

SCOT Summer Meeting 2020 – Registrar Research Session

Podium Presentations

ADOLESCENT MIDSHAFT CLAVICLE FRACTURE DISPLACEMENT DOES NOT PREDICT NONUNION OR POOR FUNCTIONAL OUTCOME AT LONG-TERM FOLLOW-UP

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The aim of this study was to define the long-term outcome following adolescent clavicle fracture.

We retrospectively reviewed all adolescent fractures presenting to our region (13-17years) over a 10-year period. Patient reported outcomes were undertaken at a minimum of 4 years post-injury (QuickDASH and EQ-5D) in completely displaced midshaft fractures (Edinburgh 2B, >2cm displacement, n=50) and angulated midshaft fractures (Edinburgh 2A2, >30 degrees angulation, n=32).

677 clavicle fractures were analysed. The median age was 14.8 (IQR 14.0-15.7) and 89% were male. The majority were midshaft (n=606, 89.5%) with either angulation (39.8%) or simple fully displaced (39.1%). Only 3% of midshaft fractures underwent acute fixation (n=18/606), all of which were fully displaced. The incidence of refracture following non-operative management of midshaft fractures was 3.2% (n=19/588), all united with non-operative management. Fracture type, severity of angulation or displacement was not associated with risk of refracture. There was one case of non-union encountered following non-operative management of all displaced midshaft fractures (0.4%, n=1/245). At a mean of 7.6 years following injury, non-operative management of both displaced and angulated fractures had a median QuickDASH was 0.0 (IQR 0.0-2.3), EQ-5D was 1.0 (IQR 1.0-1.0). 97% of angulated fractures and 94% of displaced fractures were satisfied with their final shoulder function.

We conclude that Non-operative management of adolescent midshaft clavicle fractures result in excellent functional outcomes with a low rate of complications at long-term follow up. The relative indications for surgical intervention for clavicle fractures in adults do not appear to be applicable to adolescents.

IMPACT-SCOT REPORT ON COVID-19 AND HIP FRACTURE: A MULTICENTRE STUDY ASSESSING MORTALITY, PREDICTORS OF SARS-COV-2 INFECTION AND THE EFFECTS OF SOCIAL LOCKDOWN ON EPIDEMIOLOGY

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The aims were: (1) assess the influence of COVID-19 on mortality in hip fracture; (2) identify predictors of COVID-19 status, and (3) investigate whether social lockdown influenced the epidemiology of hip fracture.

A multicentre retrospective study was conducted of all patients presenting to six hospitals with hip fracture over a 46-day period (23 days pre-/post-lockdown). Demographics, residence, place of injury, presentation blood tests, Nottingham Hip Fracture Score, time to surgery, operation, ASA grade, anaesthetic, length of stay, COVID-19 status, and 30-day mortality were recorded.

Of 317 patients with hip fracture 27 (8.5%) had a positive COVID-19 test; only 7 (26%) had symptoms on admission. COVID-19-positive patients had significantly lower 30-day survival compared to those without COVID-19 (67% versus 92%, p<0.001). COVID-19 was independently associated with increased 30-day mortality adjusting for: (1) age, sex, residence (HR 2.93, p=0.008); (2) Nottingham Hip Fracture Score (HR 3.52, p=0.001), and (3) ASA (HR 3.45, p=0.004). Platelet count predicted subsequent COVID-19 status; a value <217 x10⁹/L was 68% specific and sensitive (95% CI 58 to 77, p=0.002). A similar number of patients presented with hip fracture pre-lockdown (n=160) and post-lockdown (n=157); there was no significant difference in demographics, place of injury, Nottingham Hip Fracture Score, time to surgery, ASA, or management.

COVID-19 was independently associated with an increased 30-day mortality in hip fracture. Most patients with COVID-19 lacked suggestive symptoms at presentation. Platelet count was an indicator of risk of COVID-19 infection. These findings have urgent implications for the delivery of hip fracture services.

PERCUTANEOUS REDUCTION AND FIXATION OF LOW ENERGY LISFRANC INJURIES RESULTS IN BETTER OUTCOME COMPARED TO OPEN REDUCTION AND INTERNAL FIXATION: A MATCHED CASE-CONTROL STUDY

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Open reduction and internal fixation (ORIF) with trans-articular screws or dorsal plating is the standard surgical technique for displaced Lisfranc injuries. This aim of this study is to compare the clinical outcomes of percutaneous reduction and internal fixation (PRIF) of low energy Lisfranc injuries with a matched, control group of patients treated with ORIF.

