

ABSTRACT PRESENTATIONS - SUMMER SCOT, Dunblane Hydro, 8th Sept 2023

ARE GOOD OUTCOMES IN TOTAL KNEE REPLACEMENTS PREDICTIVE OF SUCCESS IN SEQUENTIAL CONTRALATERAL TKR SURGERY?

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There is little published literature to support the claim that a successful total knee replacement (TKR) is predictive of future good outcomes on the contralateral side. The objective was to identify whether outcome from the first of staged TKRs could be used to predict the outcome of the contralateral TKR.

This was a retrospective cohort study of 1687 patients over a 25-year period undergoing staged bilateral TKRs in a UK arthroplasty centre. A control group of 1687 patients undergoing unilateral TKR with matched characteristics was identified. Primary outcomes were satisfaction and Knee Society Score (KSS) at one year.

Preoperative status was comparable for pain, ROM and KSS (mean 41, 45, 43±14). At one year follow up, dissatisfaction was similar for all groups (4% first of staged TKR, 4% second of staged TKR, 5% controls). If the first TKR had a good outcome, the relative risk of a contralateral bad outcome was 20% less than controls (95% CI 0.6-1.2). If the first TKR had a poor outcome, the risk of a second poor outcome was 4 times higher (95% CI 2.8-6.1), increasing from 6% to 27% (absolute risk).

Patients undergoing the second of staged TKRs with a previous good outcome are likely to do well in their second procedure (94 in 100 will go on to have a second good outcome). Of those with a previous poor outcome, 27 in 100 will have a second poor outcome. The trend was persistent despite correcting for gender, age, BMI, and diagnosis.

LONG-TERM OUTCOMES OF A RANDOMISED CONTROL TRIAL COMPARING FIBULAR NAIL FIXATION WITH OPEN REDUCTION INTERNAL FIXATION IN PATIENTS WITH UNSTABLE ANKLE FRACTURES

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To compare the long-term outcomes of fibular nailing and plate fixation for unstable ankle fractures in a cohort of patients under the age of 65 years.

Patients from a previously conducted randomized control trial comparing fibular nailing and plate fixation were contacted at a minimum of 10 years post intervention at a single study centre. Short term data were collected prospectively and long-term data were collected retrospectively using an electronic patient record software.

Ninety-nine patients from one trauma centre were included (48 fibular nails and 51 plate fixations). Groups were matched for gender (p=0.579), age (p=0.811), body mass index (BMI)(p=0.925), smoking status (p=0.209), alcohol status (p=0.679) and injury type (p=0.674). Radiographically at an average of 2 years post-injury, there was no statistically significant difference between groups for development of osteoarthritis (p=0.851). Both groups had 1 tibio-talar fusion (2% of both groups) secondary to osteoarthritis with no statistically significant difference in overall re-operation rate between groups identified (p=0.518,). Forty-five percent (n=42) of patients had so far returned patient reported outcome measures at a minimum of 10 years (Fibular nail n=19, plate fixation n=23). No significant difference was found between groups at 10 years for the Olerud and Molander Ankle Score (p=0.990), the Manchester-Oxford Foot Questionnaire (p=0.288), Euroqol-5D Index (p=0.828) and Euroqol-5D Visual Analogue Score (p=0.769).

The current study illustrates no difference between fibular nail fixation and plate fixation at a long-term follow up of 10 years in patients under 65 years old, although the study is currently under powered.

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RELIABILITY AND VALIDITY OF COMPUTER VISION SOFTWARE TO MONITOR JOINT MOVEMENT FOR POST-OPERATIVE PHYSIOTHERAPY

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Technological advancements in orthopaedic surgery have mainly focused on increasing precision during the operation however, there have been few developments in post-operative physiotherapy. We have developed a computer vision program using machine learning that can virtually measure the range of movement of a joint to track progress after surgery. This data can be used by physiotherapists to change patients' exercise regimes with more objectively and help patients visualise the progress that they have made. In this study, we tested our program's reliability and validity to find a benchmark for future use on patients.

