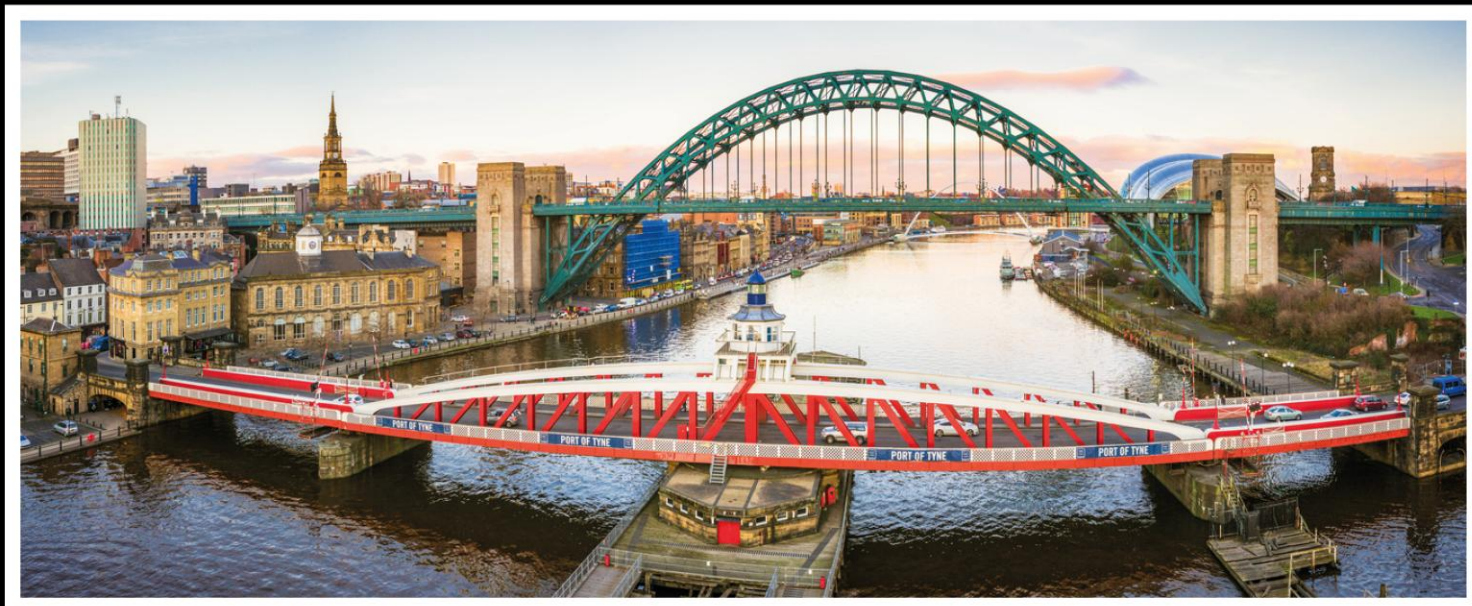
Annual Scientific Meeting and Instructional Course, Newcastle

ABSTRACT BOOK



BESS 2026

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Automatic Creation of Mathematically Perfect Glenoid En-Face View Using A Novel Artificial Intelligence System and Effect of Glenoid Rotation On Best-Fit Circles

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We created a custom deep learning platform called GlenTrak, that automatically segments CT images to create a mathematically 'perfect' glenoid en-face view, and measured the effect of vertical and horizontal rotation from this position, to best-fit circles.
Using CT scans of forty consecutive patients who presented with anterior shoulder instability in our institution, glenoid images were automatically segmented and meshes generated using a marching cubes algorithm. Glenoid images were programatically orientated to the optimal en-face view, using a least squares algorithm. The postero-inferior quadrant of the glenoid image was programmatically used to create best-fit circles. Code was written to measure the maximal bone loss from the circle edge to the bone. We used the true en-face position as the baseline and created programmatic rotations of the glenoid in the horizontal plane from 5-20 degrees(anteversion and retroversion), in the vertical plane from 5-20 degrees (superior and inferior inclination), and also combined all positions to create all possible glenoid rotations. We produced 81 images for each patient and a total of 3240 glenoid images, for 40 patients. In analysing these images for glenoid bone loss, best-fit circle diameter and position, we created 9720 datapoints. Two-way repeated measures ANOVA test (with a Greenhouse-Geisser correction) showed significant effect of glenoid rotation to bone loss ($p=0.006$), diameter of best-fit circle ($p=0.036$) and to the position of the circle ($p=0.0002$). Wilcoxon signed-rank test demonstrated that a number of positions created statistically significant results in the measured parameters, when compared to the programmatic en-face position. Its seems that horizontal rotation affects measured parameters more significantly than vertical rotation does, when compared in isolation.
We demonstrate how small degrees of rotation from the en-face position may affect the best-fit circle. This underpins the significance of a programmatically true en-face view, on which all measurements should be based.

Complication risks and long-term outcomes of reverse total shoulder arthroplasty in elderly trauma patients: a competing-risk analysis

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Purpose: To evaluate mid- and long-term outcomes after reverse total shoulder arthroplasty (RTSA) for trauma in older patients and to quantify lifetime implant-related failure using competing-risk analysis.

Methods: A retrospective cohort study of prospectively collected registry data was conducted at a tertiary referral centre. Patients aged ≥65 years undergoing primary RTSA for acute three- or four-part proximal humeral fracture (PHF) or fracture-dislocation were included (minimum follow-up 2 years). Standardised surgical and rehabilitation protocols were applied. Exclusions included open or periprosthetic fractures, delayed surgery (>4 weeks), and major neurological or neurodegenerative conditions. Outcomes were Constant Score (CS), relative Constant Score (RCS), and Subjective Shoulder Value (SSV) at 1, 2 and 5 years. Complications requiring intervention and mortality were recorded. Temporal trends were analysed with one-way analysis of variance (ANOVA), and cumulative implant failure and revision risk were estimated using competing-risk methods.

Results: Two hundred and eight patients (mean age 79.4 ± 6.9 years; 51 male) were followed for up to 14 years; 113 (54%) beyond 5 years. Twelve complications (5.8%) required intervention: infection (4), dislocation (3), periprosthetic fracture (4), and aseptic loosening (1). Seventy-five patients (36%) died during follow-up; 90-day mortality 1.4%. Functional scores remained good–excellent, improving from 62 to 70 (CS), 90 to 99 (RCS), and 77 to 87 (SSV) between 1 and 5 years. ANOVA showed stable CS ($p\approx0.25$) but significant gains in RCS ($p<0.01$) and SSV ($p<0.001$). Competing-risk analysis demonstrated a very low cumulative incidence of implant failure and revision compared with mortality.

Conclusion: RTSA for complex PHF in elderly patients provides durable, sustained shoulder function with minimal long-term risk of implant failure or need for revision. When competing mortality is considered, most patients are likely to die with a well-functioning RTSA rather than require further surgery.

Improving Patient Reported Outcome Measure (PROM) Scoring in Shoulder Trials: Comparing Classical Test Theory, Item Response Theory, and Adaptive Testing Approaches

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Purpose: To investigate whether modern psychometric methods (Item Response Theory (IRT) and Computerised Adaptive Testing (CAT)) alter treatment effect interpretations compared to traditional Classical Test Theory (CTT). Using data from two major UK shoulder trials (UKFROST and PROFHER), we aimed to evaluate measurement precision and the feasibility of reducing respondent burden through adaptive workflows.

Methods: We re-analysed patient-level Oxford Shoulder Score (OSS) data from UKFROST (n=503) and PROFHER (n=250). Three scoring approaches were compared: CTT sum scores, IRT-based expected a posteriori (EAP) scores, and simulated CAT using a standard error stopping rule of 0.32. Original statistical analysis plans, including mixed-effects repeated measures models, were replicated to compare treatment effect estimates, 95% confidence intervals (CIs), and p-values.

Results: Treatment effects and statistical significance were highly consistent across all three scoring methods. In UKFROST, all methods identified significant differences for arthroscopic capsular release vs. early structured physiotherapy at 3 and 12 months. In PROFHER, IRT and CAT identified a small benefit of surgery compared to non-surgical treatment of displaced proximal humerus fractures at 6 months (p=0.05 and p=0.04 respectively) that was borderline in CTT (p=0.06). Simulated CAT significantly reduced respondent burden, requiring a median of only 4–5 items at early follow-up, though requirements increased to 8–9 items at later timepoints as patient functional variability expanded.

Conclusion: Modern psychometric methods produce robust results consistent with traditional scoring while offering superior measurement efficiency. IRT and CAT can reduce data attrition through flexible handling of missing items and facilitate low-burden and high-frequency monitoring. These approaches support more patient-centred, precise outcome measurement in orthopaedic trials without compromising the integrity of treatment effect interpretations.

The Oxford Shoulder Score is not a one-trick pony: Factor analysis of data from the National Joint Registry. Should we re-think how we use it?

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Purpose: To use a large national dataset to evaluate the structure of the Oxford Shoulder Score (OSS) as a measurement instrument, addressing conflicting evidence on the use of OSS subscales, and evaluating ability of the OSS to measure distinct pain and function outcomes, as mandated by the Outcome Measures in Rheumatology (OMERACT) core domain set for shoulder disorders.

Methods: Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were performed on data from all primary shoulder replacements performed from 2012 to 2024 with complete pre-operative OSS data within the National Joint Registry database. Parallel analysis and scree plots were used to identify number of factors i.e. the underlying variables measured within the OSS. CFA was performed and models compared to determine whether the OSS performs better as a measure for one or two factors, or underlying variables, as identified within EFA.

Results: A total of 22,935 cases with complete preoperative OSS data were available for analysis (EFA dataset, n=11,467; CFA dataset, n=11,468). The OSS was found to characterise two underlying 'pain' and 'function' factors. Cronbach's alpha was 0.898, 0.755 and 0.890 for all OSS items, 'pain' and 'function' factors, respectively. The two-factor model was the best-performing compared to a single-factor model: comparative fit index (CFI) 0.90 vs 0.86; root mean square approximation (RMSEA) 0.10 vs 0.12; and standard root mean square residual (SRMR) 0.06 vs 0.07, respectively.

Conclusion: 'Pain' and 'function' subscales can and should be used in the analysis and reporting of OSS data within registries and research. Aggregating OSS data into a single total score is statistically suboptimal and clinically reductive. The subscale approach may facilitate more detailed and nuanced understanding of outcomes after shoulder surgery and address the core domains that should be measured, as identified by stakeholders in the OMERACT core domain set.

A UK Day Case Shoulder arthroplasty pathway. Complication, readmission and revision rates compared to inpatient shoulder arthroplasty.

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Purpose: As elective waiting lists continue to grow, same day discharge following major joint arthroplasty becomes ever more attractive. Few studies have reported on complication, readmission and revision rates following day case shoulder arthroplasty in the UK and none have attempted to compare them to a demographically matched cohort of inpatients. This study reports our experience from almost 4 years of operating a day case shoulder arthroplasty pathway and compares the outcomes to those of a matched inpatient cohort.

Methods: Demographic, operative and post operative data was collected prospectively for the first 50 consecutive day case patients. Exclusion criteria taken from the day case pathway was applied to all inpatients over the same time period to identify a cohort with a matched demographic profile in terms of sex, age, BMI and ASA grade. A retrospective review of electronic notes was conducted for the inpatient cohort and 90-day complication, readmission and revision rates were statistically compared to that of the day case cohort.

Results: 90% of patients enrolled on the pathway were successfully discharged on the day of surgery. When considering the day case and inpatient cohorts, there were no statistically significant differences observed in complication rates (10% vs 13%, p=0.437), readmission rates (2.0% vs 1.8%, p=0.967) or revision rates 0% vs 1.8%, p=0.329).

Conclusion: We find that the establishment of a day case shoulder arthroplasty pathway in the UK is not only feasible but can be successful in the majority of cases. This success doesn't rely on overly restrictive selection criteria and therefore a large proportion of patients can be offered surgery on a day case basis. In addition to high patient satisfaction and equitable safety, this represents significant potential for untapped resource savings in the NHS.

Lower Complications in Stemless Anatomic and Reverse total shoulder replacement: An analysis from the National Joint Registry

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Purpose: This study of National Joint Registry Data aimed to compare the survivorship, complications and function of stemless and stemmed implants.

Methods: Prospectively collected data from the National Joint registry between 2012 and 2023 was retrospectively analysed for all primary reverse (RSA) and anatomic shoulder replacements (aTSA) using stemmed and stemless implants, which were analysed separately. Patients were matched using propensity matching. The primary outcome was survivorship analysed using the Kaplan Meier curves, with cox regression analysis to compare hazard ratios between stemless and stemmed implants. Secondary outcomes included the incidence of all complications and Oxford shoulder score (OSS) up to 5 years post-operatively.

Results: 1484 matched RSA and 9610 aTSA were evaluated. Stemless RSA had a higher revision rate than stemmed implants HR 1.78 (95% CI: 1.01 to 3.11, p=0.04). However, the 5-year revision rate between stemmed and stemless aTSA was not significantly different HR 0.84 (95% CI: 0.69 to 1.04. p=0.11),
Stemless implants had reduced complication rates in both aTSA-1.0% (95% CI: -1.4% to -0.6%, p<0.001), and RSA -1.6% (95% CI: -2.9% to -0.2%, p=0.02). Oxford shoulder scores remained similar between the two implant groups at all time points, and there was no significant difference in the rate of loosening, infection or dislocation between the two groups.

