group (RR=0.64, 95% CI: 0.48-0.84, $p < 0.05$) over primary repair. Amongst two studies that published the radiological grades of osteoarthritis during post-operative follow up, the incidence of osteoarthritis was found to be higher in primary repair group, as compared to augmented repair (RR=0.33, 95% CI: 0.13-0.85, $p < 0.05$).

Conclusion: Augmented ACL repair, compared to primary repair, has superior clinical outcomes in terms of lower revision rates, higher ligamentous stability, and lower incidence of secondary osteoarthritis.

V95

Use Of Fibrin Glue As A Surgical Adjunct In Bone Grafting Of Fracture Non-unions

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Introduction: Non-union of long bones is a common challenge in the treatment of fractures. Bone grafting is commonly used to treat atrophic non-union, but mechanical displacement of the graft may occur, which may result in delay or failure of treatment. Fibrin glue has demonstrated positive results in management of bone defects in neurosurgery and oromaxillary facial surgery, however, there has yet to be any study on its use in long bone fractures.

Materials and Methods: We conducted a prospective randomized controlled trial at a single tertiary center involving adult patients with long bone fractures that had undergone non-union and requiring bone grafting only. Autologous iliac crest bone graft was applied to the debrided non-union site, with additional fibrin glue applied for the intervention arm. Patients were followed-up with serial radiographs until clinical and radiographical union.

Results: 10 patients (3 male, 7 female), of mean age 41.7 (19 – 63) were recruited over 5 years, with 1 drop out. 8 out of 9 fractures united after treatment. 1 patient underwent hypertrophic non-union requiring re-fixation and bone grafting. There was no difference in the time to union for patients in the fibrin glue group (19.5 weeks) versus the control group (18.75 weeks) ($p=0.86$). There were no complications sustained from usage of fibrin glue.

Conclusions: Fibrin glue appears to be a safe adjunct for treatment of non-union of long bone fractures across varying fracture sites.

V100

Two to 14 Year Outcomes Of Combined Meniscal Allograft Transplantation With Anterior Cruciate Ligament Reconstruction: A Systematic Review

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Introduction/objectives: To evaluate the clinical outcomes of anterior cruciate ligament reconstruction (ACLR) with meniscal allograft transplantation (MAT) through systematic review of current available evidence.

Materials and Methods: A systematic database search of PubMed, Embase, Web of Science and CINAHL was performed from inception up to 7 December 2021 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 had more than 10 people published in English, which involved patients who underwent a combination of ACLR and MAT were included. Quality of these studies were appraised using the Cochrane Risk Of Bias In Non-randomized Studies of Interventions (ROBINS-I) tool. Systematic review of International Knee Documentation Committee (IKDC), Lysholm and Tegner activity scores were conducted.

Result/Discussion: Seven studies involving 363 patients were included. The average mean follow up time was 4.08 years, ranging from 1.75 to 14 years. All studies used the Lysholm Knee Scoring system to report clinical outcomes, while two studies and four studies used the IKDC Questionnaire and Tegner activity scale respectively to measure clinical outcomes post-operatively. Comparing postoperative to pre-operative scores, we found an improvement above the minimal clinically important difference (MCID) for the Lysholm (Mean Difference (MD) range= 16.00 to 26.10) and Tegner activity scores (MD range = 1.50 to 1.90). All but one study reported an increase above the MCID for IKDC scores post-op (MD range= 5.60 to 23.00).

Conclusion: Combined MAT and ACLR have good two to 14 year clinical outcomes post operatively and is an optimal procedure for patients with concurrent ACL injuries with irreparable meniscus injuries. More prospective studies and studies evaluating outcome differences between concurrent ACLR with MAT and staged ACLR with MAT should be conducted.

V101

Clinical outcome Scores Post Unicompartmental Knee Arthroplasty: A Comparison Of The MAKO Robotic Arm Versus The Oxford Conventional Approach

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Background: Unicompartmental knee arthroplasty (UKA) has significant advantages over total knee arthroplasty (TKA). However, due to its need for precise positioning and soft tissue balancing, UKA failures and revision rates may be higher than that of TKA. Robotic assisted UKA offers more accurate implant positioning, more accurate soft tissue balancing, improved lower limb alignment, and a reduction in surgical error. However, there are few studies studying functional outcomes post robotic assisted UKA. The aim of this study was thus to compare the functional outcomes between robotic assisted fixed bearing and conventional mobile bearing medial UKA.