We compared 150 shoulder joint angles, measured using a goniometer, and those calculated by our program called ArmTracking in a group of 10 participants (5 males and 5 females). Reliability was tested using adjusted R squared and validity was tested using 95% limits of agreement. Our clinically acceptable limit of agreement was $\pm 10^\circ$ for ArmTracking to be used interchangeably with goniometry.

ArmTracking showed excellent overall reliability of 97.1% when all shoulder movements were combined but there were lower scores for some movements like shoulder extension at 75.8%. There was moderate validity shown when all shoulder movements were combined at 9.6° overestimation and 18.3° underestimation.

Computer vision programs have a great potential to be used in telerehabilitation to collect useful information as patients carry out prescribed exercises at home. However, they need to be trained well for precise joint detections to reduce the range of errors in readings.

INCIDENCE OF FEMORAL OSTEOLYSIS IN THE TITANIUM ALLOY THOMPSON PROSTHESIS

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The Thompson hemiarthroplasty is a common treatment option for acute neck of femur fractures in the elderly population. Our department noted a significant number of patients returning with thigh pain, radiographic loosening and femoral osteolysis following cemented implantation of the titanium alloy version of the Thompson hemiarthroplasty. We are not aware of any previous reports documenting complications specific to the titanium Thompson implant and a retrospective cohort study was therefore initiated following clinical governance approval.

366 titanium alloy Thompson prostheses were implanted for hip fracture treatment between 2017 and 2020. As of February 2023, 6 of these have been revised at our hospital. 5 were revised for symptomatic femoral osteolysis and 1 presented with an acute periprosthetic fracture. All revised cases were determined to be aseptic. 32 living patients were excluded from recall on compassionate grounds due to permanent nursing home residence. 47 living patients were identified of which 33 attended for xray. 28 deceased and/or nursing home resident patients who had pelvis x-rays in the previous 12 months were also included in the analysis. Including the 6 index hips already revised, a total of 61 hip xrays were analysed, of which 19 hips (31.1%) showed radiographic evidence of femoral osteolysis or loosening.

We conclude that there is a concerning incidence of femoral osteolysis and implant loosening associated with the titanium Thompson implant. We have discontinued use of the implant and reported our experience to the MHRA. We encourage other Scottish Health-Boards who use this implant to consider enhanced follow-up.

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VITAMIN D DEFICIENCY IN HIP FRACTURE PATIENTS IS ASSOCIATED WITH AN INCREASED MORTALITY RISK

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The aims were to assess whether vitamin D deficiency influenced mortality risk for patients presenting with a hip fracture.

A retrospective study was undertaken including all patients aged over 50 years that were admitted with a hip fracture to a single centre during a 24-month period. Serum vitamin D levels were assessed. Patient demographics and perioperative variables and mortality were collected. Cox regression analysis (adjusting for confounding) was utilised to determine the independent association between serum vitamin D level and patient mortality.

The cohort consisted of 2075 patients with a mean age of 80.7 years and 1471 (70.9%) were female. 1510 (72.8%) patients had a serum vitamin D level taken, of which 876 (58.0%) were deficient (<50nmol/l). The median follow up was 417 (IQR 242 to 651) days. During follow up there were 464 (30.7%) deaths. Survival at 1 year was significantly ($p=0.003$) lower for patients who were vitamin D deficient (71.7%, 95% confidence intervals (CI) 68.6 to 74.9) compared to those who were not (79.0%, 95% CI 75.9 to 82.3). Vitamin D deficiency was also independently associated with an increased mortality risk at 2-years (HR 1.42, 95% CI 1.17 to 1.71, $p=0.03$), but not at 1-year ($p=0.08$).

Hip fracture patients with vitamin D deficiency had an increased mortality risk. This risk was independent of confounders at 2 years. The role of measuring vitamin D levels in these patients is unclear. Improved public health policy about vitamin D may be required to reduce deficiency in this patient population.

THE EFFECT OF HOSPITAL CASE VOLUME ON RE-REVISION FOLLOWING REVISION TOTAL HIP ARTHROPLASTY

A national study using the Scottish Arthroplasty Project dataset

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The aim of this study was to measure the effect of hospital case volume on the survival of revision total hip arthroplasty (RTHA).