Conclusion: Stemless revision rate have a higher revision rate for RSA, but provide a lower complication rate when used for aTSA. These are intraoperative complications which may not have an initial effect on revision rates, but may affect clinical outcomes outside of the remit of this study. More considered implant and patient selection may be required. Further long term study is required to assess the impact of use of stemless implants to improve implant survivorship.

The Association between Mid-term Clinical Outcomes and Scapular Notching after Reverse Total Shoulder Arthroplasty: A Risk Factor Analysis

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Purpose: The aim of this study is to quantify patient and surgical risk factors associated with scapular notching after reverse total shoulder arthroplasty (rTSA) at mid-term follow-up and compare clinical outcomes between patients with and without scapular notching.

Methods: We retrospectively reviewed an international multi-center database of a single platform shoulder prosthesis for primary rTSA patients with 5-year minimum clinical and radiographic follow-up. The incidence of scapular notching was quantified and risk factors associated with development of scapular notching were identified using univariate and multivariate logistic regression analyses. Clinical outcomes including complications/revisions, humeral radiolucent lines, active range of motion measures (ROM) including abduction, forward elevation [FE], or internal rotation [IR], and patient-reported outcome measures (PROMs) including ASES, Constant, VAS pain, shoulder function, or SAS were compared between patients with and without scapular notching.

Results: Of 1,768 patients (average follow-up: 78.0±23.1 months), 242 (13.7%) had scapular notching. A multivariate model identified female sex (p=0.0082), lower BMI (27.8±5.4 vs 28.8±5.9, p=0.0465), diagnosis of rotator cuff tear arthropathy (p=0.0155), use of analgesics (p=0.0040), no use of computer navigation (p=0.0041), smaller (≤38mm) glenosphere diameters (p=0.023), and smaller-size glenoid baseplates (p=0.0005) as risk factors for scapular notching. There were no significant differences in pre-operative PROMs or ROM between cohorts. Post-operatively, scapular notching patients had significantly worse abduction (p=0.0494), FE (p=0.0048), VAS pain (p<0.0001), shoulder function (p=0.0001), Constant (p=0.0002), ASES (p<0.0001), and SAS (p<0.0001). Scapular notching patients had significantly more complications (6.6% vs 3.1%, p=0.0059), revisions (4.1% vs. 1.6%, p=0.0071), and humeral radiolucent lines (27.9% vs. 14.6%, p<0.0001).

Conclusion: At 5-year minimum clinical follow-up, rTSA patients with scapular notching have significantly worse clinical outcomes than those without. Numerous patient and implant factors were associated with the development of scapular notching. It is advisable to minimize the risk of scapular notching through patient/implant selection and technique modification.

Free Paper Session 2: Miscellaneous

Score Early, Heal Early: RUSHU, a Prospective Decision-Making Tool for Humeral Shaft Fractures

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Introduction: This study prospectively evaluated a novel clinical pathway incorporating the Radiographic Union Score for HUmeral fractures (RUSHU) and fracture mobility at 6–8 weeks to enable early identification of patients with humeral shaft fractures likely to require surgical intervention.

Methods: A prospective cohort of 121 patients (2020–2024) managed using the predictive pathway was compared with 129 historical controls (2015–2019). A RUSHU score ≤8 combined with fracture mobility at 6–8 weeks was used to guide consideration of early surgery. The primary outcome was time to fracture union. Secondary outcomes included six-month non-union rates and time to surgical intervention.

Results: Use of the prospective RUSHU-based pathway was associated with a substantial reduction in six-month non-union rates (36% historical cohort vs 9% prospective cohort, p<0.001). Median time to fracture union was significantly reduced from 19 weeks (range 6–170) to 12 weeks (range 6–112; p<0.001). Among patients undergoing delayed surgery, median time to intervention decreased from 19 to 14 weeks, while time to surgery for established non-union reduced from 37 to 33 weeks. Baseline age (median 61 vs 60 years, p=0.312) and sex distribution (p=0.36) were comparable between cohorts. The prospective cohort included a higher proportion of AO type B and C fractures and a greater prevalence of recognised risk factors for non-union, including smoking and diabetes.

Conclusion: This is the first prospective study to utilise the RUSHU score to guide early surgical decision-making in humeral shaft fractures. A pathway incorporating early radiographic assessment and fracture mobility significantly reduced time to union and non-union rates, facilitating earlier definitive management in patients unlikely to succeed with non-operative treatment. This strategy may optimise outcomes and minimise prolonged ineffective conservative care.

A validated complexity scoring system for use in elbow arthroplasty: the Elbow Arthroplasty Severity (EASe) score

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Purpose: To develop a complexity scoring system for use in elbow arthroplasty—the Elbow Arthroplasty Severity (EASe) score—and to evaluate its ability to predict postoperative complications.

Methods: A complexity scoring system was developed through literature review and expert consensus at a tertiary referral elbow centre. The initial EASe score comprised six binary components reflecting procedural complexity, local pathology and patient frailty, yielding a total score from 0–6. The score was retrospectively applied to a consecutive cohort of patients undergoing primary or revision elbow arthroplasty. The primary outcome was any postoperative complication; secondary outcomes included major complications, unplanned re-operation, 30-day readmission, mortality within one year, and post-operative length of stay. Multivariable logistic regression, receiver operating characteristic (ROC) analysis, calibration assessment, and decision-curve analysis were performed. Based on observed associations and clinical plausibility, a clinically informed re-weighted EASe score (range 0–8) was constructed. Optimal thresholds for predicting major complications were identified using Youden's index.

Results: One hundred and ten procedures were included, with an overall complication rate of 41.8% and a major complication rate of 21.8%. The original EASe score showed limited discrimination for any complication but acceptable discrimination for major complications (AUC ≈0.70). Soft tissue compromise and infection were independently associated with adverse outcomes. The re-weighted EASe score demonstrated improved prognostic performance, with fair discrimination for any complication (AUC ≈0.66) and good discrimination for major complications (AUC ≈0.78). Using Youden's index, a re-weighted EASe score ≥4 provided the optimal balance of sensitivity and specificity for predicting major complications.

Conclusion: The EASe score provides a novel method for stratifying complexity and risk in elbow arthroplasty. A clinically informed re-weighted version demonstrates improved discrimination and yields a practical threshold that may support risk stratification, surgical planning, resource allocation, and informed consent. Prospective multicentre validation is required.

Novel Artificial Intelligence System Used For Automatic Calculation of the Glenoid Track

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We developed a custom deep learning system (GlenTrak®), which automatically segments shoulder CT or MRI arthrograms (T1 fat-suppressed and VIBE sequences) of patients with anterior dislocations, and automatically calculates the glenoid track.
After a power calculation, we included shoulder CT scans of 44 consecutive patients who presented following traumatic anterior shoulder dislocations to our institution. Glenoid and humeral images were automatically segmented and meshes generated using a marching cubes algorithm. Glenoid images were programatically orientated to the true en-face view and the postero-inferior quadrant of the glenoid image was programmatically used to create best-fit circles. Humeral segmentations were used by the platform to size the Hill-Sachs interval. Code was written to measure the maximal bone loss from the circle edge to the bone. GlenTrak produced a determination of whether a bipolar lesion is on-track or off-track. Three investigators, at two different times, went on to create best-fit circles, and measured best-fit circle diameter, glenoid bone loss and the Hill-Sachs interval in these 44 scans. We compared measurements obtained from GlenTrak and the three investigators. Between the investigators, intra-observer reliability was good (ICC≥0.8 for all variables) and inter-observer reliability was moderate to good (ICC≥0.7 for all variables). Cohen's Kappa only showed fair to moderate agreement between the investigators. When we compared GlenTrak with the investigators' average values, the ICC for best-fit circle diameter was 0.95, the ICC for bone loss was 0.87 and the ICC for the Hill-Sachs interval width was 0.81. Cohen's Kappa for agreement between GlenTrak and the three investigators was 0.78, which shows substantial agreement.
We demonstrate how a new artificial intelligence platform is able to automatically segment CT scans of shoulder dislocation patients and accurately establish their glenoid track, a calculation that is validated, but until now has been time-consuming, resource-consuming and often inaccurate.

What are the comparative clinical outcomes of anterior capsular reconstruction (ACR) versus tendon transfer for irreparable subscapularis tears?

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Background: Irreparable subscapularis tears are a complex surgical problem, potentially resulting in weakness on internal rotation, anterior shoulder instability, pain, and functional impairment. Surgical options include anterior capsular reconstruction (ACR) and tendon transfer (TT). However, definitive evidence regarding the optimal treatment strategy remains unexplored.

Purpose: To systematically review the literature comparing parameters for ACR versus TT for irreparable subscapularis tears.

Methods: A systematic review was conducted according to PRISMA principles. PubMed, Embase, and the Cochrane Library were searched for studies evaluating ACR or TT in patients with irreparable subscapularis tears. Eligible studies reported at least one clinical outcome, including function, pain, range of motion (ROM), complications, or re-tear/failure rates.

Results: Sixty-three studies met inclusion criteria, including 14 ACR studies and 48 TT studies. Tendon transfer techniques included pectoralis major, latissimus dorsi, teres major, lower trapezius, and combined transfers. Median follow-up was 21.5 months for ACR and 30 months for TT. Both techniques demonstrated improvements in pain, function, and ROM. Quantitative re-tear rates were reported in 35 studies, with median rates of 14.3% for ACR and 11.4% for TT. Complications were infrequent and mainly included neuropathy, infection, instability, or graft/tendon failure. No clear difference in complication rates was observed between techniques.

Conclusion: Both anterior capsular reconstruction and tendon transfer provide significant clinical improvement for irreparable subscapularis tears, with comparable re-tear rates and few complications. Tendon transfer is supported by a broader evidence base, while ACR represents a promising biological alternative. Further comparative studies are required to determine the optimal surgical technique.

Low Vitamin D is associated with Poor outcomes for Arthroscopic decompression+/-Excision lateral clavicle surgery

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Purpose: Does Vitamin D level influence recovery after Arthroscopic decompression+/-Excision lateral clavicle surgery(ASAD+/-AELC).

Methods: 78 vitamin D naïve patients, 35 to 65 years old, with impingement syndrome+/-arthritis of Acromioclavicular joint and normal cuff on imaging were recruited into an observational study with prospectively collected data. They had no previous surgery on that shoulder nor any other rheumatological diseases. VAS pain score and Oxford shoulder score(OSS) were collected pre-operatively and at 2,6 and 12 weeks post surgery. Vitamin D levels were measured at 6 weeks.

80 patients were needed to have a 80% power of an OSS difference of 6+ with 25% vitamin D deficient and 10% losses to the study.

Results: 10 patients had a cuff tear and were excluded at surgery, 11 had no vitamin D level leaving 57 with complete data. 5 developed a frozen shoulder and were excluded. Average age 49.5 years, 31 male, 26 female, 50 White, 6 Asian,1 Black. 20% had inadequate Vitamin D levels(<25nmol/L) 47% deficient(25-50nmol/L) and 33% normal(50+nmol/L). Pre-op vitamin D status did not affect VAS or OSS.
VAS scores at 2,6,12 weeks were significantly higher at all time points, showing no recovery with time if vitamin D <25nmol/L compared to 25+nmol/L(12 week VAS 4.7(SD2.0) vs 3.4(SD2.5) (95% confidence limits, power 86%). VAS scores for groups >25-50 and 50+nmol/L were the same.
The OSS showed a similar pattern of consistently significantly lower scores with 12 week mean scores of 29(SD9) vs 37(SD8)(significant at 90% confidence limits, power 60%).

Conclusion: 20% of a population of vitamin D naïve patients of all ethnicities undergoing ASAD+/-AELC surgery have critically deficient(<25nmol/L) Vitamin D. This study shows this group have significantly increased post-operative pain and decreased function at all time points to 12 weeks post operation. Normalising pre-operative Vitamin D levels may speed and improve recovery after ASAD+/-AELC.

How does a large language model compare with upper limb surgeons in proximal humerus fracture management?

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Background: Management of proximal humerus fractures (PHFs) remains controversial, with substantial variation in treatment recommendations among experienced surgeons. Large language models (LLMs) such as ChatGPT are increasingly explored in clinical decision support, yet their role in orthopaedic treatment planning is unclear. This study aims to compare treatment recommendations generated by ChatGPT with those of fellowship-trained upper limb surgeons across a broad range of PHF scenarios.

Methods: In this comparative observational study, 118 anteroposterior shoulder radiographs paired with clinical vignettes were independently reviewed by four fellowship-trained upper limb surgeons and by ChatGPT (web-based interface; model labelled "5.2" at time of access). Participants selected one management option from five predefined categories. Interobserver agreement was assessed using Fleiss' kappa, and pairwise agreement between ChatGPT and individual surgeons was assessed using Cohen's kappa. Alignment with surgeon consensus and clinical acceptability were also evaluated.