Over a seven-year period (2012-2019), 16 consecutive patients with a low energy Myerson B2-type injury were treated with PRIF. Patient demographics were recorded within a prospectively maintained database at the institution. This study sample was matched for age, sex and mechanism of injury to a control group of 16 patients with similar Myerson B2-type injuries treated with ORIF. Clinical outcome was compared using the American Orthopaedic Foot and Ankle Society (AOFAS) midfoot score and Manchester Oxford Foot Questionnaire (MOXFQ).

At a mean follow up of 43.0 months (95% CI 35.6 – 50.4), both the AOFAS and MOXFQ scores were significantly higher in the PRIF group compared to the control ORIF group (AOFAS 89.1 vs 76.4, $p=0.03$; MOXFQ 10.0 vs 27.6, $p=0.03$). There were no immediate postoperative complications in either group. At final follow up, there was no radiological evidence of midfoot osteoarthritis in any patient in the PRIF group. Three patients in the ORIF group developed midfoot osteoarthritis, one of whom required midfoot fusion.

PRIF is a technically simple, less invasive method of operative stabilisation of low energy Lisfranc injuries which also appears to be associated with better mid-term clinical outcomes compared to ORIF.

NON-OPERATIVE MANAGEMENT OF DISPLACED OLECRANON FRACTURES IN THE ELDERLY RESULTS IN SESAMOID LIKE FUNCTION: AN ULTRASOUND ASSESSMENT OF THE RELATIVE MOVEMENT OF THE FRACTURE FRAGMENTS

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Non-operative management of displaced olecranon fractures in elderly low demand patients is reported to result in a satisfactory outcome despite routinely producing a nonunion. The aim of this study was to assess whether there is evidence of dynamic movement of the fracture fragment during the elbow arc of movement.

Five consecutive patients (≥ 70 years of age) with a displaced olecranon fracture (Mayo 2A) that were managed with non-operative intervention were recruited. All underwent ultrasound evaluation at six weeks and follow-up questionnaires at six months including the DASH and Oxford Elbow Score (OES).

There were three women and two men with a mean age of 79yrs (range 70-88). All injuries were sustained following a fall from standing height. The mean fracture gap in extension was 22.5mm (95% CI 13.0-31.9), midflexion 21.8mm (11.6-32.0) and in deep flexion 21.8mm (10.9-32.8). Although the amount of fracture displacement varied between patients, it remained static in each patient with no significant differences observed throughout the arc of motion (ANOVA $p=0.99$). The six-month median DASH score was 7.5 (IQR range, 4.2-39.3) and the OES was 44.0 (29.0-47.5). Four out of the five patients were satisfied with their function.

Ultrasound evaluation of displaced olecranon fractures following non-operative management suggests the proximal fragment may function as a sesamoid type bone within the triceps sleeve. This could explain how a functional arc of movement with a minimum level of discomfort can usually be expected with non-operative management in select patients.

ASSESSMENT OF THE QUALITY OF BONE REPAIR AFTER AUTOLOGOUS FAT-DERIVED MESENCHYMAL STEM CELLS (MSCs) INJECTION IN A CLINICALLY RELEVANT MODEL OF ATROPHIC NONUNION

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The role of mesenchymal stem cells (MSCs) in enhancing healing process has been examined with allogeneic and xenogeneic cells in transplantation models. However, certain factors might limit the use of allogeneic cells in clinical practice, (e.g. disease transmission, ethical issues and patient acceptance). Adipose tissue represents an abundant source for autologous cells. The aim of this study was to evaluate adipose-derived autologous cells for preventing non-union.

Adults male Wistar rats (n=5) underwent a previously published surgical procedure known to result in non-union if no treatment is given. This consisted of a mid-shaft tibial osteotomy with peri/endosteal stripping stabilised by intramedullary nail fixation with a 1mm gap maintained by a spacer. During the same operation, ipsilateral inguinal subcutaneous fat was harvested and processed for cell isolation. After three weeks in culture, the cell number reached 5×10^6 and were injected into the fracture site.

At the end of the experiment, all tibias (injected with autologous fat-MSCs) developed union. These were compared with a control group injected with PBS (n=4) and with allogenic (n=5) and xenogeneic (n=6) cell transplantation groups. The amount of callus was noticeably large in the autologous cell group and the distal-callus index was significantly greater than that of the other groups, *P-value* = <0.05, *unpaired t-test*, corrected by Benjamini & Hochberg.

