Free Paper Session I: Trauma

FP 1.1

Comparison of Six Common Outcome Measures for Surgical Fixation of Distal Radius Fractures — Responsiveness, Ceiling-bottom Effects and Minimal Detectable Changes

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Introduction: Standardised reporting of outcomes in healthcare is important in clinical documentation, quality assurance and research. We aimed to compare the performance of six commonly used outcomes instruments.

Methods: This is a prospective cohort study which included patients with acute distal radius fractures treated with plate fixation. We assessed six outcomes instruments: the Cooney modification of the Green and O'Brien score (MGNO), the Sarmiento modification of Gartland and Werley score (GNW), the shortened questionnaire for Disabilities of the Arm Shoulder and Hand (QDASH), the patient-rated wrist evaluation questionnaire (PRWE), wrist flexion and extension range of motion arc (FEarc), and hand grip strength fraction (GripFrac). Statistical analysis included standardisation of scales (converted to a linear 0-100 point scale), responsiveness (Cohen's d effect size), ceiling and floor effects, minimal detectable change, and criterion validity.

Results: A total of 259 patients were recruited, and the mean age was 55.6 years old. In 6 weeks to 3 months, GripFrac and FEarc were the most responsive. In 3 months to 6 months, GripFrac was the most responsive. From 6 months to 12 months, GripFrac, PRWE, QDASH, and MGNO were most responsive. From 12 months to 24 months, PRWE and MGNO were the most responsive. Significant correlations were obtained for all outcome measures. Except for FEarc, all other scores had ceiling effects.

Conclusion: Different outcome measures differ considerably in responsiveness, and even the same outcome measures had different responsiveness when used to assess different timeframes during rehabilitation.

FP1.2

Tension Band Wiring Using Stainless Steel Wires versus FiberWire during Patella Fracture Repair Surgery: A Retrospective Cohort Study

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Introduction: Traditional tension band wiring for treating displaced patella fracture involves the use of stainless steel wires. However, hardware-related complications require removal of implants. Alternatively, non-absorbable sutures such as FiberWire can be used to fix the fracture. The aim of this study was to compare the outcomes of tension band wiring using stainless steel wires with FiberWire.

Methods: A total of 32 patients suffered from transverse patella fracture from January to December 2018 were included. 18G stainless steel wire was used in 18 cases, and FiberWire #2 was used in 14 cases. Range of motion, pain score, resumption to previous mobility and work, length of hospital stay, implant failure, and revision rates were compared at 6 months after surgery. Mann-Witney *U* test and Chi-square test were used to compare the results.

Results: Mean age of the patients was 65.6 years at the time of surgery. Both groups had comparable demographics. Operating time using FiberWire (104 minutes) was significantly longer than that using stainless steel wires (80.4 minutes). Six patients in stainless steel wire group had symptomatic hardware impingement, among whom, five requested removal of the wires. There were also two cases of broken wires. In other aspects, both groups had comparable results.

Conclusion: Despite a longer operating time, fixation using FiberWire has comparable results with stainless steel wire and does not have hardware complications that require implant removal. These findings suggest that FiberWire is a viable alternative in treating patella fractures.

FP1.3

Vibration Therapy Improves Postural Stability and Prevents Falls after Distal Radius Fracture in Elderly Patients: A Randomised Controlled Trial

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FP1.4

Effectiveness of a Day Rehabilitation Programme in Improving Functional Outcome and Reducing Mortality and Readmission of Elderly Patients with Fragility Hip Fractures

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FP1.5

Predictors of the Pattern and Progression of Secondary Osteoarthritis after Tibial Plateau Fractures

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Introduction: Although tibial plateau fractures constitute only 1% of all fractures, they carry important implications, including osteoarthritis (OA) of the knee. This study investigated the relationship between the Schatzker classification of tibial plateau fractures and resultant osteoarthritic patterns.

Methods: A retrospective study of all tibial plateau fractures seen between 1998 and 2013 was performed. A total of 152 knees with a mean age of 52.9 years and mean follow-up time of 5 years were included. The pattern and progression of OA were determined by evaluating case notes and radiographs collected over time.