Results: Interobserver agreement among surgeons was moderate (Fleiss' $\kappa = 0.44$, 95% CI 0.36–0.52). Inclusion of ChatGPT as a fifth rater did not materially change overall agreement ($\kappa = 0.42$, 95% CI 0.35–0.49). ChatGPT matched at least one surgeon in 85% of cases and at least two surgeons in 69.5%. Pairwise agreement with surgeons ranged from fair to moderate (κ 0.33–0.45). Most model recommendations were considered clinically acceptable; however, four cases (3.4%) were judged unsafe.

Conclusion: Moderate variability exists in PHF management even among fellowship-trained surgeons. ChatGPT frequently aligned with expert opinion but produced occasional unsafe recommendations. Current LLMs may function as supervised decision-support tools but cannot replace specialist clinical judgement.

Is surgical treatment for rotational stiffness of the forearm effective?

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Purpose: Rotational stiffness of the forearm contributes to significant disability. Little is known about the outcome of surgical treatment and whether it is safe. This study aims to report the clinical outcomes and adverse events following open forearm arthrolysis techniques for patients resistant to non-surgical treatment for rotational stiffness.

Methods: This is a case series study of 50 patients who underwent forearm arthrolysis for rotational stiffness between 2010 and 2020.
Primary outcome was pronosupination arc of motion. This was recorded pre-operatively, at 6-months and at least 1-year following forearm arthrolysis.
Secondary outcomes were complications and further surgery.
The procedures included release of adhesions and osteophytes (n=23), radial head excision (n=10), removal metalwork (n=6), corrective osteotomy (n=5), excision of heterotopic ossification (n=5) and radioulnar interposition arthroplasty (n=1).

Results: Forty-six patients had post-traumatic stiffness, four patients had primary osteoarthritis. 15 failed to complete six-month follow up, leaving 35 patients.
The median pre-operative rotational arc of motion (RAM) was 110 degrees (IQR 70-135).
At six months follow-up, RAM increased to median of 170 degrees (IQR 145-180). The median improvement at six months was 50 degrees (IQR 20-77.5).
Eighteen patients completed follow-up to at least 1-year, with a median RAM of 137.5 degrees (IQR 110-180). This included two patients with a significant deterioration between six and 12-months follow up (mean 95 degrees decrease).
There was one reported complication of transient radial nerve palsy. Three patients required revision arthrolysis for persistent stiffness.

Conclusion: To our knowledge, this is the first report of the outcomes of surgical treatment for loss of pronosupination of the forearm. Open forearm arthrolysis can produce meaningful improvements in forearm rotation for patients with stiffness refractory to non-surgical treatment, gains largely maintained at midterm follow-up. Whilst complications and revision surgery occurred in small numbers, the procedure appears safe for carefully selected patients.

Free Paper AHP

Co-designing prehabilitation and early rehabilitation for people experiencing shoulder replacement surgery: Findings from the SPRING study.

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Background: Amid a landscape of differing rehabilitation practices for shoulder replacement, the NIHR-funded Shoulder Replacement Prehabilitation and Rehabilitating Early (SPRING) study is co-designing and evaluating two new personalised self-management support interventions, for people experiencing total shoulder replacement - one before (prehabilitation), and one after surgery (early rehabilitation). Here, we share the findings, learnings and emergent interventions from an iterative co-design process.

Methods: Using an adapted accelerated experience-based co-design (AEBCD) approach, 12 group meetings (face-to-face [n=5] and online [n=7]), were held across England, Wales and Northern Ireland. These meetings explored the experiences, priorities, and practical advice of healthcare professionals (n=13) and people living with shoulder replacement (n=25), and fostered collective working to design and develop intervention components together. One-to-one interviews (n=13) were used to gather in-depth experiential intervention content. Data were analysed iteratively using content analysis.

Results: Findings highlighted a variety of recovery stories experienced by people with shoulder replacement. People highlighted the importance of physiotherapy access and more information prior to surgery, including information on the surgery itself, recovery phases, and practical information to guide preparation (e.g., assistive devices, social support). After the surgery, people similarly recognised the need for physiotherapy and activity information but also shared their challenges and tips for navigating day-to-day life (e.g., managing pain), what to do/not to do (e.g., activity, progression), and information to support family and friends.

Conclusions/Implications: Findings informed six intervention core principles which underpinned the SPRING prehabilitation and early rehabilitation interventions: Two handbooks, with stories and practical advice, and a training package for healthcare professionals to deliver one-to-one personalised support sessions. Building on the co-design, the interventions will be piloted in NHS sites. Following any adaptations, the effectiveness and implementation of these interventions will be evaluated within a randomised controlled trial in comparison to usual NHS care.

What Does 'Ready' Mean? Six-Month Associations Between Physical Performance, Psychological Readiness, and Shoulder-Related Quality of Life after Stabilisation Surgery

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Purpose: To examine relationships between post-operative 6-month (1) psychological readiness and (2) shoulder-related quality of life with physical performance tests and explore their relevance to return-to-sport (RTS) decision-making.

Methods: This multicentre prospective observational study included individuals aged 16–40 years who participated in regular sport prior to injury and had undergone anterior shoulder stabilisation surgery. At six months post-operatively, participants completed physical performance testing (PPT) including Line Hops (LH), Side Hold Rotations (SHR), Ball Abduction External Rotation (BABER) and the Athletic Shoulder (ASH) test. Psychological readiness to return to sport was assessed using the Shoulder Instability–Return to Sport after Injury (SIRSI) questionnaire, and shoulder-specific quality of life was measured using the Western Ontario Shoulder Instability Index (WOSI). Exploratory correlation analyses examined the relationships between physical performance measures, psychological readiness, and shoulder-related quality of life.

Results: Of the 78 subjects, 64 were male, and 14 were female, 71 were right-handed (89.9%), and 6 were left-handed (7.6%) (1missing). Mean age was 25.21 (5.82) years, and the average height and weight were 176.47 (22.2)cm and 85.12 (16.17) kg, respectively. There was a significant correlation between SIRSI and WOSI total score ($r=-0.584$, $p<0.001$). There was a significant correlation between SIRSI scores and limb symmetry index of LH ($r=0.349$, $p=0.002$), SHR ($r=0.298$, $p=0.005$), BABER ($r=0.366$, $p=0.001$) and affected side BABER ($r=0.243$, $p=0.018$). WOSI scores were significantly correlated with limb symmetry index in LH ($r=-0.381$, $p=0.001$), SHR ($r=-0.403$, $P<0.001$), and BABER ($r=-0.403$, $p<0.001$).

Conclusion: At 6 months post-stabilisation, psychological readiness (SIRSI) and shoulder-related quality of life (WOSI) show small to moderate associations with PPT measures (notably LH, SHR, and BABER), supporting their potential contribution to RTS decision-making. Longer term follow up is required to ascertain whether these factors predict quality of life and recurrent shoulder instability.

Developing an educational intervention for frozen shoulder: a service development project utilizing the JBI evidence implementation model

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Purpose: To develop an evidence-based patient information sheet (PIS) in co-production with patients and professionals utilising the JBI evidence implementation model.

Method: 1. A literature review informed a survey distributed to Musculoskeletal Physiotherapists.
2. Engagement with stakeholders through Special Interest Groups (SIG's), co-designing with national experts
3. An initial Patient and Public Involvement and Engagement (PPIE) session to establish their experiences with the care they received.
4. A workshop held with Musculoskeletal Physiotherapists to gain feedback on initial draft to feedback on the PIS… …
5. A follow-up PPIE session to feedback on the PIS.

Results: Literature review: On exploring the key factors for education three themes emerged; what patients wanted to know; what they should know and the importance of tailoring (Tapp, 2024). Patients report variable satisfaction with the levels of education received from physiotherapists (Brindinso et al., 2024).
Survey: 31 responses were received. Thematic analysis of open-ended questions identified themes around communication, content, tailoring, training and patient needs.
PPIE (experiences of care): revealed significant variations in the care received and the implications for their pain experience. The importance of 'getting it right first time' was essential.
Musculoskeletal conference workshop: 91 delegates attended. Feedback included utilising the 'first contact model' to provide the patient information leaflet early. Other amendments to reduce the reading age were advised.
Follow-up PPIE session: highlighted the value of story-telling, incorporating evidence around best physiotherapy treatments and the importance of screening for co-morbidities linked to frozen shoulder risk factors. Empathy and validation is key.

Conclusion: A co-designed, evidence based educational intervention for patients with frozen shoulder was achieved. Health care professionals should engage in identifying risk factors as part of the management plan.

Successful and sustained reduction in length of stay for elective shoulder arthroplasty with the introduction of an ambulatory shoulder arthroplasty pathway

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Aims: To determine the extent to which the introduction of an ambulatory shoulder arthroplasty pathway has impacted on length of stay for elective shoulder arthroplasty

Methods and Results: Initial mean length of stay prior to the introduction of the ambulatory pathway was 3.2 days. A pathway was instigated in a stepwise fashion from opt in, to opt out, which involved pre-operative screening of comorbidities and social circumstances to ensure suitability, pre-operative counselling and an enhanced recovery peri-operative protocol. Patients receive a singe-dose prophylactic antibiotic, tranexamic acid, absorbable subcuticular sutures, skin glue and waterproof dressings. Post-operative radiographs are obtained enroute from recovery to the day-case ward and routine post-operative blood tests were found to be unnecessary through retrospective review. A day-1 post-operative telephone review with a dedicated checklist is completed with patient access to a 24/7 point of contact if there are problems or concerns. The physiotherapy, radiology, pre-operative assessment team and pharmacy teams all contribute to the successful running of the pathway and have been key to its instigation.
The mean length of stay reduced from 3.2 days to 2 days with the opt-in ambulatory pathway. 12 months after the full instigation of the pathway in an opt-out format, the mean length of stay for 87 patients under the care of 3 consultants for elective shoulder arthroplasty has reduced to 1.5 days. Increasing ASA is associated with an increased length of stay with a mean stay of 0.6 days for ASA 1, 1.1 days for ASA 2 and 1.9 days for ASA 3 patients.
There are still some patients for who the pathway is not available due to insufficient multi-disciplinary services.

Conclusion: We demonstrate and successful and sustained reduction in length of stay following elective shoulder arthroplasty with the introduction of an ambulatory shoulder arthroplasty pathway.

Fascicle architecture of the Supinator Muscle and its functional role in elbow stability

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Purpose: While the contribution of static stabilisers is well established, the role of dynamic stabilisers remains unclear particularly the supinator muscle (SM), therefore this study aimed to visualise the fascicle architecture of the SM and quantify fascicle-level architectural features to determine the muscle's relative contribution to elbow stability versus supination.

Methods: In a cadaveric study of 16 upper limbs, SM fascicles from a left male upper limb cadaver were identified, painted in alternating colours and 3D scanned. A digital 3D map was generated using digital alignment and fascicle tracing. Architectural parameters: fascicle length, pennation angle, curvature and positional variables were measured and analysed using Spearman's rank and Mann-Whitney U test with $p<0.05$.

Results: The 3D fascicle map revealed two distinct fascicle populations corresponding to the superficial and the deep heads. Pennation angle correlated significantly with fascicle length ($p=0.047$), distance to bone ($p=0.001$), curvature, distalness and layer ($p<0.001$). Fascicle length and curvature related to positional variables ($p<0.001$). Pennation angle, curvature and distalness differed between the two heads ($p<0.001$). Due to their oblique arrangement, individual fascicles were less curved than the SM overall ($p<0.001$). Dissection revealed neurovascular bundle pattern variation to other cadavers, a relationship between the extensor digitorum tendon and the deep branch of the radial nerve and deep fascicles, and deep head fascicle insertions into the annular ligament. These results correspond with the other 15 SMs analysed in the wider study.

Conclusion: The superficial head of the SM seemingly contributes more to elbow stability and the deep head to supination and potential radial head support through variable annular ligament insertions. These findings highlight the importance of preservation and reconstruction of the superficial head during elbow surgery and nerve decompression, with further in vivo and dynamic studies to confirm them.

People with facioscapulohumeral dystrophy (FSHD) demonstrated limited arm movements primarily from altered scapular kinematics.

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Purpose: To quantify the movement and muscle activity patterns of people with and without FSHD using 3D motion capture, surface electromyography (sEMG) and a physiologically representative biomechanical model of the shoulder girdle which includes scapular kinematics.

Methods: An exploratory cross-sectional study. Adults were recruited into three groups of 1) FSHD with scapulothoracic arthrodesis (scap fix) 2) FSHD and no surgery (no surgery) and 3) age- and sex-matched controls (CG). Participants attended a single session and carried out seven motion tasks in which their movements and muscle activity was measured using 3D-movement analysis and sEMG. Descriptive statistics and normalised movement and muscle activity plots were used to compare joint angles, sEMG patterns, and scapulohumeral rhythm between groups.