We report a novel method for autologous MSCs implantation to stimulate fracture healing. Local injection of autologous fat-MSCs into the fracture site resulted in a solid union in all the tibias with statistically significantly greater amounts of callus.

PRE-OPERATIVE OPIOID ANALGESIA HAS NO EVIDENT BENEFIT AND IS ASSOCIATED WITH A WORSE OUTCOME FOLLOWING ARTHROPLASTY

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Non-surgical osteoarthritis management includes analgesia escalation to oral opiates; however, tolerance can occur. This study aims to assess analgesic effects of opiate use pre-operatively and whether this influences outcome 1-year post-operatively in patients undergoing total hip/knee arthroplasty (THA/TKA).

This prospective study assessed 1487 patients undergoing primary THA (n=729) or TKA (n=758) for osteoarthritis, with 95 respectively reporting pre-operative opiate use >1 month. THA opiate users had significantly higher BMI (p=0.007) and more likely to suffer associated comorbidities. TKA opiate users were significantly younger (p<0.001), with higher BMI (p=0.019) and more likely to suffer associated comorbidities. Pre-operative quality of life (QoL) and joint specific function were significantly worse (Hip EQ-5D 0.17 vs 0.41, p<0.001, OHS 14.6 vs 21.2, p<0.001; Knee EQ-5D 0.27 vs 0.44, p<0.001, OKS 16.4 vs 21.4, p<0.001). Pre-operative pain was significantly worse in those taking opioids (Hip Pain VAS 42.73 vs 50.70, p<0.001; Knee Pain VAS 50.93 vs 53.36, p=0.30). Post-operatively the THA opiate group had significant improvement in EQ-5D (0.175, p<0.001) and OHS (6.5, p<0.001) but were significantly less improved than opiate naïve patients after adjusting for confounding (EQ-5D 0.10, p<0.001; OHS 3.2, p<0.001). TKA opiate group also had significant improvement in EQ-5D (p<0.001) and OKS (p<0.001) but were significantly less (EQ-5D 0.089, p<0.001; OKS 3.9, p<0.001) than opioid naïve patients.

Pre-operative opiate use was associated with significantly worse pre-operative QoL, joint specific function and worse subjective pain. Post-operatively, the opiate group had significantly lower improvement in their QoL and joint specific function.

EXTENT OF GLENOHUMERAL BONE LOSS DOES NOT INFLUENCE THE OUTCOME OF THE LATARJET PROCEDURE

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The aim of this study was to determine if the extent of the glenoid and humeral bone loss affects the rate of recurrent instability and the functional outcome following the Latarjet procedure.

102 patients underwent open Latarjet procedure during the period 2006–2015 (Mean age 31.6 years, 92 (90.1%) Male, 81 (79%) primary procedure). Functional outcome was measured using the Western Ontario Shoulder Instability Index (WOSI) and Quick Disabilities of the Arm, Shoulder and Hand (QuickDash) score at a mean of 5.6 years post-operatively. All patients underwent computed tomographic (CT) imaging pre-operatively. Using three-dimensional reconstruction the glenoid bone loss, Hill-Sachs lesion and ‘Glenoid Track’ status was recorded.

Radiographically-confirmed redislocation was rare (0.98%), but 20% (n=20/102) reported ongoing subjective shoulder instability. Thirty-seven shoulders (36%) were classified as “Off-Track”. The median Quick DASH and WOSI scores were 2.27 (IQR 9.09; range 0-70.45) and 21.65 (IQR 55.15; range 0-200.3), respectively. There were no significant differences observed between overall Quick DASH scores or WOSI scores for either On-Track or Off-Track groups (p=0.91 and 1, respectively). Subjective instability was not influenced by the degree of glenoid bone loss (p=0.86), the overall size of the Hill-Sachs lesion (p=0.69), or the presence of an ‘Off-Track’ lesion (p=0.90).

Functional outcome and recurrent instability following the Latarjet procedure do not appear to be influenced by the extent of glenohumeral bone loss prior to surgery.

RADIOSTEREOMETRIC ANALYSIS OF THE STEMLESS HUMERAL COMPONENT IN TOTAL SHOULDER ARTHROPLASTY: IMPLANT STABILITY UNDER LOAD

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Over the last decade stemless shoulder arthroplasty has become increasingly popular. However, stability of metaphyseal loading humeral components remains a concern. This study aimed to assess the stability of the Affinis stemless humeral component using Radiostereometric analysis (RSA).