Results: The Kellgren-Lawrence Grading (KL) was used to determine the progression of OA. Unicondylar Schatzker scores 1-4 were associated with laterally dominant OA knee. Over time, the mean KL change medially for knees with Schatzker scores 1, 2, 3, and 4 were 1.100 ($p=0.019$), 0.697 ($p=0.004$), 0.682 ($p=0.035$), and 0.68 ($p=0.020$), respectively. Laterally, the mean KL differences were 1.525 ($p=0.001$), 0.788 ($p=0.001$), 1.227 ($p<0.001$), and 0.849 ($p=0.002$), respectively. Bicondylar Schatzker scores (5-6) were associated with medially dominant OA knee. The mean KL difference medially for knees with Schatzker scores 5 and 6 were 0.940 ($p<0.001$) and 1.176 ($p<0.001$), respectively. The mean KL change laterally were 0.820 ($p<0.004$) and 0.967 ($p=0.003$), respectively. These results may be explained by the energy levels implied by each Schatzker score. No further significant relationships between Schatzker scores and other radiological parameters were identified.

Conclusion: The Schatzker classification score predicted the OA pattern that developed over time. Such knowledge will allow treatments to be better tailored to preserve individual patient's function in the future.

FP1.6

Clinical Results of Cannulated Screw Fixation for Hip Fracture in Elderly Patients

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Introduction: Incidence of geriatric hip fractures continues to increase in the elderly population. Treatment with cannulated hip screws remains a valid option in intracapsular hip fracture. The objective of this study was to review the outcome and complications following cannulated hip screw fixation.

Methods: A retrospective study of all hip fractures that were treated by cannulated screw fixation between 2014 and 2018 was performed. In all, 233 hips of patients with a mean age of 73 years and a minimum follow-up time of 1 year were recruited. A clinical and radiological evaluation was carried out in this cohort. The primary outcome was the mortality rate and the secondary outcomes were complications and risks factors for failure.

Results: Complication includes non-union (non-displaced=2.54%, displaced=11.1%), collapse (non-displaced=1.52%, displaced=0%), screw cut-out (non-displaced=9.64%, displaced=11.1%), or avascular necrosis (non-displaced=9.64%, displaced=36.11%). The total failure rate was 23.35% for non-displaced fractures and 58.33% for displaced fractures. Age, fracture type, and sex were studied as risk factors but only fracture type (p=0.001) was significantly correlated with surgical failure rates. The first-year mortality rate was 8.58% with functional status and age negatively impacting survival. When age was similar, the mortality risk increased by 1.637× with every functional decline. When functional status was similar, the mortality risk increased by 1.050× with every age increase.

Conclusion: Fracture type was a significant risk factor for surgical failure. Functional status and age both negatively influenced survival. While findings were comparable with literature results, more can be done to improve patients' function following intracapsular hip fractures.

FP1.7

Minimally Invasive Surgery Approach for Displaced Intra-articular Calcaneal Fracture Fixation: Review of Functional Outcome and Ability to Return to Work

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FP1.8

Ultrasound-guided Pericapsular Hip Joint Neurolysis for Geriatric Hip Fractures

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Owing to the increasing and ageing population in Hong Kong, geriatric hip fracture constitutes a major healthcare issue. Despite our recommendation for operative intervention, studies concluded that 6% of patients with high anaesthetic risk and multiple comorbidities eventually received non-operative treatment. For non-operative management, traditional treatment relies on oral analgesics for pain control. Certain analgesics such as non-steroidal anti-inflammatory drugs and tramadol may induce significant adverse drug effects. Suboptimal pain control also delays mobilisation. Neurolysis, on the contrary, incorporates cross-specialty collaboration with anaesthesiologists to provide early pain relief, and facilitates early sitting out and cardiopulmonary rehabilitation, benefiting patients who are vulnerable to complications arising from prolonged immobilisation. With good anatomical understanding of hip joint sensory innervation, selective chemical denervation, also known as neurolysis, acts as a powerful pain-relieving intervention for hip fractures. Articular branches of the femoral nerve, accessory obturator nerve and obturator nerves are localised with ultrasound guidance. After hydrolocation with saline, 100% alcohol is injected for neurolysis, and lidocaine is injected while the needle is withdrawn, to prevent residual alcohol dispersing along the needle tract. From October 2018 to March 2019, nine hip fracture patients fulfilling selection criteria received neurolysis treatment. No local or systemic complications were observed. 78% of cases achieved satisfactory pain control in terms of Numeric Pain Rating Scale and could tolerate early mobilisation and sitting out. Pain control was maintained upon subsequent outpatient follow-ups. Our presentation will outline literature review and current practice of defining patient selection criteria, furnishing the neurolysis procedure, evaluating pilot results, and discussing current limitations and future prospect of this procedure.