Methods: A retrospective review was done of 159 patients who underwent UKA in a single centre; 110 patients underwent conventional mobile-bearing UKA while 49 patients underwent robotic assisted fixed-bearing UKA. Outcome measures included the Oxford Knee Score (OKS), Knee Society Score (KSS), and Visual Analogue Score (VAS) for pain at 3 months, 1 year and 2 years post-UKA.

Results: Pre-operative patient demographics and outcome scores were not significantly different between both groups. ROM was significantly greater in the MAKO group compared to the Oxford group at 3 months ($p=0.039$), 1 year (0.053) and 2 years (0.001) post-operation. While OKS, KSS and VAS scores improved for both groups, there were no significant differences in the final patient reported outcome measures (PROM). None of the patients experienced a mechanical failure, infection or revision post-surgery. 2 patients in the Oxford UKA group had deep vein thrombosis post-surgery, which was resolved with anti-coagulation. 1 patient each in the Oxford and MAKO group suffered a periprosthetic fracture, of which the patient in the Oxford group was managed conservatively.

Conclusion: Both robotic assisted MAKO UKA and conventional Oxford UKA showed good clinical outcomes. Robotic-assisted MAKO UKA had superior ROM outcomes compared to conventional Oxford UKA up to 2 years post-surgery. These results are promising; further mid- and long-term studies can better assess long-term outcomes of robotic assisted UKA.

V102

Quantifying Treatment Success After Reverse Shoulder Arthroplasty; Threshold Score For Constant, Oxford, And UCLA Shoulder Score

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Background: Patient reported outcome measures (PROM) allow clinicians to quantify patient's progress after operation. However, response after surgery should not be based on the numerical values of scores alone. What is more important in clinical practice is whether the scores translate into actual clinical improvement. Threshold score, which is defined as an absolute cutoff value in a specific PROM that has both good sensitivity and specificity to determine whether a patient received successful treatment after an operation, is an emergent concept that allow clinicians to accurately quantify patients' perceived treatment success at various follow up time points.

Objectives: To determine threshold score for treatment success for Constant-Murley Score (CMS), University of California Los Angeles (UCLA) Shoulder Score and Oxford Shoulder Score (OSS) after reverse shoulder arthroplasty

Study Design & Methods: This is a prospective study of all patients who underwent RSA in the authors' institution between Jan 2011 to Feb 2020. Inclusion criteria were patients who underwent unilateral RSA for 1. Massive irreparable rotator cuff tear, 2. Cuff tear arthropathy, and 3. Comminuted proximal humerus fracture. The patients were prospectively followed up for 12 months. Patients were assess pre-operatively, and at 3, 6, and 12 month post-operatively for pain, functional outcome, satisfaction with surgery, expectation fulfillment. Functional outcome was measured with OSS, CMS, and UCLA shoulder score. Treatment success was defined in this study as simultaneous fulfillment of 3 criteria: improvement in pain, expectation for surgery met, and patient satisfied with surgery. Threshold scores were determined by Receiver Operating Characteristic (ROC) analyses using the various PROMs as predictors and the defined treatment success as the criterion in the logistic regression. Area Under the Curve (AUC) of the ROC analysis serves as a measure of the discrimination power of the various PROMs, with a larger AUC signifying higher discriminative power. AUC with the 95% confidence interval (CI) was estimated for OSS, CMS, and ULCA shoulder score to determine treatment success at 3-, 6-, and 12-months post operation. The optimal cutoff points (c^*) for threshold scores were determined by the Youden index (J), which optimizes the PROMs' differentiating ability when equal weight is given to sensitivity and specificity.