This is a retrospective analysis of Scottish Arthroplasty Project data, a nationwide audit which prospectively collects data on all arthroplasty procedures performed in Scotland. The primary outcome was RTHA survival at ten years. The primary explanatory variable was the effect of hospital case volume per year on RTHA survival. Kaplan-Meier survival curves were plotted with 95% confidence intervals (CIs) to determine the lifespan of RTHA. Multivariate Cox proportional hazards were used to estimate relative revision risks over time. Hazard ratios (HRs) were reported with 95% CI, and p -value < 0.05 was considered statistically significant.

From 1999 to 2019, 13,020 patients underwent RTHA surgery in Scotland (median age at RTHA 70 years (interquartile range (IQR) 62 to 77)). In all, 5,721 (43.9%) were female, and 1065 (8.2%) were treated for infection. 714 (5.5%) underwent a second revision procedure. Co-morbidity, younger age at index revision, and positive infection status were associated with need for re-revision ($p<0.001$). The ten-year survival estimate for RTHA was 93.3% (95% CI 92.8 to 93.8). Adjusting for sex, age, surgeon volume, and indication for revision, high hospital case volume was not significantly associated with lower risk of re-revision (HR1, 95% CI 1.00 to 1.00, p 0.073)).

The majority of RTHA in Scotland survive up to ten years. Increasing yearly hospital case volume cases is not independently associated with a significant risk reduction of re-revision.

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LOW RISK OF DELAYED TALAR SHIFT IN STABLE WEBER B FRACTURES MANAGED WITH A FUNCTIONAL BRACING PROTOCOL WITH EARLY WEIGHT BEARING

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Stable Weber B fractures are typically treated non-operatively without complications but require close monitoring due to concerns over potential medial deltoid ligament injuries and the risk of delayed talar shift. Following recent evidence suggesting this is unlikely, a functional protocol with early weight bearing was introduced at Glasgow Royal Infirmary (GRI) following a pilot audit.

This study aims to evaluate the risk of delayed talar shift in isolated Weber B fractures managed with functional bracing and early weight-bearing, particularly if signs of medial ligament injury are present.

We conducted a retrospective review of 148 patients with isolated Weber B fractures without talar shift at presentation that were reviewed at the virtual fracture clinic at our institution between July 2019 and June 2020. The primary outcome was the incidence of delayed talar shift. Secondary outcomes were other complications and adherence to protocol.

48 patients had medial signs present and of these 1 (2%) showed possible talar shift on X-rays at 4 weeks, and was kept under review. This patient had a normal medial clear space at 3 months. No patients with medial signs not documented (n=19) or not present (n=81) had delayed talar shift. 10% of patients (n=15) had at least 1 complication: delayed union (n=2); non-union (n=3); ongoing pain (n=14).

Functional bracing with early weight-bearing is a safe, effective protocol for managing isolated Weber B fractures without initial talar shift. This study concludes that the risk of delayed talar shift is low in all patients, with or without medial signs.

THE RADIOGRAPHIC UNION SCORE FOR ULNAR FRACTURES (RUSU) PREDICTS ULNAR SHAFT NONUNION

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To develop a reliable and effective radiological score to assess the healing of isolated ulnar shaft fractures (IUSF), the Radiographic Union Score for Ulna fractures (RUSU).

Initially, 20 patients with radiographs six weeks following a non-operatively managed ulnar shaft fracture were selected and scored by three blinded observers. After intraclass correlation (ICC) analysis, a second group of 54 patients with radiographs six weeks after injury (18 who developed a nonunion and 36 who united) were scored by the same observers.

In the initial study, interobserver and intraobserver ICC were 0.89 and 0.93, respectively. In the validation study the interobserver ICC was 0.85. The median score for patients who united was significantly higher than those who developed a nonunion (11 vs 7, $p < 0.001$). A ROC curve demonstrated that a $RUSU \leq 8$ had a sensitivity of 88.9% and specificity of 86.1% in identifying patients at risk of nonunion. Patients with a $RUSU \leq 8$ (n = 21) were more likely to develop a nonunion (n=16/21) than those with a $RUSU \geq 9$ (n=2/33; OR 49.6, 95% CI 8.6-284.7). Based on a PPV of 76%, if all patients with a $RUSU \leq 8$ underwent fixation at 6-weeks, the number of procedures needed to avoid one nonunion would be 1.3.