FP1.9

A Self-fulfilling Prophecy? Pretreatment Patient Expectation and Its Effects on Outcome and Patient Satisfaction in Distal Radius Fractures: Results of the Trauma Expectation Factor–Trauma Outcome Measure (TEFTOM-DR) Multicentre Study

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Introduction: Our objective was to determine whether pretreatment patient expectation predicted outcomes and whether expectation fulfilment correlated with satisfaction in patients with distal radius fractures.

Methods: In all, 132 patients with distal radius fractures were prospectively recruited from three institutions in Hong Kong, Shenzhen, and Shanghai. The validated Trauma Expectation Factor (TEF)–Trauma Outcome Measure (TOM) questionnaire developed by the AO Foundation was used. Patients pretreatment expectation was measured using the TEF scale. The TEF and baseline factors: fracture classification, treatment method, age or injury on duty state were compared with the SF-12 Health Survey version 2 (SF-12v2), TOM, and quick Disabilities of the Arm Shoulder and Hand (qDASH) outcome scores after casting or internal fixation at 6 and 12 months. "Fulfilment of expectation" defined by the difference between TEF and TOM scores was compared with the Patient Satisfaction Questionnaire Short Form (PSQ-18) general satisfaction scale. Correlation was calculated using the Spearman's rho (r).

Results: A total of 61 patients reaching 1-year follow-up were analysed. At 6 months, pretreatment expectation (TEF) demonstrated statistically significant correlation with SF12-general health (r=0.443, p=0.000) and qDASH (r=0.302, p=0.000). At 12 months, TEF correlated with TOM (r=0.273, p=0.33) and SF12-general health (r=0.338, p=0.08). At 6 and 12 months, PSQ-18 general satisfaction scores had statistically significant correlation (r>0.44, p<0.001) with absolute TOM, qDASH, and SF-12 scales but not with "fulfilment of pretreatment expectations" (TEF-TOM) [r=0.2, p=0.12].

Conclusion: Pretreatment expectation is correlated with eventual outcome scores in the SF-12 scale. Patient satisfaction is related to absolute outcomes but not fulfilment of expectations.

FP1.10

Interim Results of a Multicentre Cohort Using a Fenestrated Spiral Blade Cephalomedullary Device with or without Cementation

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Introduction: Newer-generation proximal femoral nail allows cement augmentation to enhance bone anchorage. Our study investigated whether cement augmentation in the TFN-Advanced Proximal Femoral Nailing System (TFNA) reduces the rate of cut-out/cut-through and excessive blade sliding.

Methods: This was a multicentre retrospective cohort study conducted between September 2015 and March 2019. Inclusion criteria were pertrochanteric fracture (AO/OTA classification type 31 A1, A2, A3), age ≥50 years, low energy trauma, and treated with TFNA. Primary outcomes were the rates of implant cut-out, cut-through, and mortality. Secondary outcome was the degree of fracture collapse represented by blade sliding on X-ray. Confounding factors such as patient demographics, fracture characteristics, fracture reduction quality, and fixation quality were accounted for.