Patients underwent total shoulder arthroplasty via a standardised technique with a press-fit stemless humeral component and a cemented pegged glenoid. Tantalum beads were inserted into the humerus at the time of operation. RSA of the relaxed shoulder was completed at weeks 1, 6, 13, 26, 52 and 104 post-operatively. Stressed RSA with 12 newtons of abduction force was completed from week 13 onwards. ABRSA 5.0 software (Downing Imaging Limited, Aberdeen) was used to calculate humeral component migration and induced movement.

15 patients were recruited. Precision was: 0.041, 0.034, 0.086 and 0.101 mm for Superior, Medial, Posterior and Total Point Motion (TPM) respectively. The mean TPM over 2 years was 0.24 (0.30) mm, (Mean (Standard deviation)). The mean rate of migration per 3 month time period decreased from 0.45 (0.31) to 0.02 (0.01) mm over 2 years. Mean inducible movement TPM peaked at 26 weeks at 0.1 (0.08) mm, which reduced to 0.07 (0.06) mm by 104 weeks when only 3 patients had measurable inducible motion. There was no clear trend in direction of induced movement. There were no adverse events or revisions required.

We conclude migration of the humeral component was low with little inducible movement in the majority of patients implying initial and 2 year stability of the stemless humeral component.

Poster Abstracts

ANTERIOR CRUCIATE LIGAMENT GRAFT RERUPTURE: ANALYSIS OF TRANS-TIBIAL VERSUS ANTEROMEDIAL PORTAL TECHNIQUE FOR FEMORAL TUNNEL PLACEMENT IN 473 PATIENTS

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Correct femoral tunnel position in anterior cruciate ligament reconstruction (ACLR) is critical in obtaining good clinical outcomes. We aimed to delineate whether any difference exists between the anteromedial (AM) and trans-tibial (TT) portal femoral tunnel placement techniques on the primary outcome of ACLR graft rupture.

Adult patients (>18year old) who underwent primary ACLR between January 2011 - January 2018 were identified and divided based on portal technique (AM v TT). The primary outcome measure was graft rupture. Univariate analysis was used to delineate association between independent variables and outcome. Binary logistic regression was utilised to delineate odds ratios of significant variables.

473 patients were analysed. Median age at surgery was 27 years old (range 18-70). A total of 152/473, (32.1%) patients were AM group compared to 321/473 (67.9%) TT. Twenty-five patients (25/473, 5.3%) sustained graft rupture. Median time to graft rupture was 12 months (IQR 9). A higher odds for graft rupture was associated with the AM group, which trended towards significance (OR 2.03; 95% CI 0.90 - 4.56, $p=0.081$). Older age at time of surgery was associated with a lower odds of rupture (OR 0.92, 95% CI 0.86 - 0.98, $p=0.014$).

There is no statistically significant difference in ACLR graft rupture rates when comparing anteromedial and trans-tibial portal technique for femoral tunnel placement. There was a trend towards higher rupture rates in the anteromedial portal group.

APPLYING THE NET PROMOTOR SCORE TO ARTHROSCOPIC SHOULDER SURGERY

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The purpose of this study is to evaluate the net promoter score of arthroscopic subacromial decompression and rotator cuff repair.

The Friends and Family Test, a variant of the Net Promoter Score, was adapted for the National Health Service to evaluate overall patient satisfaction and how likely patients are to recommend an intervention. It ranges from -100 to 100. Positive scores indicate good performance.

This study quantifies the scores in 71 patients at 1 year following arthroscopic sub acromial decompression and rotator cuff repair. All of the procedures were performed by 1 consultant shoulder specialist. The patient filled out a shoulder questionnaire pre-operatively, at 6 months and 1 year.

The score was 72 for subacromial decompression ($n=32$) and 85 for rotator cuff repair +/- decompression ($n=39$). Oxford shoulder score was also taken and had a rise of 4.3 and 6.9 respectively. Our study indicates that these procedures are highly valued and are recommended by patients according to the Friends and Family Test. The results of the Friends and Family Test correlated well with postoperative functional improvement and satisfaction.

We conclude from this study that a compound score based on the Friends and Family Test is a useful addition to traditional measures of patient satisfaction.

DAY CASE THR - 18 MONTHS EXPERIENCE IN THE NHS

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According to the Scottish Arthroplasty Project the mean inpatient LoS following a Total Hip Replacement (THR) has fallen from 10.3 days in 2001 to only 3.9 days. This reduction in patient LoS has lead units in the UK to follow the example of centres around the world in offering THR as a day case procedure. In this study we examine data gathered from the first 18 months of day case THR within a district general hospital elective orthopaedics unit.