Results: A total of 134 patients underwent RSA during the study period. The mean age of the patients were 71.7 (± 7.4) years with 44 male and 87 female. Overall, with the definition of treatment success as simultaneous fulfillment of all 3 criteria, 65.6% of patients had treatment success at 3 months, 74.8% at 6 months, and 81.3 at 12 months. All 3 criteria showed steady improvement from 3- to 12 months after operation with patients achieving excellent satisfaction rate and expectation fulfillment with surgery at 12 months (95.8% for satisfaction, 93.8% for expectation fulfillment). ROC analysis showed good prediction of treatment success using OSS, CMS, and ULCA shoulder score at 12 month follow up (AUC >0.7), with OSS providing consistently good discriminatory power from 3- to 12-month after operation (AUC >0.7). The following threshold scores were determined. At 3-month: CMS 42, UCLA 17, OSS 32. At 6-month: CMS 39, UCLA 25, OSS 30. At 12-month: CMS 51, UCLA 26, OSS 18

Conclusions: CMS, UCLA score, and OSS have good predictive value in defining treatment success after arthroscopic RC repair. The cutoff scores are time dependent with better scores required to constitute treatment success at longer follow up.

V103

Minimal Clinically Important Differences For Oxford, Constant, And UCLA Shoulder Scores After Reverse Shoulder Arthroplasty To Allow Interpretation Of Patient Reported Outcome Measures And Future Statistical Power Analyses

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Aim: To determine Minimal clinically important difference (MCID) for Constant-Murley Score (CMS), University of California Los Angeles (UCLA) Shoulder Score and Oxford Shoulder Score (OSS) after reverse shoulder arthroplasty.

Materials and Methods: Patients were prospectively followed up between January 2011 and February 2020. Inclusion criteria was that of patients who underwent reverse shoulder arthroplasty for massive irreparable cuff tear, cuff tear arthropathy, and fractures, with and without prior cuff repair by a fellowship trained surgeon. Patients were assessed preoperatively and at 3, 6 and 12 months postoperatively. Functional outcome was assessed by the CMS, UCLA score, and OSS and the respectively MCIDs were determined using simple linear regression in consonance with patient satisfaction and expectation fulfilment.

Results: A total of one hundred and thirty-one patients were followed up for 12 months. The MCIDs at 3 months for CMS, UCLA and OSS were 7.2, 3.3 and 6.9 respectively. At 6 months, the MCIDs for CMS, UCLA and OSS were 6.6, 2.4 and 4.7 respectively. At 12 months, the MCIDs for CMS, UCLA and OSS are 9.3, 2.9 and 6.6 respectively.

Conclusions: CMS, UCLA and OSS are valid scores to calculate MCID after Reverse Shoulder Arthroplasty and the MCID established in this study can be used for the interpretation of these scores to help in statistical power analysis for future studies.

V104

Assessment Of Shoulder Range Of Motion Using A Commercially Available Wearable Sensor – A Validation Study

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Background: Our study aims to validate a commercially available inertial measurement unit system against a standard laboratory-based optical motion capture system for shoulder measurements in a clinical context.

Methods: The validation analyses were conducted on 19 healthy male volunteers. 12 reflective markers were placed on each participant's trunk, scapula and across the arm and one inertial measurement unit was attached via a self-adhesive strap on the forearm. A single tester simultaneously collected shoulder kinematic data for four shoulder movements: flexion, extension, external rotation, and abduction. Agreement between optical motion capture system and inertial measurement unit measurements was assessed with Bland-Altman analyses. Secondary analysis included mean biases, root mean square error analysis and Welch's t-test.

Results: Bland-Altman limits of agreement exceeded the acceptable range of mean difference for 95% of the population (-22.27° , 11.31°). The mean bias showed high levels of agreement within 8° for all four movements. More than 60% of participants demonstrated mean bias less than 10° between methods. Statistically significant differences were found between measurements for abduction ($p < .001$) and flexion ($p = 0.027$) but not for extension and external rotation ($p > .05$).

Conclusions: Our study shows preliminary evidence for acceptable accuracy of a commercially available inertial measurement unit against an optical motion capture system for assessment of shoulder movements by a single tester. The inertial measurement unit also exhibits similar whole degree of error compared to a standard goniometer with potential for application in remote rehabilitation.