Results: In all, 75 patients met the inclusion criteria, with 41 patients in the cement augmented (CA) group and 34 patients in the non-cement augmented (NCA) group. There was no statistically significant difference between the two groups in patient demographics, fracture characteristics, and reduction quality. There were more posteriorly positioned blades in the NCA group (20.6% vs 4.9%; p=0.039). There was a lower rate of cut-out or cut-through (11.8% vs 0%; p=0.026) and less fracture collapse in the CA group (3.6 mm vs 2.0 mm; p=0.029).

Conclusion: There was a lower rate of cut-out or cut-through and less fracture collapse in the CA group.

FP1.11

Artificial Intelligence in Hip Fracture Prediction Following Distal Radius Fracture

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FP1.12

Improved Glenoid Component Screw Placement for Reverse Shoulder Arthroplasty by Surgeon Designed Patient-specific Instrumentation versus Conventional Method: A Comparative Study

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Introduction: Glenoid component fixation in reverse shoulder arthroplasty (RSA) is critical to prevent loosening. Long angle stable screws in the superior and inferior glenoid bone is the preferred method. However, this can be technically challenging especially in patients with smaller glenoid dimensions. Here, we assess the efficacy of a surgeon-designed three dimensional (3D)-printed patient-specific instrumentation (PSI) in enhancing the accuracy of screw placement compared with conventional instrumentation.

Methods: Multicentre retrospective comparative study of RSA was performed using conventional instrumentation against a surgeon designed, in-house produced 3D-printed PSI jigs for glenoid guide pin orientation and superior-inferior screw placement. The outcome measurements were screw length attainable for superior and inferior screw placement, operating time, and complications.

Results: Twenty-nine RSAs were performed with 11 using PSI and 18 with conventional instrumentation. Average anteroposterior glenoid diameter was 27.1 mm (range, 24.9-29.2 mm) in the conventional group and 23.6 mm (range, 21.6-29.3 mm) in the PSI group. Superior and inferior screw lengths were significantly longer by a mean of 7.70 mm and 10.58 mm, respectively in the PSI group compared with conventional group (p=0.02, 95% confidence interval [CI]=1.13-14.3; p=0.01, 95% CI=3.34-17.8). The mean superior screw lengths were 46.2 mm (range, 36-48 mm) and 38.5 mm (range, 20-48 mm) for PSI and conventional instrumentation, respectively, while the mean inferior screw lengths were 46.2 mm (range, 36-48 mm) in PSI and 35.6 mm (range, 20-48 mm) in conventional instrumentation.

Conclusion: Significantly longer screws were placed using PSI. Long screws were reliably placed even in small glenoids with anteroposterior diameter of <25 mm. Routine use of PSI can improve placement of screws in RSA.

FP1.13

Reverse Total Shoulder Replacement for Geriatric Three- and Four-part Proximal Humerus Fractures — Propensity Score Matched Comparison to Internal Fixation at 2 Years

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Introduction: The present study aimed to investigate 2-year results of patients aged >60 years with proximal humerus fractures treated with reverse total shoulder arthroplasty (rTSA) compared with those treated with locking plate internal fixation (IF). We hypothesise that the functional outcome after rTSA is comparable to that after IF.

Methods: All patients presenting with proximal humerus fractures undergoing surgical treatment were prospectively recruited. We included only patients with 3- or 4-part anatomical neck of humerus fractures. There were 13 patients treated with rTSA and 30 with IF. All patients followed a protocol-driven rehabilitation programme with outcome assessment at 3, 6, 12, and 24 months. Constant score, quick Disabilities of the Arm Shoulder and Hand (qDASH), range of motion, rate of complications, and revision surgery were recorded and compared. Propensity score matching was used to select 13 matching patients from the IF group according to age and sex.

Results: Thirteen rTSA patients were age- and sex-matched with 13 IF patients. At a mean follow-up of 3, 6, 12 and 24 months, average constant shoulder score was 34.7, 51.5, 65.5, and 68.4, respectively, for rTSA and 39.6, 50.1, 58.2, and 63.6, respectively, for IF. Mean qDASH scores were 49.0, 18.2, 7.9, and 5.6, respectively, for rTSA and 31.7, 21.9, 21.5, and 17.4, respectively, for IF. Mean shoulder abduction range was 62.9°, 90.1°, 113.0° and 109.0°, respectively, for rTSA and 71.0°, 85.6°, 90.0° and 93.6°, respectively, for IF. All above findings had no statistically significant difference. There were significantly more complications observed for IF (n=7) than rTSA (n=1) [p=0.015] but a similar rate of re-operations for IF (n=3) and rTSA (n=1) [p=0.297].