Data was collected prospectively from all patients undergoing THR within our district general hospital elective orthopaedic unit. Patients were selected to day case THR group via consultant review at outpatient clinic and anaesthetic assessment at pre-assessment clinics. Between August 2018 and February 2020 (18 months) 40 patients successfully underwent day case THR. None of the patients discharged home were readmitted within the next 30 days. The average age of successful day case THRs was 60 years old. The at 6 months post-op mean OHS was 45.1 and at 1 year post-op the mean score was 47.2. The average improvement in OHS was 21.1 at 6 months and 26.9 at 1 year post-op. All of the patients successfully discharged as day cases were satisfied with their care and all but one would recommend it to their friends and family.

We have shown that day case THR is not only possible within an NHS district general hospital but gives exceptional patient outcomes with excellent patient satisfaction.

OUTCOMES OF BRACHIAL PLEXUS AND PERIPHERAL NERVE SHEATH TUMOURS IN THE WEST OF SCOTLAND

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Brachial plexus tumours (BPT) and peripheral nerve sheath tumours (PNST) are largely benign in nature, with malignant tumours being rare and presenting significant surgical challenges. Excision of benign tumours may relieve pain and other symptomology. This retrospective study analysed data from 138 PNST and 92 BPT patients managed by a single consultant orthopaedic or plastic surgeon experienced in nerve tumour surgery between January 1999 to December 2019. The most common benign tumours were schwannomas and neurofibromas, with sarcomas being the most common malignant tumour.

In the PNST group 30 patients were managed by observation only. Twenty patients underwent trucut biopsy, 21 patients underwent biopsy and surgical excision and 56 patients underwent surgical excision only. There were nine complications, with two significant neurological deficits requiring further surgical intervention. No recurrence of tumours occurred in this group.

In the BPT group 16 patients were managed by observation only. Seven patients underwent trucut biopsy, 16 patients biopsy and surgical excision and 44 BPT patients underwent surgical excision only. Sixteen patients had complications with two significant complications requiring urgent further surgical intervention. Seven patients had recurrence of tumours which presented as metastases, with three patients requiring further surgery to remove recurrence of tumours.

BPT patients are more complex and present with both benign and malignant lesions and are therefore more prone to complications due to the complex nature of the surgery and higher recurrence rate of tumours than PNST. Benign tumours in both groups can be safely managed conservatively if patients' symptomology is acceptable.

OUTCOME AFTER LATERAL TIBIAL PLATEAU FRACTURE FIXATION AUGMENTED WITH CALCIUM PHOSPHATE CEMENT

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The aim was to report operative complications, radiographic and patient-reported outcomes following lateral tibial plateau fracture fixation augmented with calcium phosphate cement (CPC).

From 2007-2018, 187 patients (median age 57yrs [range 22-88], 63% female [n=118/187]) with a Schatzker II/III fracture were retrospectively identified. There were 103 (55%) ORIF and 84 (45%) percutaneous fixation procedures. Complications and radiographic outcomes were determined from outpatient records and radiographs. Long-term follow-up was via telephone interview.

At a median of 6 months (range 0.1-138) postoperatively, complications included superficial peroneal nerve injury (0.5%, n=1/187), infection (6.4%, n=12/187), prominent metalwork (10.2%, n=19/187) and post-traumatic osteoarthritis (PTOA; 5.3%, n=10/187). The median postoperative medial proximal tibial angle was 89° (range 82-107) and posterior proximal tibial angle 82° (range 45-95). Three patients (1.6%) underwent debridement for infection and 27 (14.4%) required metalwork removal. Seven patients (4.2%) underwent total knee replacement for PTOA.

Sixty percent of available patients (n=97/163) completed telephone follow-up at a median of 6yrs (range 1-13). The median Oxford Knee Score was 42 (range 3-48), Knee injury and Osteoarthritis Outcome Score 88 (range 10-100), EuroQol 5-Dimension score 0.812 (range -0.349-1.000) and Visual Analogue Scale 75 (range 10-100). There were no significant differences between ORIF and percutaneous fixation in patient-reported outcome (all p>0.05).

Fixation augmented with CPC is safe and effective for lateral tibial plateau fractures, with a low complication rate and good long-term knee function and health-related quality of life. Percutaneous fixation offers a viable alternative to ORIF with no detriment to patient-reported outcome.