The RUSU shows good interobserver and intraobserver reliability and is effective in identifying patients at risk of nonunion six weeks after fracture. This tool requires external validation but may enhance the management of patients with isolated ulnar shaft fractures.

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PATELLOFEMORAL INSTABILITY MANAGEMENT IN A PROSPECTIVE PAEDIATRIC COHORT IN EDINBURGH

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Patellofemoral instability (PFI) is a common cause of knee pain and disability in the paediatric population. Patella alta, lateralised tibial tubercle, medial patellofemoral ligament (MPFL) deficiency, genu valgum and trochlear dysplasia are well known risk factors.

A prospective database was created including patients referred through our physiotherapy pathway following first-time patella dislocation. Patella alta and lateralisation of the tibial tuberosity was treated with a Fulkerson-type tibial tubercle osteotomy(TTO). Medial patellofemoral ligament was reconstructed using quads tendon autograft pull-down technique. A modified Sheffield protocol was used postoperatively allowing weightbearing in a hinged knee brace.

Forty patients were identified with 8 patients having bilateral presentations. Male to female ratio was 12:28 with an age range of 4-17 years. Eight patients had congenital PFI, five patients acquired PFI through traumatic patella dislocation and twenty-seven patients developed PFI from recurrent dislocations. Structural abnormalities were found in 38(95%) of patients. Patella alta (Caton-Deschamps index >1.2) was identified in 19(47%) patients, genu valgum in 12(30%) patients, increased tibial tubercle-trochlear groove distance(TT-TG>20mm) was present in 9(22.5%) patients and persistent femoral anteversion(> 20 deg) in 7(17%) patients. Eight patients were treated with TTO and MPFL reconstruction, three patients with MPFL reconstruction alone and five patients had guided growth for genu valgum correction. Ten patients are awaiting surgery. No postoperative patients had recurrence of PFI at their latest follow up.

PFI is a common problem in the adolescent paediatric population with identifiable structural abnormalities. Correcting structural pathology with surgery leads to predictable and safe outcomes.

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VACCINATION AGAINST COVID-19 REDUCED THE MORTALITY RISK OF COVID-POSITIVE HIP FRACTURE PATIENTS TO BASELINE LEVELS: THE NATIONWIDE DATA-LINKED IMPACT PROTECT STUDY

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COVID-19 confers a three-fold increased mortality risk among hip fracture patients. The aims were to investigate whether vaccination was associated with: i) lower mortality risk, and ii) lower likelihood of contracting COVID-19 within 30 days of fracture.

This nationwide cohort study included all patients aged >50 years with a hip fracture between 01/03/20-31/12/21. Data from the Scottish Hip Fracture Audit were collected and included: demographics, injury and management variables, discharge destination, and 30-day mortality status. These variables were linked to population-level records of COVID-19 vaccination and testing.

There were 13,345 patients with a median age of 82.0 years (IQR 74.0-88.0), and 9329/13345 (69.9%) were female. Of 3022/13345 (22.6%) patients diagnosed with COVID-19, 606/13345 (4.5%) were COVID-positive within 30 days of fracture. Multivariable logistic regression demonstrated that vaccinated patients were less likely to be COVID-positive (odds ratio (OR) 0.41, 95% confidence interval (CI) 0.34-0.48, $p<0.001$) than unvaccinated patients. 30-day mortality rate was higher for COVID-positive than COVID-negative patients (15.8% vs 7.9%, $p<0.001$). Controlling for confounders (age, sex, comorbidity, deprivation, pre-fracture residence), unvaccinated patients with COVID-19 had a greater mortality risk than COVID-negative patients (OR 2.77, CI 2.12-3.62, $p<0.001$), but vaccinated COVID-19-positive patients were not at increased risk (OR 0.93, CI 0.53-1.60, $p=0.783$).

Vaccination was associated with lower COVID-19 infection risk. Vaccinated COVID-positive patients had a similar mortality risk to COVID-negative patients, suggesting a reduced severity of infection. This study demonstrates the efficacy of vaccination in this vulnerable patient group, and presents essential data for future outbreaks.