Conclusion: The 2-year outcomes of rTSA are comparable to those of IF, with a lower complication rate.

FP1.14 *Indian Orthopaedic Association Ambassador Paper*

Double-tunnel Anatomical Coracoclavicular Ligament Reconstruction versus Coracoclavicular Repair and K-wire Fixation versus Conservative Management in Acute Acromioclavicular Joint Dislocations

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Introduction: The acromioclavicular joint is an integral component of the shoulder complex and a common site of injury particularly for athletes involved in sports such as football, cricket, rugby, and shot put. Classic surgical techniques are associated with high complication rates.

Methods: This is a prospective study on 136 patients at three centres from July 2015 to August 2018 with acute grade 3, 4, 5 acromioclavicular joint dislocations. Group 1 had 46 patients, operated with double-tunnel anatomical coracoclavicular ligament reconstruction. Group 2 had 46 patients operated with coracoclavicular repair and K-wire fixation. Group 3 had 44 patients, managed conservatively. Visual analogue scale, constant functional scale, start of movement, return to work, satisfaction index, and coracoclavicular distance were assessed over 12 months.

Results: Mean follow-up duration was 12±0.8 months. Visual analogue scale, range of motion, coracoclavicular distance, and constant scores were better for Group 1 at 1 day, 6 weeks, and 6 months ($p<0.05$) after surgery. Mean return to work was by 7 days in Group 1.

Conclusion: Proximal migration of clavicle, acromioclavicular arthritis, pain, loss of terminal abduction, and stiffness is common in conservative and coracoclavicular repair patients after K-wire removal. Dislocated acromioclavicular joint is a common scenario in conservatively managed patients with occasional inflammation, shoulder and back pain and bony prominence in elderly patients. Anatomical coracoclavicular ligament reconstruction promises good functional outcomes with assured coracoclavicular stability and near normal joint anatomy throughout life.

FP1.15 *Japanese Orthopaedic Association Ambassador Paper*

Treatment Strategy for Osteoporotic Vertebral Fractures

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Objectives: In the majority of osteoporotic vertebral fractures (OVFs), the associated pain gradually subsides as bony union and stability progress with conservative treatment. However, some patients present with intractable back pain for prolonged periods of time. We previously reported that characteristic magnetic resonance imaging findings (high-intensity or diffuse low-intensity area in the fractured vertebrae on T2-weighted images). Therefore, the purpose of this study was to investigate the efficacy of balloon kyphoplasty (BKP) for treatment of fresh OVFs in patients with these poor prognostic factors.

Methods: This study enrolled 116 patients with poor prognostic magnetic resonance imaging findings who underwent BKP within 2 months after injury, and 116 controls with acute OVFs and the same poor prognostic factors who underwent conservative treatment. Patients were propensity score–matched.

Results: A decrease in activities of daily living occurred in 5.6% of patients in the BKP group and 26.7% of patients in the conservative treatment group ($p<0.001$). The mean Short Form–36 vitality subscale score improved by 26.9 ± 25.9 points in the BKP group and 14.5 ± 29.4 points in the control group ($p=0.03$). The mean vertebral body wedge angle improved by 5.5 ± 6.2° in the BKP group and -6.3 ± 5.0° in the control group ($p<0.0001$). The mean percentage of vertebral body height improved by 15.2 ± 19.2% in the BKP group and -20.6 ± 14.2% in the control group ($p<0.0001$).

Conclusion: Activities of daily living, quality of life, and vertebral deformity showed greater improvement with BKP intervention for fresh OVF with poor prognostic factors than with conservative treatment at 6 months after injury. This might be a new efficient strategy for OVF.