Results: Data was collected for 14 participants (10M:4F), seven with FSHD and seven age- and sex- matched controls, a mean (SD) age of 41.6(15.7). The FSHD (no surgery) group achieved lower mean (SD) thoracohumeral elevation, approximate mean difference of 50°, most notably in flexion 74.6° (29.2) and abduction 80.8° (31.2) compared to the CG who achieved 126.9° (12.7) and 130.1° (10.8) respectively. Despite these differences, range of movement for glenohumeral elevation was similar between groups. Considerable variability across the acromioclavicular and sternoclavicular joints was noted in all FSHD groups, with no clear between group differences. Scapulohumeral rhythm was reduced in the FSHD (no surgery) group. FSHD groups demonstrated prolonged and higher normalised activity levels of the trapezius, anterior deltoid, infraspinatus muscles.

Conclusion: Evaluations that focus on arm position alone are insufficient for explaining why people with FSHD lose arm function. People with FSHD demonstrated limited arm movements primarily from altered scapular kinematics. The scapular motions and muscle activity patterns observed in the FSHD group were heterogenous which made identification of between group differences difficult in our limited sample size, but further study appears justified.

Chair-based rehabilitation for people with massive irreparable rotator cuff tears: a pilot study

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Purpose: To investigate the effectiveness and participant acceptability of a newly developed chair-based rehabilitation programme over five months in people with symptomatic massive irreparable rotator cuff tears.

Methods: 11 participants with a mean age of 78 (range, 71-83) were recruited, demonstrating massive irreparable rotator cuff tears on magnetic resonance imaging. Passive range of movement was maintained. Average symptom duration was 33.1 months (range, 14-60). Participants completed five months of chair-based rehabilitation, incorporating shoulder elevation training and remnant rotator cuff strengthening. Participants were provided with detailed instructions and illustrations of the exercises to complete between clinical visits. Primary outcome measure was the Oxford Shoulder Score. Secondary outcomes included the Numerical Pain Rating Scale, EQ-5D-5L and flexion range of movement. Outcomes were collected at baseline and at five months. A corticosteroid injection was administered at baseline as required. Paired t-test and Wilcoxon matched-pairs test compared outcomes at baseline and five months. Acceptability was reported at five months.

Results: Clinically and statistically significant improvements were observed for both primary and secondary outcomes comparing baseline to follow-up. Oxford Shoulder Score improved from 17.9 (SD ± 6) at baseline to 35.5 (SD ± 6) at five months (p=<0.001). Numerical Pain Rating Scale reduced from 7.4 (SD ± 1.1) at baseline to 3 (SD ± 1.2) at five months (p=<0.001). EQ-5D-5L health index improved by 0.33 (95% CI 0.09-0.35) (p=0.001). Flexion range of movement significantly increased by 102° (95% CI 86-117) from 50° (SD ± 16) at baseline to 151° (SD ± 19) at five months. Participants reported the intervention highly acceptable.

Conclusion: Five months of chair-based rehabilitation provides an effective and acceptable alternative rehabilitation strategy for people with massive irreparable rotator cuff tears who are unable to engage with traditional supine anterior deltoid strengthening exercises.

Free Paper 4: Elbow

Postero-lateral Elbow Impingement as an Under-Recognised Cause of Refractory Lateral Elbow Pain: Outcomes of Arthroscopic Debridement

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Aim: To assess whether arthroscopic postero-lateral elbow debridement provides meaningful clinical benefit in patients with refractory lateral or posterior elbow pain attributable to postero-lateral impingement.

Methods: A retrospective review was undertaken of patients undergoing elbow arthroscopy with posterolateral debridement between 2009 and 2022. Inclusion criteria were persistent lateral or posterior elbow pain, loss of terminal extension and/or mechanical symptoms, and failure of non-operative management. Pathology was classified as intrinsic, extrinsic, or mixed. Pre- and post-operative outcomes included range of motion (ROM), visual analogue scale (VAS) pain scores, Mayo Elbow Performance Score (MEPS), Oxford Elbow Score where available, patient satisfaction, complications, and follow-up duration.

Results: Twenty-six elbows in 26 patients were analysed (19 male, 7 female; mean age 54 years). Mean follow-up was 22 months (range 2–48). Mean extension deficit improved from 20° pre-operatively to 6° post-operatively, with total arc of motion increasing from 96° to 132°. Mean VAS pain score improved from 8.0 to 1.8 and mean MEPS improved from 38 to 87. Improvements were observed across intrinsic, extrinsic and mixed pathology groups. Overall, 92% of patients reported good or excellent satisfaction. There were no infections, neurovascular injuries, re-operations, or mortality.

Conclusion: Postero-lateral elbow impingement is an under-recognised cause of persistent lateral elbow pain. Arthroscopic posterolateral debridement delivers consistent pain relief, restoration of terminal extension and high patient satisfaction with a low complication rate, and should be considered in patients with refractory symptoms and mechanical features.

MRI Analysis of the Development & Ossification of the Coronoid Process in Children

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Purpose: To characterise the age-related appearance and maturation of the coronoid process in children using MRI.

Methods: A retrospective review of paediatric elbow MRI scans performed at four hospitals over a 15-year period was undertaken. All MRIs with T1-weighted sagittal images in patients aged 0–18 years were included. An angular measurement technique based on reproducible anatomical landmarks was developed and validated to assess coronoid apical height at the trochlear sulcus on sagittal reconstruction. The fusion status of other ossification centres was documented to assess correlation with coronoid ossification. Data were analysed with respect to age and sex.

Results: A total of 469 MRI scans were reviewed; 244 were excluded based on radiological or patient factors, leaving 225 scans for final analysis (121 females, 104 males). Inter- and intra-observer reliability of the novel coronoid height measurement were excellent (intraclass correlation coefficients 0.90 and 0.93, respectively). Cartilaginous coronoid ossification was identifiable in early childhood, with magnitude increasing progressively with age. The greatest interval change was observed between 10–14 years in females and 12–16 years in males. Complete ossification was typically observed by 14 years in females and 16 years in males (Spearman $\rho = -0.78$, $p < 0.001$). Olecranon physeal fusion demonstrated excellent diagnostic performance for complete coronoid ossification (sensitivity 94.8%, specificity 89.8%, AUC 0.92). An unfused olecranon reliably excluded complete coronoid ossification (negative predictive value 98%, likelihood ratio −0.06).

Conclusion: This is the first study to describe the coronoid ossification in children. The results suggest that if the olecranon physis is unfused, the coronoid will not be ossified and visible on a plain x-ray or CT scan. MRI scans with T1 weighting are required to assess the coronoid in this age group. This new knowledge will be valuable to clinicians managing elbow injuries in children and adverse sequalae in adults.

Association between surgeon volume and patient outcomes after radial head arthroplasty

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Introduction: Primary radial head arthroplasty (RHA) is often performed by general trauma surgeons with sporadic caseloads. We investigated the association between surgeon volume and revision risk to inform trauma workforce planning.

Materials & Methods: This prospective cohort study utilized National Joint Registry (NJR) data linked to Hospital Episode Statistics (HES) from 2012–2024. Participants included adults undergoing primary RHA for acute trauma or its sequelae in the UK. The primary outcome was revision surgery; secondary outcomes included 12-month reoperation, serious adverse events, and prolonged hospital stay (>3 nights).

Results: Analysis of 3,221 procedures by 638 surgeons across 416 units revealed a workforce heavily skewed toward low-volume practice (median: 0.8 procedures/year). Notably, 74% of surgeons were "casual" operators averaging <1 case annually.
Multilevel mixed-effects models and restricted cubic splines identified a minimum volume threshold of 2.8 procedures per year. Below this, revision risk increased exponentially. Surgeons averaging <1 case/year had a 13.0% predicted failure rate, compared to 3.6% for those performing >4 cases—a 3.6-fold increase in relative risk. Linkage data showed that 42.8% of failures involved excision arthroplasty, a mode frequently missed by registries. Higher volume also correlated with fewer reoperations and shorter hospital stays.

Conclusions: Surgeons performing fewer than 2.8 RHA procedures annually are associated with significantly higher rates of revision, reoperation, and prolonged hospitalization. The current model of sporadic exposure among general trauma surgeons is linked to avoidable patient harm. These findings advocate for reorganizing trauma services to pool cases among specialist elbow surgeons maintaining a minimum annual caseload of at least three procedures.

Long-term outcomes and patient-reported results following Discovery Total Elbow Replacement

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Purpose: To report long-term implant survivorship, complications and patient-reported outcome measures (PROMs) following Discovery Total Elbow Replacement (TER).

Methods: All Discovery TERs performed between 2011 and 2024 were retrospectively identified from prospectively coded records. 3 specialist surgeons performed all procedures. Kaplan–Meier survivorship analysis was performed with revision as the endpoint and deaths censored. Complications, reoperations and radiographic outcomes were recorded. PROMs included QuickDASH, return to activities of daily living, satisfaction score and willingness to undergo surgery again.

Results: A total of 177 Discovery TERs were included. Mean age at surgery was 59.4 years, with a mean follow-up of 89 months (range 12–165). Implant survivorship was 96% at 5 years and 90% at 10 years. The overall revision rate was 7% (13 elbows). Infection occurred in 5%, periprosthetic fracture in 4%, and ulnar neuritis in 7%, with one patient requiring secondary ulnar nerve transposition. Radiographic lucency was observed in 13% of cases; however, only 5% underwent revision for aseptic loosening.
PROMs demonstrated favourable outcomes. Mean QuickDASH was 42. Ninety-two percent of patients returned to normal daily activities, 85% would undergo the procedure again, and mean satisfaction was 9/10.

Conclusion: This represents the largest reported series of Discovery Total Elbow Replacement with long-term follow-up and one of the few to incorporate patient-reported outcomes. The Discovery system demonstrates excellent survivorship, low revision rates and high patient satisfaction at up to 13 years, supporting its role as a durable option for end-stage elbow arthropathy.

A CT-Based Method for Pre-operative Implant Sizing in Distal Humerus Hemiarthroplasty

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Purpose: To develop a standardised and reproducible method for pre-operative spool sizing for distal humeral hemiarthroplasty (DHH), using the Stryker Latitude system.

Methods: Pre-operative computerized tomography (CT) scans of 47 consecutive patients undergoing DHH for acute fracture in a single centre were included.
Patients with poor-quality CT reconstructions, pre-existing elbow osteoarthritis, and associated proximal ulna fractures were excluded. Intra-operative and post-operative anteroposterior radiographs of the implanted DHH were assessed for correct sizing according to pre-determined criteria. Patients with an inappropriately sized implant were also excluded.
The distance between the lateral aspect of the radial head and the sublime tubercle was measured on the 3D reconstruction with the humerus subtracted. Measurements were performed independently by two observers and verified by a senior author. Implant size used was recorded and correlated with the CT measurement.
Inter-observer reliability was assessed using intraclass correlation coefficients (ICC). Differences in CT measurements between implant size groups were analysed using the Kruskal–Wallis test.

Results: There were 4 small+, 19 medium, 16 medium+, 4 large and 4 large+ spools used in the 47 patients.
CT measurements increased progressively with increasing implant size. There was a statistically significant difference in measurements across implant sizes ($p < 0.001$).
Derived CT cut-off values were: ≤ 40.5mm for Small+, > 40.5 to < 43.6 for Medium, ≥ 43.6 to < 46.5 for Medium+, ≥ 46.5 to < 50.0 for Large, and ≥ 50.0 for Large+. Thresholds were based on adjacent-group overlap and percentile separation.
Inter-observer reliability shows excellent agreement with an ICC value of 0.946 (95% CI 0.903–0.971).

Conclusion: A simple CT-based linear measurement provides a reliable and reproducible method for pre-operative estimation of humeral component size in Latitude DHH and may serve as a useful adjunct to surgical planning as well as help with stock management and manufacture.

Long term survival of the Discovery total elbow replacement: minimum 10-year follow up

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Purpose: This study presents the longest follow up on the long-term outcomes of the Discovery total elbow replacement (TER) from a non-design tertiary centre.

Methods: A prospectively maintained local joint registry was interrogated to yield a consecutive series of Discovery TERs performed at a single non-design centre. The primary outcome was survivorship of the implant. The secondary outcomes included clinical and patient-reported outcomes, measured by Oxford Elbow Score (OES) and Mayo Elbow Performance Score (MEPS). Kaplan–Meier survival curves, with revision as endpoint, and considering data as censored at the time of death, were calculated. Statistical analyses were performed using SPSS version 31, with a 5% significance level.

Results: A total of 94 Discovery TER (n=78) were performed for inflammatory arthropathy (48%), trauma (21%), osteoarthritis (20%) and post-traumatic sequelae (11%). The mean age was 78 (SD ±10), with a female to male ratio of 1.9. Thirty five patients (37%) died before the 10-year follow up. Mean follow up for remainder 58 TERs was 13.2 years (SD: 2, range 10-17). Revision rate was 27.5% (n=16), performed for aseptic loosening (81%), aseptic loosening with disassociation (13%) and septic loosening (6%). Mean time to revision was 8 years (SD 5, range 0.6-16 years). Mean OES was 37 (SD 20, range 5 to 48) and mean MEPS was 84 (SD 20, range 10-100) at 13.2 years. Kaplan Meier at 12 years was 72% (95%CI 61%-84%) for all-cause revision. Mean range of movement at 13.2 years were: extension 23°±14°, flexion 137°±15°, supination 74°±13° and pronation 76°±15°.