V105

Expanding Orthogeriatric Co-managed Care To Major Lower Limb Fragility Fractures: Early Results From One Year Post-Implementation

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Introduction: Orthogeriatric care for hip fractures has demonstrated resounding success over past two decades. Until recently, non-hip fragility lower limb fractures had been largely excluded from orthogeriatric care. Recent studies showed that this group of fragility fractures contribute significantly to healthcare and socioeconomic burden with loss of quality of life and excess mortality exceeding that of hip fractures. As a leading centre in orthogeriatric care, we have expanded our multi-disciplinary orthogeriatric care to include all major non-hip lower limb fragility fractures in 2021.

Methods: We compared admitted patients 60 years and older with major non-hip lower limb fragility fractures (femur, patella, tibia, ankle, periprosthetic, peri-implant, acetabulum) during a 4-month pre-intervention period in 2020 (Usual Care group) with all included patients receiving orthogeriatric care in 2021 (OrthoGeriatric Care group). Baseline characteristics compared were age, gender, Clinical Frailty Scale (CFS), fracture types, treatment type (conservative or surgical). Key outcomes compared were time to surgery, length of stay, mortality, 30-day readmission, complications and discharge to community hospital.

Results: Compared with UC group, OG group was older (71.7 versus 77.8), had more females (59% versus 81%) and frailer with CFS ≥ 4 (45% versus 87%). Both groups were comparable in fracture types and treatment type (55% versus 48% operated). There were no statistical differences in time to surgery (3.4 versus 3.1 days), length of stay (9.2 versus 9.7 days), inpatient and 1-year mortality. OG group had marked reduction in patients with medical complications (27.6 % versus 12.4%

($p=0.022$), RR 2.23 (95%CI 1.03-4.78)), and more patients with continued rehabilitation with community hospitals (31% versus 50% ($p=0.037$)).

Conclusion: Orthogeriatric care extended to all major lower limb fragility fractures resulted in reduction in medical complications and ensured continued rehabilitation at community hospitals.

V109

Understanding The Use Of A Hinged External Fixation In The Treatment Of Various Knee Conditions. A Case Series

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Introduction: A hinged external fixation is traditionally used on the knee to allow early rehabilitation in patients who have sustained significant injury or trauma to the knee. It can be used for patients with knee dislocations, ligamentous disruptions and instability, and even in complex tibial plateau fractures. We present 3 cases where the hinged knee external fixation was applied for varying indications and shows how it can help improve the functional outcomes for our patients. The first case is a 19-year old female who was admitted in our institution for polytrauma following a fall from height. She sustained a complex left flexion type tibial plateau fracture with a large posterior fragment with multiligamentous knee injury. This was also complicated by a left femoral shaft fracture, resulting in a floating knee. She developed arthrofibrosis of the left knee 3 months after primary fixation with a limited range of 5-45 degrees with knee subluxation. She underwent staged reconstruction with initial knee-spanning hexapod external fixation to distract and reduce the knee joint. This was changed to a hinge external fixator to progressively improve her range of motion. She was able to achieve a range of 5-100 degrees 8 months post-injury and was able to ambulate well without any aids. At 1 year follow up she can ambulate without aids. The second case is a 64-year-old male who presented with a left knee fracture dislocation after a road traffic accident. He had an anterior column tibial plateau fracture with associated injuries to the PLC, PCL and LCL. An open reduction and internal fixation of his anterior plateau fracture was performed followed by application of a hinged knee ring fixator in the same setting. This conferred stability to his knee and allowed for early range of motion, both of which were vital to his recovery. He was eventually able to achieve an ROM of 5-90 by 6 weeks post-injury. The final case is a 39-year-old female with significant arterial thrombosis of her lower limbs secondary to anti-phospholipid syndrome. This resulted in a below knee amputation which was complicated by a significant fixed flexion deformity. In view of her FFD, she was unable to be adequately fitted with a lower limb prosthesis and it affected her ambulation. She was placed on a hinged external fixator for 2 months which improved her flexion contracture. This subsequently allowed her to be fitted with a prosthesis and achieve ambulation thereafter.

Conclusion: The above cases highlight the various indications for which we can consider using a hinged external fixation. When used in the right setting, this can help improve functional outcomes for our patients.