Conclusion: This is the longest term follow up study of the Discovery TER from a non-design centre to date. Our results demonstrated survivorship comparable to the other modern semi-constrained designs TER. Despite advances in the design of TER prostheses, rates of complication remain high.

Functional, Radiological and Reoperation Outcomes of ALIGN Radial Head Replacement in Complex Elbow Trauma: A Single-Centre Cohort Study

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Purpose: The purpose of this study is to evaluate functional, radiological, complication, and reoperation outcomes following the use of the ALIGN radial head replacement for terrible triad injuries at a major trauma centre.

Methods: Patients undergoing ALIGN radial head replacement between May 2021 and January 2025 were retrospectively reviewed. Of 54 eligible patients, 41 patients (42 elbows) had complete follow-up; all injuries represented terrible triad patterns. Outcomes included range of motion (ROM) at 6 and 12 months, Mayo Elbow Performance Score (MEPS), complications, reoperations, and radiographic findings including heterotopic ossification (HO) and periprosthetic lucency. Paired comparisons were performed using the Wilcoxon signed-rank test.

Results: Mean age was 45.9 ± 13.9 years (range 20–80); 56% were male. Significant improvement occurred from 6 to 12 months. Mean extension deficit improved from 20.9 ± 18.5° to 14.6 ± 18.7° ($p = 0.006$), while flexion increased from 122.0 ± 19.2° to 133.3 ± 17.6° ($p < 0.001$). Pronation improved from 64.6 ± 26.6° to 78.0 ± 20.8°, and supination from 69.5 ± 17.2° to 76.1 ± 11.5°, increasing the rotational arc from 134.2 ± 39.3° to 154.0 ± 28.0° (all $p < 0.001$).

At 12 months, mean MEPS was 74 ± 15, with 69% achieving good-to-excellent outcomes. Eleven complications (26.2%) occurred, most commonly infection (n = 3); implant-related events included metallosis (n = 1). Ten reoperations (23.8%) were required, most frequently radial head excision (n = 3), undertaken for prosthesis loosening (n = 2) or pain associated with lucency and metallosis (n = 1).

Periprosthetic lucency was mild in 28%, moderate in 9%, and severe in 5%. HO was Grade I in 23%, Grade II in 5%, and Grade III in 2%.

Conclusion: ALIGN RHR resulted in significant functional improvement with a satisfactory complication and reoperation profile in complex elbow trauma.

Free Paper 5: Video Technique

3D segmentation and 3D printed-assisted all-arthroscopic bone block shoulder stabilisation with distal clavicle autograft

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Background: With an increasing incidence of traumatic anterior shoulder instability across the world, and a better understanding and application of the glenoid track concept, arthroscopic bone block procedures in all of their variations, have become more prevalent. Preparation of the glenoid bony bed and of the graft itself remains a technical challenge that sometimes results to suboptimal placement of the graft in relation to the glenoid defect and the remaining glenoid articular surface.

Technique: We describe our technique of all-arthroscopic anterior glenoid bone block reconstruction, using an ipsilateral distal clavicle bone graft. We will demonstrate the several important technical steps that make this procedure feasible and several pitfalls that may result to an inferior post-operative outcome. In addition, we always perform this procedure with the aid of pre-operative 3D segmentation of the affected shoulder and 3D printing of the defect, the proposed graft and the proposed fitting of the graft on the glenoid. These 3D models are used intra-operatively to allow for accurate graft harvesting and preparation, before fixation of the graft in the defect and we will demonstrate this very important step in our video technique.

Clinical Application: The main benefit of our described technique is the near anatomic shape of the final graft, with minimal wastage of the distal clavicle resection, alongside an all-arthroscopic procedure to stabilise shoulders with off track lesions. We have used this technique in more than 15 patients thus far and we have obtained post-operative CT scans in all patients except for one, who was lost to follow-up. These scans have confirmed graft union and remodelling in all cases. We have also collected Oxford Shoulder Instability Scores for all patient pre and post-operatively and these show clinical improvement in all patients who had this procedure.

Made to Measure: novel use of a custom 3D-printed mould to create an anatomical distal humerus cement spacer

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Background: We describe a novel application of 3D printing technology to create a patient-specific anatomical distal humerus cement spacer. Applying principles established in hip surgery,where anatomical spacers have been shown to improve joint stability and reduce mechanical symptoms,we developed a custom spacer to optimise elbow stability and function. This can be utilised in a range of complex distal humerus pathology such as unreconstructable open distal humerus fractures, non-union, and infected or failed fixation.

Technique: Two patients with failed, infected distal humerus fixation and unreconstructable bone loss were treated. CT imaging of the contralateral elbow was used to produce a patient-specific 3D-printed mould, in collaboration with the hospital 3D printing team. Following surgical debridement and tissue sampling, the sterilised mould was filled with antibiotic-loaded cement around a distal humerus hemiarthroplasty stem. A custom cannulation across the epicondylar axis was incorporated to allow passing of suture material to facilitate soft-tissue stabilisation. The anatomical spacer was implanted to maintain joint congruity during systemic antibiotic therapy, prior to definitive reconstruction.

Clinical application: Both patients were encouraged to maintain active elbow movement, a key prognostic factor for final range of motion following total elbow arthroplasty. Six weeks post-operatively, Patient A achieved a range of motion from 10° extension to 100° flexion, while Patient B achieved 45° to 100°. The spacer was well tolerated in both cases, with no episodes of instability or dislocation. Infection was successfully eradicated Patient A, who proceeded to uncomplicated total elbow arthroplasty with no evidence of infection at 12 months. Patient B remains infection-free and awaiting second stage surgery.

Conclusion: Patient-specific anatomical distal humerus cement spacer provides a stable, functional elbow. Anatomical spacers are well established in hip, knee, and shoulder surgery. Application of this technique to the elbow represents a significant development in treatment of complex elbow pathology.

Interposition Arthroplasty at The Proximal Radio-Ulna Joint For Stump Impingement Following Radial Head Excision

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Background: Radial stump impingement against the proximal ulna is a recognised phenomenon that develops slowly following radial head resection for radiocapitellar arthritis or post-traumatic sequelae. Patients typically present with deep anterolateral pain during forearm rotation and loading that progresses with time. The condition is difficult to manage and challenging to diagnose.

Surgical strategies to address proximal radial stump impingement include placement of a radial head prosthesis to move the radius away from the ulna and re-align the forearm and interposition of tissue between the stump and ulna. While radial head replacement is appealing, it is often not possible due to chronic malalignment of the radial shaft and contracture of the interosseous membrane. Interposition has been described using anconeus but in our experience this is not robust enough. Our preferred technique is interposition with tendo achilles allograft as it is more durable and has no graft site morbidity. .

Technique: This technical video will illustrate the technique for interposition arthroplasty at the proximal radioulnar joint using Achilles tendon allograft, with particular focus on:

- Picking a winner: pre-operative assessment and patient selection
- Achieving adequate exposure through an extended Kocher's approach
- Placement and orientation of transosseous tunnels in the ulna
- Tendon allograft preparation
- Optimal tensioning and shuttling of transosseous sutures to securing the graft
- Considerations for post-operative rehabilitation protocol

Clinical Application: This technique has been used in four cases (aged 13 – 50 years) by the senior author for cases of stump impingement following radial head excision for trauma sequelae. Achilles tendon allograft was used in all cases, with high level of post-operative patient satisfaction, and no incidence of post-operative complications to report. We recommend this technique as a reliable solution for this uncommon and difficult to treat problem.

Approach and exposure for a custom glenoid implant with scapular spine strut

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Background: As the need for revision shoulder replacement increases, there are more patients with severe glenoid bone loss and deformity. 3D printed custom glenoid implants have been used in these cases after careful consideration of the options with good outcomes at a minimum of two years. Scapular spine struts have been used to increase implant stability in cases of severe posterior bone loss. We present a technique to ensure adequate exposure to allow implantation of these devices.

Technique: Extensive releases are required to expose the glenoid bony anatomy. This is essential so that what the surgeon sees reflects the 3D models to ensure accurate insertion of the k-wires using PSI guides upon which the prosthetic position is optimised. We present a technique demonstrating glenoid releases and soft tissue excision to adequately expose the glenoid and scapular spine for seating of the implant. We demonstrate the use of a two-guidewire technique to ensure rotational stability and accurate implementation of the pre-operative plan and reaming depth guides.

Clinical application: We have used this technique and implant design with the scapular spine strut in 30 cases to date. We have published a series of 19 patients, 11 of which were revision procedures, demonstrating 100% baseplate survival at mean follow up of 46 months. 12 patients had severe (E4 or C4 Seebauer-Gupta) bone loss, and 7 patients had severe glenoid retroversion >30°. Mean Oxford Shoulder Score increased from 14/48 to 32/48 post-operatively. Complication rates were in line with the literature on revision shoulder arthroplasty, and included one humeral revision for loosening, one tendon transfer for poor external rotation, and one acromial stress fracture.
As 3D printed custom glenoid use in shoulder arthroplasty increases, we believe this video technique demonstrates how to safely and adequately expose the glenoid and scapular spine for accurate implantation.

Zeta: a modified lateral para-olecranon approach for elbow arthroplasty

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The lateral paraolecranon approach is popular for elbow arthroplasty but can be associated with compromised nerve function and restricted access. The Zeta approach is designed to increase exposure of the trochlea while protecting the ulna nerve.

Technique: With the patient in lateral decubitus position, elbow bent over a bolster, without tourniquet, a posterior midline incision is made down to triceps. In-situ decompression of the ulnar nerve is performed, but no further medial dissection. The triceps tendon is split between the long and lateral head, by palpation of the thick medial long head tendon, down to the olecranon. The dissection continues laterally by sharp elevation of the lateral head of triceps off the olecranon to reach the Boyd interval, which is opened. The z-shaped approach continues to the joint capsule that is incised longitudinally to expose the posterior trochlea, olecranon process, posterior capitellum and proximal portion of the radial head. For total elbow arthroplasty the approach is extended taking the lateral ligament and common extensor off the lateral column and releasing the anterior capsule to dislocate the ulnohumeral joint.

Results: The approach has been used in 11 total elbow arthroplasty and 3 hemiarthroplasty with a minimum 2-year follow up. The mean age was 62 years (range 29-86). Eleven patients were female. The median pain score improved from 8 (IQR 7 to 10) to 1 (IQR 0 to 6). The mean quickDASH improved from 78 (s.d. 13.9) to 37 (s.d. 14.1). The median arc of flexion improved from 60deg (IQR 10 to 90) to 110deg (IQR 110 to 120) and pronosupination from 138deg (IQR 88 to 150) to 180deg (IQR 180 to 180). One patient had mild transient ulnar nerve symptoms and one patient had ongoing pain from non-union of the medial column. There were no cases of triceps insufficiency.

3D printing for shoulder & elbow surgeons: an easy to adopt and simplified workflow.

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Background: Three-dimensional (3D) printing has increasing value in shoulder & elbow surgery, particularly for pre-operative planning in arthroplasty, fractures, and instability. Despite this, adoption remains limited due to perceived cost, reliance on industry or engineers, and the belief that image segmentation is technically complex. A simple, surgeon-led workflow that is accessible and reproducible is required to democratise this technology.

Technique: This video presents a step-by-step workflow demonstrating how any shoulder surgeon can independently segment CT scans and generate patient-specific 3D printed models using freely available software and low-cost desktop printers. CT DICOM data are imported into open-source software (3D Slicer), where semi-automated segmentation is performed using intuitive thresholding and island selection tools. The model is refined in Meshmixer, allowing smoothing, artefact removal, and selective isolation of clinically relevant anatomy such as the glenoid and coracoid. The final model is exported as an STL file and printed using standard slicing software (e.g. Cura). This technique is novel in its simplicity and accessibility, removing the need for specialist engineering input and demonstrating that segmentation and model creation are skills that can be readily learned and performed by surgeons.

Clinical Application: This workflow has been implemented in routine clinical practice for pre-operative planning in shoulder arthroplasty and instability cases, including osteoarthritis, cuff tear arthropathy, and complex glenoid deformity. Models can typically be produced within 45–60 minutes of print time following segmentation. Surgeons report improved understanding of patient-specific anatomy, enhanced surgical planning, and increased engagement in teaching. Early experience confirms feasibility, reproducibility, and seamless integration into standard care for patients, supporting the concept that 3D printing can be widely adopted by surgeons without significant additional cost or resources.

Arthroscopic all-suture knotless bony Bankart fixation

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A traumatic anterior shoulder dislocation with associated acute displaced bony Bankart anterior glenoid fractures is one of the few indications for acute arthroscopic stabilisation surgery. Many techniques have been developed over the years, and this novel technique leverages the unique properties of a double-loaded all-suture knotless anchor to create a secure, stable fixation. This avoids metal, hard bodies anchors, knots, and minimises the footprint of the construct.

The technique benefits from using 2.6 mm double loaded knotless anchors, which have two fixed repair sutures and one shuttling suture. The anchors allow us to create an entirely knotless construct with either one or two anchors placed anteriorly on the glenoid neck medial to the fracture bed, depending on the height of the bony fragment.

After preparation of the anterior labrum and bony fragment, 1 or 2 anterior glenoid nek anchors are inserted via a percutaneous trans-subscapularis portal depending on the size of the fragment. The shuttle sutures are removed and discarded, and the repair sutures are shuttled around the bone block using a suture lasso.

When 2 anterior anchors are used, the sutures are interlinked into 3 glenoid face anchors placed adjacent to the fracture line, along with inferior and superior labral repair sutures from the inferior and superior glenoid face anchors to repair AIGHL and stabilise the bone fragment. When 1 medial anchor is used, the sutures are shuttled in to 2 glenoid face anchors with an additional more superior 1.8mm knotless labral repair anchor.

We have performed 8 cases using a similar technique with double loaded all-suture anchors on the anterior glenoid neck into 2.9mm pushlock anchors, and 5 cases using the modification of the technique with an all-suture construct. Short to mid-term follow-up with no further episodes of instability and good outcomes.

Is Large Head Hemiarthroplasty a Viable Salvage Option After Failed Reverse Shoulder Arthroplasty?

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Background: The management of failed reverse shoulder arthroplasty (RSA) represents a formidable surgical challenge, particularly when compounded by severe glenoid bone loss, chronic instability, infection, or profound soft tissue deficiency. In scenarios where re-revision RSA is technically unfeasible due to compromised bone stock or failed previous reconstructions, large head hemiarthroplasty (LHHA) has been proposed as a definitive salvage procedure. However, the clinical effectiveness and longitudinal failure rates of LHHA in this specific revision setting remain poorly defined.

Purpose: To evaluate the clinical outcomes, functional improvements, and specific failure rates of large head hemiarthroplasty when utilized as a salvage intervention following failed RSA.

Methods: A retrospective review was conducted at a single tertiary referral center, identifying more than 30 patients who underwent conversion of a failed RSA to an LHHA. Primary indications for this salvage conversion included recurrent instability, periprosthetic infection, significant glenoid bone loss, and mechanical failure. Clinical success was quantified using functional scores, pain evaluation, and active range of motion (ROM) measurements. Failure was strictly defined as the requirement for subsequent revision surgery or the persistence of severe, debilitating dysfunction.

Results: Preliminary findings demonstrated that LHHA provided reliable pain relief in the majority of the cohort. However, functional outcomes were modest, characterized by limited improvements in active ROM. The observed failure rate was 23%, primarily driven by persistent instability, progressive bone loss, or unresolved infection. Despite these limited functional gains, LHHA facilitated limb preservation and avoided the morbidities associated with more complex reconstructive procedures in high-risk patients.

Conclusion: Large head hemiarthroplasty is a reasonable salvage option for a highly selected subset of patients with failed RSA when further revision RSA is not feasible. While the procedure achieves acceptable pain palliation, the 23% failure rate primarily due to dislocation and instability underscores that LHHA is a suboptimal revision strategy for restoring joint stability or high-level function.

Outcomes of a UK Day-Case Shoulder Arthroplasty Pathway: Safety, Patient Satisfaction and Cost-Saving Analysis

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Purpose: This study reviews the safety, cost-savings and patient satisfaction of a DCSA pathway introduced in May 2021.

Methods: All elective shoulder arthroplasties over three-years(May 2021–2024) at a single centre were prospectively collected and retrospectively analysed. Two cohorts were compared: DCSA and inpatient. Primary outcomes were 90-day readmission and complication rates. Secondary outcomes included estimated cost savings and patient satisfaction using a locally developed non-validated questionnaire.

Results: Of 102 shoulder arthroplasties, 25 were DCSA and 77 inpatients. DCSA patients were significantly younger(mean age 64.8 vs 73.6 years; $p < .001$), and more likely to have ASA I status(16% vs 6%; OR 2.74, 95% CI 0.68–11.14; $p = .04$). There were no significant differences in 90-day complications(4% vs 9%; OR 0.42, 95% CI 0.05–3.56; $p = .42$) or readmissions(0% vs 2%; OR 0.42, 95% CI 0.05–3.56; $p = 1.00$). All DCSA patients reported treatment success and were six times more likely to recommend it. Estimated cost-savings were £10,262.75, with £37,766.92 potentially saved if all patients had undergone DCSA.

Conclusion: DCSA is safe, cost-saving, with high patient satisfaction. DCSA could be more widely adopted across the UK.

Cemented versus Uncemented Glenoid Components in Anatomic Total Shoulder Arthroplasty: A Systematic Review and Meta-analysis

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Purpose: To determine whether cemented or uncemented glenoid fixation is associated with superior revision rates and clinical outcomes in primary anatomic total shoulder arthroplasty.

Method and Results: A systematic search of PubMed and Embase was performed from 1st January 1990 to 23rd August 2025 and reported in accordance with PRISMA. Eligible publications compared cemented and uncemented glenoid components in primary anatomic TSA. The primary outcome was all-cause revision. Secondary outcomes were radiolucent lines, and range of motion (forward flexion and external rotation). Meta-analyses were performed using random-effects models, analysed separately by study design and only when data were available from ≥2 studies of that design for each outcome measure. Where multiple publications reported overlapping studies, the most recent publication was included in meta-analysis.

Eleven publications met inclusion criteria (three from two national registry cohorts, five cohort studies, three from two randomised-control trials). Uncemented glenoid fixation was associated with significantly higher incidence of all-cause revision compared with cemented fixation (national registry cohorts: IRR 4.93, 95% CI 4.73-5.13, I^2=0%, τ^2=0; cohort studies: RR 3.04, 95% CI 2.06-4.46, I^2=0%, τ^2=0). Among the cohort studies, there were no significant differences in radiolucent lines (RR 0.41, 95% CI 0.10-1.63, I^2=86.6%, τ^2=0.65) or range of motion (forward flexion: MD = 8.58°, 95% CI -37.11-54.26, I^2=0%, τ^2=0; external rotation: MD = 12.34°, 95% CI -108.35-133.04, I^2=89.3%, τ^2=161.24).

Conclusions: Cemented glenoids demonstrate lower revision rates than uncemented glenoids in anatomic TSA, while radiolucent lines and functional outcomes are comparable. The meta-analysed evidence was limited to studies published from 2018 onwards, demonstrating even with contemporary uncemented designs, cemented fixation remains the most reliable option for implant longevity.

Factors Influencing Implant Selection and Fixation in Radial Head Arthroplasty: A Qualitative Analysis of Surgeon Decision-Making in the UK

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Introduction: When performing radial head arthroplasty (RHA), surgeons must make several decisions ranging from implant selection to fixation strategy. It is unclear, however, how 'black box' factors, such as training and intraoperative intuition, influence these decisions alongside the existing evidence base. This inductive thematic analysis study aims to explore surgeon decision-making in elective and acute RHA. This study evaluated: (1) factors driving implant selection and fixation; (2) intraoperative cues altering strategy; and (3) patient profiles influencing indications.

Materials & Methods: Design This was a qualitative study involving inductive thematic analysis. Setting Semi-structured interviews were conducted virtually via Microsoft Teams across UK hospitals. Participants Purposive sampling recruited consultant orthopaedic surgeons specialised in elbow and upper limb surgery.

Results: Ten surgeons from diverse UK settings were interviewed. Thematic saturation was achieved after eight interviews. Five main themes and 11 subthemes were identified. Decision-making was shaped by implant selection drivers, fixation philosophy, intraoperative cues, patient profiles, and functional outcomes. Most surgeons described defaulting to fellowship-trained implants to reduce cognitive load. There was consensus that press-fit fixation is contraindicated in patients with poor bone quality and on the utility of modularity. There was, however, a lack of consensus regarding the 'unfixable' fracture threshold and the optimal fixation philosophy for primary stems.

Discussion/Conclusions: Surgeon decision-making in radial head arthroplasty is shaped by training-formed habits, intraoperative uncertainty, and patient context. Bone quality consistently emerged as the key pivot for fixation strategy, while thresholds for implantability varied widely between surgeons. These findings illustrate how experiential heuristics drive practice in the absence of strong evidence and point to a need for better tools, particularly around bone assessment, to reduce unwarranted variation.

Stem design in radial head arthroplasty: a systematic review and meta-analysis

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Background: Radial head arthroplasty (RHA) is increasingly used for complex elbow instability, yet controversy persists over optimal stem fixation and implant polarity. This study systematically reviews the evidence to determine revision rates, radiographic loosening, and reoperation rates after primary RHA, stratified by stem fixation (intentional loose-fit, press-fit, cemented) and polarity (monopolar versus bipolar), with specific attention to surveillance time bias.

Methods: MEDLINE, Embase, Scopus, and Cochrane databases were searched from inception to 20 October 2025. Studies reporting outcomes of primary RHA with ≥12 months follow-up and design-specific data were included. Risk of bias was assessed with the MINORS tool and quality of evidence using GRADE. Both conventional pooled-proportion meta-analysis and incidence-rate (events per 100 patient-years) meta-analysis were performed to adjust for differences in follow-up duration.

Results: Forty-six studies (4,467 distinct elbows) were included. In the unadjusted pooled analysis, intentional loose-fit stems demonstrated a lower revision rate (3.4% vs 8.0%; $p < 0.001$) compared to press-fit stems. However, after adjusting for exposure time in the incidence-rate meta-analysis, this survival advantage was no longer significant, though the point estimate for press-fit stems remained higher (loose-fit 0.97 vs press-fit 2.01 revisions/100 patient-years; $p = 0.10$). No difference was found between monopolar and bipolar designs in any analysis (revision 5.8% vs 5.8%; $p = 0.74$).

Conclusion: This large RHA meta-analysis shows the widely reported survival advantage of intentional loose-fit stems may be largely attributable to shorter follow-up in those cohorts. After adjustment for surveillance time, revision rates are equivalent for loose-fit and press-fit stems, and for monopolar versus bipolar designs. The additional complexity and cost of bipolar implants may not be justified.

A cross-sectional survey comparing management of proximal humerus fractures across a multi-national upper limb specialist surgeon panel

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Statement of purpose: This study assesses treatment choices for 3- or 4- part PHFs across surgeons from a multi-national panel, focusing on operative versus non-operative strategies and whether inter-surgeon agreement exists within and between countries.

Methods: A prospective cross-sectional survey was completed by a cohort of consultant/attending-level shoulder surgeons from UK, USA, India, and Australia. Treatment decisions for 20 individual cases were assessed with standardisation of clinical data and imaging. The cases covered varying ages (20-80 years), comorbidities, and fracture morphologies for 3/4-part Neer proximal humerus fractures (severity, fragmentation, tuberosity displacement, and head split or dislocations). Statistical analysis was performed using a mixed-effects logistic regression model and Krippendorff's alpha (K-A).

Results: 75 surgeons responded to the study. There was representation from Asia (India, n=26), Europe (UK, n=24), North America (USA, n=18) and Oceania (Australia, n=7). Thirty-nine surgeons had over ten years of experience in treating PHFs. International agreement was low between surgeons (K-A 0.238) regarding overall decision-making. After adjustment for surgeon country and patient demographics, patient age (<65 vs ≥65 years) was not independently associated with the likelihood of recommending operative management (estimate 0.34, $p = 0.67$). There was wide variation amongst surgeons worldwide with 51.7% of UK-based, 72.3% of Indian, 57.8% of American, and 69.3% of Australian surgeons preferring operative management across the 20 cases. Likelihood for operative management was greater in Australia ($p =0.024$) and India ($p<0.001$), compared to the United Kingdom. There was no significant difference between the United States and United Kingdom ($p=0.89$). The commonest operative modality in all countries was ORIF. In all countries, RSA was preferred to hemiarthroplasty.

Conclusion: This study provides a unique insight into the international variation amongst surgeons where healthcare characteristics and patient factors contribute to the decision-making processes involved in the management of PHFs.

Anatomic or reverse? National Registry Outcomes of Total Shoulder Arthroplasty in Cuff-Intact Glenohumeral Osteoarthritis patients

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Purpose: To compare implant survivorship, revision indications, complication profiles, and Patient-reported outcomes following Anatomical versus Reverse Total Shoulder Arthroplasty for cuff-intact or cuff-repaired glenohumeral osteoarthritis in contemporary national practice.

Methods and Results: A retrospective population-based cohort study was conducted using prospectively collected national registry data between 2012 and 2023. Adults undergoing primary shoulder arthroplasty for osteoarthritis with a documented normal or repaired rotator cuff were included; cases with attenuated cuff status, inflammatory arthropathy, fracture, or other non-osteoarthritis indications were excluded. In the unmatched cohort (17,348 procedures: 14,853 anatomical; 2,495 reverse), reverse recipients were significantly older and had higher ASA grades, reflecting evolving implant selection patterns. To minimise confounding, propensity score matching (1:1) was undertaken using demographic, clinical, and implant-related variables, achieving well-balanced comparison groups.

Matching yielded 2,312 patients per group. The primary outcome was time to first revision, analysed using Kaplan–Meier survival estimates and Cox proportional hazards regression. During follow-up, 145 revisions occurred (102 anatomical; 43 reverse). Reverse arthroplasty was associated with a significantly lower hazard of revision (HR 0.62, 95% CI 0.43–0.89; p=0.01). Revision mechanisms differed markedly: cuff insufficiency accounted for 47% of Anatomical revisions compared with 5% following Reverse (p<0.001), whereas infection accounted for 26% of Reverse revisions versus 7% after Anatomical arthroplasty (p=0.004). Overall recorded complications/adverse events were lower following Reverse arthroplasty (1.5% vs 2.5%; p=0.02). Oxford Shoulder Score improved substantially in both groups; early outcomes were comparable, while modestly higher scores were observed after Anatomical arthroplasty at 3 and 5 years.

Conclusion: In this large contemporary national comparison, Reverse arthroplasty demonstrated superior survivorship and fewer recorded complications in cuff-intact or cuff-repaired osteoarthritis, despite slightly lower medium-term Patient-reported scores. These findings provide high-level evidence to inform implant selection as Reverse arthroplasty continues to expand beyond traditional indications.

Humans Vs Machines: Can Orthopaedic Surgeons Tell Who Wrote The Better Answer?" – A Study Comparing Large Language Models And Consultant Surgeons In Pre-Operative Rotator Cuff Counselling

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Background: Artificial intelligence (AI) is reshaping healthcare communication, but the value of large language model (LLM)–generated advice compared with surgeon-written information remains unclear.

Purposes: This study assessed whether orthopaedic surgeons could distinguish consultant- from AI-generated responses to pre-operative rotator cuff repair questions and how helpful these responses were.

Methods: We conducted a cross-sectional, web-based survey in which clinicians rated 40 generated by Open AI's ChatGPT 4o-mini and DeepSeek V3.1 using a standardised prompt and by two UK Consultant shoulder surgeons. Participants rated each response for perceived helpfulness and judged whether it was written by AI or a Consultant Surgeon. Fifty-five clinicians participated.

Results: Across 2,200 ratings, overall perceived helpfulness was high (mean 3.86). ChatGPT (3.96) and DeepSeek (3.99) were rated as helpful as the stronger Consultant (3.94) and higher than the second Consultant (3.55). Within-participant comparisons showed no significant differences between either AI model and Consultant 1, while both LLMs outperformed Consultant 2. Clinicians showed limited ability to distinguish AI from Consultant responses.

Conclusion: LLMs now rival consultant surgeons in generating helpful pre-operative information for patients. While human expertise remains essential for complex decision-making and risk communication, AI offers clarity, accessibility and scalability that could enhance patient education.

Incidence and Risk Factors for Iatrogenic Nerve Injury Following Reverse Shoulder Arthroplasty: A Systematic Review and Meta-Analysis

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Abstract: Reverse shoulder arthroplasty (RSA) has transformed management of irreparable rotator-cuff pathology and complex shoulder arthritis since its introduction by Grammont et al. (1987). Although functional outcomes are excellent, iatrogenic nerve injury remains a clinically significant yet frequently under-reported complication. This systematic review and meta-analysis aimed to quantify the pooled prevalence of postoperative neurological injury after RSA, identify the most frequently affected nerves, and examine modifiable risk factors.
Comprehensive database searches of PubMed, Embase, Cochrane Library, and Google Scholar (January 2020 – July 2025) identified six eligible studies comprising 43 295 shoulders (LiBrizzi et al., 2020; Kim et al., 2020; Hruby et al., 2022; Olsen et al., 2022; Inagaki et al., 2023; North et al., 2023). Reported incidences ranged from 1.3 % to 19 %. A random-effects meta-analysis demonstrated a pooled prevalence of 5.48 % (95 % CI 3.22–7.73 %). The axillary nerve was most often affected, followed by the ulnar and radial nerves. Revision surgery, operative duration > 120 minutes, and excessive humeral distalisation were principal risk factors.
Conclusion: Iatrogenic nerve injury occurs in approximately one in twenty RSAs. While most cases resolve, persistent sensory or motor deficits are not uncommon. Careful patient positioning, controlled traction, and awareness of high-risk scenarios are critical for prevention

Computer-Assisted Navigation Versus Standard Surgical Planning in Reverse Total Shoulder Arthroplasty: A Systematic Review and Meta-Analyses

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Aim: The aim of this review was to compare computer-assisted navigation with standard surgical planning in reverse total shoulder arthroplasty (RTSA).

Methods: A systematic review was conducted in accordance with PRISMA guidelines. MEDLINE, EMBASE, Scopus, and the Cochrane Library were searched up to April 2025. Studies were eligible if they directly compared computer-assisted navigation with standard surgical planning in RTSA and reported outcomes related to implant positioning, functional outcomes, or complications. Cadaveric studies, non-comparative studies, reviews, case reports, and non-English publications were excluded. Risk of bias was assessed using the ROBINS-I V2 tool. Where at least two studies reported comparable outcomes, fixed-effects meta-analysis was performed; otherwise, narrative synthesis was used. Outcomes assessed included glenoid baseplate version and inclination, screw number and length, validated functional outcome scores, range of motion, and post-operative complications.

Results: Nine observational studies comprising 2,421 patients met inclusion criteria, including 900 computer-navigated and 1,521 conventionally planned RTSAs. All studies demonstrated a high risk of bias, primarily due to confounding. Meta-analysis showed no significant difference between groups for post-operative glenoid baseplate version or inclination. Functional outcomes favoured computer-assisted navigation, with significantly higher Simple Shoulder Test, Constant–Murley, UCLA, and Shoulder Arthroplasty Smart scores, while ASES and SPADI scores showed no significant differences. Range-of-motion analysis demonstrated significantly greater active internal and external rotation in the navigated group, with no differences in abduction or forward elevation. Overall, complication rates were significantly lower in the computer-assisted navigation group, although individual complications such as revision, dislocation, scapular notching, and fracture rates did not differ significantly between groups.

Conclusion: Computer-assisted navigation in RTSA is associated with improved functional outcomes and a lower overall complication rate compared with standard surgical planning, while evidence for implant positioning remains mixed.

Outcomes of Salvage Elbow Hemiarthroplasty for Non-union, Malunion & Failed Internal Fixation of Distal Humerus Fracture

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Purpose: The aim of this study was to evaluate the outcomes of Distal Humerus Hemiarthroplasty (DHH) as a salvage procedure for previously treated distal humerus fracture.

Methods: Data was collected from two centres for 36 consecutive patients who underwent DHH for failed distal humerus fracture internal fixation (n=22) or failed non-operative treatment (n=14). The primary outcome was conversion to total elbow arthroplasty. Secondary outcomes included complications, range of motion, Oxford Elbow Score (OES), Visual Analogue Score (VAS), and radiological outcomes.

Results: Mean age at time of DHH was 58 years (range 41-69), and median follow-up was 88 months (range 7-180). The OES was significantly higher in those initially conservatively managed (43, range 35-47) compared to those initially surgically treated (41, range 13-47) (p=0.047). The median VAS score was 10 (IQR 10-30) with no difference between the two groups. The flexion-extension arc was not significantly different between those initially managed conservatively and surgically (128±32 vs 113±32, p=0.298).
Eight patients had ulnar nerve paraesthesia without motor deficit. Four patients (11%) were converted to total elbow arthroplasty due to instability, three of whom had initial surgical treatment and one non-operative treatment. One patient had implant loosening, who also had instability and was revised, and seven (20%) patients had asymptomatic heterotopic ossification. There were no instances of progressive ulnar wear or deep infection.

Conclusion: Salvage DHH offers a viable option for patients in whom initial fracture management has failed but instability is the primary complication. Functional outcomes were satisfactory and superior after failed conservative management. In successful cases, adverse radiographic changes were limited with good midterm durability. While these findings are promising, surgeons should be very selective about offering DHH as a salvage, particularly after failure of internal fixation, and the decision for this treatment should be made through a multi-disciplinary approach.

There is a lack of gender specific outcome data for the treatment of shoulder instability in female collision athletes

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Shoulder injuries are common in collision sports, as participation and professionalisation increases in women's sports, there is a greater need to understand sex-specific factors that may influence treatment outcomes.

Methods and Results: A systematic literature search was conducted across MEDLINE, EMBASE, AMED, CINAHL, and CENTRAL databases. Studies were included if they reported on female athletes undergoing shoulder stabilisation procedures such as arthroscopic Bankart repair (ABR), Latarjet procedures, or posterior capsulolabral repair. Outcomes of interest were return to play (RTP) rates and injury recurrence. Study quality was assessed using the Newcastle-Ottawa Scale.
Six studies met the inclusion criteria, comprising of retrospective and prospective cohorts and one case-control study. Sample sizes of female athletes were small (range 9–58), and many studies reported combined male-female outcomes. RTP rates for female athletes ranged from 71–95%, with ASES scores improving from 40–50 preoperatively to 84–86 postoperatively. Evidence on revision surgery rates was limited and conflicting, with some papers reporting revision rates as high as 55.5%, and other revision rates of 0%. Variation in sport type, definitions of RTP and surgical interventions limited the comparability of results.

Discussion: Female athletes remain underrepresented in shoulder instability research. Anatomical, physiological, and hormonal differences may influence recurrence and recovery, yet existing management frameworks are tailored more to males. Small sample sizes, mixed-sex cohorts, and inconsistent outcome definitions limit the widespread application of current evidence to female collision-sport athletes.

Conclusions: There is an urgent need for female-specific research in shoulder instability management. Future studies should include sex-stratified, sport-specific cohorts, evaluate anatomical and hormonal influences on outcomes, and develop targeted surgical and rehabilitation protocols. Multicentre registries and prospective studies could produce high-quality sex-specific data to better guide clinical decision-making and optimise RTP outcomes for female athletes.

Pre-operative biopsies in the revision setting: helpful or harmful?

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Aim: The purpose of this study was to assess the benefit of obtaining pre-revision deep tissue biopsies to rule out low-grade infection in shoulder and elbow cases undergoing future revision procedure for a presumed aseptic cause.

Methods: Consecutive patients over a 4-year period from a single centre undergoing a revision shoulder or elbow procedure without evidence or suspicion of infection were included. Electronic patient records were utilised to determine biopsy results, revision procedure, and clinical outcome.

Results: 81 patients underwent a revision shoulder or elbow procedure in presumed aseptic cases. Of these, 40 had biopsies taken prior to revision procedure, with 7 positive results (defined as 3/5 or more positive samples). These were treated with oral antibiotics before undergoing revision. At the time of definitive revision procedure further intra-operative biopsies showed that infection had been cleared in only 4 out of 7 cases, and new infection was identified in a further 6 cases that had previously been negative.
Of the 41 patients who did not have pre-revision biopsies, 13 were found to be positive at the time of definitive procedure and subsequently successfully treated with oral antibiotics. The specificity of pre-revision biopsy was 100%, with a sensitivity of only 54%.
Positive biopsies across both cohorts were predominantly C.Acnes (86%), followed by S.Aureus (8%), S.Saccharolyticus (3%) and S.Epidermidis (3%).

Conclusion: Pre-revision biopsy has a low sensitivity for identifying bacteria in presumed aseptic cases and is not necessarily a benign procedure, with a potential risk of introducing infection. Pre-revision antibiotic treatment may not result in negative biopsies at the time of definitive revision. Over a quarter of cases in this study had positive biopsies at definitive procedure, highlighting the importance of obtaining biopsies at the time of revision even in presumed aseptic cases.

Increased Risk of Mortality in the Frail and those with Fracture of the Humerus

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Aims: This study aims to examine the association between frailty scores, humerus fractures, and 12-month mortality in patients 65 years and over presenting to the Emergency Department (ED) with acute fractures.

Methods: A retrospective cohort study using electronic hospital records of consecutive patients aged 65 years and over, presenting to the ED with an acute fracture between April 2019 and April 2024, was conducted with a minimum 12-month follow-up. The primary outcome was all-cause mortality within 12 months of the index emergency department presentation. Frailty was defined using the Clinical Frailty Scale (CFS) with patients categorized as non-frail (CFS score 1-3) or frail (CFS score 4-9).

Results: A total of 4,932 patients aged 65 years and over presented to ED with an acute fracture (excluding fractured neck of femur). The mean age was 76 years (SD 7.75), and 3,591 patients (73%) were female. Humerus fractures occurred in 594 patients (12%). CFS score was available for 1,658 patients (34%), who comprised the analytical cohort.
Univariable analysis identified a strong association between frailty and 12-month mortality (OR 6.10, 95% CI 4.42–8.42, frail compared to non-frail patients). Increasing age was also associated with mortality (OR 1.13 per year, 95% CI 1.11–1.14).
Humerus fracture was associated with increased mortality compared with non-humerus fracture (OR 1.30, 95% CI 1.01–1.70).
In multivariable analysis frailty remained the strongest predictor of 12-month mortality (OR 3.95, 95% CI 2.81–5.57). Humerus fracture (OR 1.61, 95% CI 1.08–2.40) and male sex (OR 1.76, 95% CI 1.28–2.41) were independently associated with an increased risk of mortality.

Conclusion: In older adults presenting to the emergency department with fractures, frailty is the strongest predictor of 12-month mortality. Recognition of humerus fractures as high-risk injuries allows for development of intervention strategies to reduce mortality in this vulnerable population.

Home-Based Versus Supervised Outpatient Rehabilitation Following Reverse Total Shoulder Arthroplasty: A Systematic Review and Meta-analysis of Randomised Controlled Trials

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Purpose: To compare clinical outcomes between home-based rehabilitation and supervised outpatient physiotherapy following reverse total shoulder arthroplasty (rTSA).

Methods: A systematic review and meta-analysis of randomised controlled trials was conducted in accordance with PRISMA guidelines. MEDLINE, Embase, and the Cochrane Central Register of Controlled Trials were searched until December 2025. Trials comparing home-based and formal supervised outpatient physiotherapy following primary rTSA were included. Primary outcomes were the American Shoulder and Elbow Surgeons (ASES) score and active range of motion (ROM) at 12 months. Secondary outcomes included pain, 24 month follow-up, complications, and cost of care. Random effects meta-analyses were performed with the random using the restricted maximum likelihood model.

Results: Four randomised controlled trials comprising 440 patients were included. There were no statistically significant difference in ASES scores between home-based rehabilitation and supervised physiotherapy at one year (mean difference −0.49; 95% CI −4.63 to 3.66. No differences were observed in pain scores (VAS mean difference −0.21; 95% CI −0.64 to 0.23) or active ROM, with pooled mean differences of less than 2 degrees for forward flexion, external rotation, and internal rotation. Narrative synthesis of secondary outcomes, including the SANE and WOOS scores, demonstrated comparable improvements between rehabilitation strategies. Two-year follow-up data equally shoed no difference in functional outcomes. Complication and revision rates were similar across groups. A statistically significant reduction in total care-cycle costs was demonstrated in the largest included trial (mean difference −$6,920; $p < 0.01$), supported by reduced healthcare utilisation in a second study.

Conclusion: Home-based rehabilitation following rTSA results in comparable functional outcomes, pain relief, and patient-reported outcome measures to supervised outpatient physiotherapy, without increased complications. These findings support home-based rehabilitation as a safe and effective alternative following primary rTSA, with potential advantages in healthcare resource allocation.

Factors associated with prolonged length of stay after a proximal third humeral shaft fracture

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Purpose: To identify patient and injury characteristics associated with prolonged length of stay (LOS) following proximal third humeral shaft fractures in patients over 60 years of age.

Introduction: Proximal third humeral shaft fractures in older patients may affect their ability to mobilise and understanding drivers of prolonged LOS will help improve care pathways in this vulnerable group.

Methods: A prospective multi-centre national service evaluation (Pro-Third) involved 25 sites in the UK. Data were collected via RedCap, with missing data excluded. Variables were predominantly categorical. Prolonged LOS is defined as ≥11 days, hence 2 groups are created for comparison. We assessed demographics, clinical status (ASA, Clinical Frailty Score (CFS), mobility), and injury characteristics. Univariate tests (Logistic Regression, Chi-square, Fisher's Exact, t-test) assessed associations with prolonged LOS.

Results: There are 237 patients in total. Mean age was 74 years old (29% male, 71% Female). Prolonged LOS was noted in 19.4% of patients presenting to hospital. Positive predictors are for older age, higher ASA grade and CFS, pre-injury mobility aids, and smoking. Gender, AMTS, haemoglobin, mechanism of injury, and fracture displacement were not found to be significant.
While a trend was observed for wedge fractures, fracture characteristics did not reach significance ($p=0.249$). There were no differences between the operative and non-operative groups ($p=0.331$). Although the time to surgery was not significant ($p=0.499$), intramedullary nails were associated with increased LOS compared to plate fixation ($p<0.001$).
Patients were also less likely to be discharged to their usual residence ($p=0.0005$) after prolonged LOS.

Conclusion: Our findings support proximal third humeral shaft fractures as fragility fractures, with 19.4% of patients presenting to hospital having prolonged LOS. Multi-disciplinary care, cohorted wards and early comprehensive geriatric care are therefore particularly relevant for admitted patients.

Outcome and cost effectiveness analysis of repeat hydrodilatation in refractory frozen shoulder

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Purpose: Shoulder hydrodilatation is a recognised treatment for adhesive capsulitis. Hydrodilatation followed by physiotherapy is offered as a first line treatment for patients presenting with debilitating symptoms. The treatment of patients with pain and reduced range of motion following hydrodilatation is poorly described; our aim is to assess the efficacy and cost-effectiveness of repeat hydrodilatation in refractory frozen shoulder.

Methods: This is a case series study of 21 patients who had repeat hydrodilatation of the same shoulder.
All hydrodilatation episodes between January 2014 and March 2024 (n=240) were identified, including both fluoroscopy guided in theatre and ultrasound guided. 21 patients underwent repeat hydrodilatation of the same shoulder.
Primary outcome was subjective effectiveness of repeat hydrodilatation. Using clinical records or telephone calls, we categorised outcomes as 'unresponsive', 'transient improvement' or 'complete recovery'.
Secondary outcomes were complications and rates of further surgery. We performed an economic analysis to assess the cost-effectiveness of repeat hydrodilatation compared to capsular release.

Results: Twenty-one patients underwent second hydrodilatation; 16 (76%) reported a complete recovery and two (9%) reported a transient improvement. The remaining three (15%) patients reported no response to second hydrodilatation, proceeding to capsular release.
There were no reported complications.
The national schedule of NHS costs (2024/25) suggests a cost of £2356 for minor day-case shoulder procedures including capsular release, and up to £219 for minimal shoulder outpatient procedures such as ultrasound guided hydrodilatation. Using an effectiveness rate of 85%, this suggests a saving of £1783.60 per patient when following a repeat hydrodilatation protocol.

Conclusion: Repeat hydrodilatation is an effective and safe treatment option for patients who fail to respond to initial hydrodilatation. There were no reported complications.
Economic analysis, based on healthcare costs only, suggests a cost saving of £1783 per patient when compared to capsular release for refractory frozen shoulder.

Hydrodilatation as first-line intervention for primary frozen shoulder: a comparative audit with arthroscopic capsular release

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Background: Frozen shoulder is a common cause of pain and functional limitation. Hydrodilatation and arthroscopic capsular release are established treatment options for patients who fail initial conservative management; however, the optimal first-line interventional approach remains debated.

Purpose: To compare clinical outcomes following hydrodilatation and arthroscopic capsular release and to evaluate the role of hydrodilatation as an initial intervention for primary frozen shoulder.

Methods: A retrospective clinical audit was conducted at James Paget University Hospital in 2024. A total of 42 patients were treated over an 18-month period, of whom 30 underwent ultrasound-guided hydrodilatation (Group H) and 12 underwent arthroscopic capsular release (Group A). Outcome measures included pain relief, shoulder range of motion, and functional outcomes assessed using the Oxford Shoulder Score (OSS). Pre- and post-intervention outcomes were compared between both groups in line with local practice and national recommendations.

Results: Both treatment modalities resulted in improvement in pain and shoulder function. Hydrodilatation was associated with superior early pain relief and significant functional improvement, with comparable gains in shoulder range of motion to arthroscopic capsular release at final follow-up. Arthroscopic capsular release did not demonstrate additional functional benefit over hydrodilatation. No major complications were reported in either group, while hydrodilatation was associated with a shorter recovery period and lower treatment burden.

Conclusion: This audit demonstrates that hydrodilatation is an effective and well-tolerated treatment for primary frozen shoulder, providing outcomes comparable to surgical intervention. These findings support current British Elbow and Shoulder Society (BESS) guidance, which recommends non-operative and minimally invasive interventions as first-line treatment. Hydrodilatation should therefore be considered the preferred initial interventional option, with arthroscopic capsular release reserved for refractory cases.

Am I too old for a shoulder replacement? The association between age and comorbidities on the outcomes following Reverse Shoulder Arthroplasty

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Introduction: Reverse shoulder arthroplasty (RSA) is increasingly performed in elderly patients; however, concerns remain regarding the impact of advanced age and comorbidity on outcomes. While National Joint Registry (NJR) data shows low revision rates in those >75, outcomes specific to RSA in the very elderly and the influence of co-morbidities with advancing age are not well defined.

Methods: All elective RSA procedures performed between April 2012 and March 2022 in patients ≥80 were requested from the NJR and linked to Hospital Episode Statistics. Patients undergoing RSA for trauma or with incomplete follow-up were excluded. Primary outcome was revision surgery, with analysis of the influence of gender and co-morbidity burden. Secondary outcomes were 30-day medical complications requiring re-admission, length of stay (LOS) and 30, 90 day & one-year mortality. Subgroup analyses were performed for patients ≥85 and ≥90 years.

Results: A total of 6,988 patients aged ≥80 years were included. Revision rates were low, at 1.41% at 1 year, 2.32% at 5 years, and 3.35% at 9 years. Male gender was associated with an increased risk of revision (hazard ratio (HR) 3.45, 95% CI 2.47–4.81, p<0.001), while ASA grade was not. Revision risk decreased with advancing age (HR 0.89 per year increase, 95% CI 0.84–0.96, p=0.001). Medical complications within 30 days occurred in 8.9% of patients aged ≥80 years, increasing to 16.4% in those aged ≥90 years. Median LOS increased from 3 to 4 days. Thirty-day mortality increased from 0.52% to 1.43%, 90-day mortality from 0.97% to 3.21%, and one-year mortality from 3.3% to 8.2%.

Conclusion: Elective RSA in patients aged ≥80 years is associated with low revision rates, even in advanced age. Chronological age alone should not be considered a contraindication to RSA; however, increasing medical complications and mortality with age should inform pre-operative counselling and perioperative optimisation.

Infection After Primary Reverse Total Shoulder Arthroplasty: Incidence and Risk Factors

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Purpose: The aim of this study is to identify risk factors for periprosthetic joint infection after reverse total shoulder arthroplasty (rTSA) and quantify the impact of having multiple risk factors on infection incidence.

Methods: We retrospectively analyzed 12,626 primary rTSA patients (7,573 female/4,882 male/171 unknown) from an international multi-center database of a single platform shoulder prosthesis. A univariate analysis, followed by multivariate logistic regression, identified risk factors for infection including patient demographics, diagnosis, comorbidities, implant sizes/types, and operative/surgical parameters. Odds ratios and infection rates for patient cohorts with multiple risk factor combinations were calculated.

Results: 105 (31F/74M) of 12,626 primary rTSA patients had an infection (0.83%). Younger age (68.2±8.4 vs. 71.9±7.9 years; p<0.001), male sex (p<0.001), fracture diagnosis (p=0.002), no comorbidities (p=0.014), lesser tuberosity osteotomies for subscapularis repair (p=0.027), longer surgical time (99.5±34.9 vs. 83.5±36.6 minutes; p=0.021), and larger (>38mm) glenosphere diameters (p=0.042) were identified as risk factors for infection after rTSA. Two patient cohorts with two risk factors and five patient cohorts with different combinations of three risk factors had an OR>5. Two patient cohorts with combinations of four or more risk factors had an OR>10. One cohort consisted of male patients with fracture diagnosis that were less than 68.2 years old and had surgery time >100 minutes (infection rate=8.1%; OR=10.8). The second cohort consisted of male patients with a fracture diagnosis that were less 68.2 years old, received glenosphere diameters >38mm, and had surgery time >100 minutes (infection rate=7.7%; OR=10.1).

Conclusion: The results of this study demonstrated an infection rate of 0.83% after primary rTSA using a single platform prosthesis. Numerous risk factors increased the risk of infection after rTSA. Infection rates varied widely among patient cohorts with different combinations of risk factors, where multiple patient cohorts were associated with OR>10, demonstrating the impact of accumulating risk factors

Early UK clinical outcomes from a prospective multi-centre registry evaluating rotator cuff repair augmented with a bioinductive collagen implant

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Aim: To assess clinical and patient-reported outcomes following rotator cuff repair augmented with a bioinductive collagen implant (BCI), using a UK prospective registry designed to generate real-world evidence on clinical effectiveness, safety, and health-economic value.

Methods: All patients undergoing rotator cuff repair with a BCI for full- or partial-thickness tears were prospectively enrolled across UK orthopaedic centres as part of an international registry (UK, Italy, Germany, Australia). Patient-reported outcome measures (Oxford Shoulder Score [OSS], Visual Analogue Scale [VAS] pain, QuickDASH, SANE, EQ-5D-5L) and complications were collected at baseline, 3, 6, and 12 months post-operatively. Scores were compared against baseline using paired analysis.

Results: Since registry inception (October 2020), 245 UK patients (mean age 58.7 years, 70.6% male) have been enrolled. For partial-thickness tears, significant improvements were observed at 12 months in QuickDASH, SANE, and OSS (all $p<0.05$). VAS-Pain scores improved at each timepoint, with progressive benefit through 12 months. EQ 5D 5L scores improved significantly from 6 months onwards. Among full-thickness tears, all PROMs were significantly improved from baseline at every timepoint. Early complication rate (<6 weeks) was 7.3%, most commonly pain or stiffness; late complications (>6 weeks) occurred in 3.3% of patients.

Conclusion: Early UK registry data demonstrate that rotator cuff repair augmented with a BCI is safe and associated with meaningful improvement in shoulder function and quality of life at one year. Ongoing follow-up will evaluate 24 month outcomes, return to work, and return to sports/activities within the UK setting.

Copeland resurfacing arthroplasty versus stemless hemiarthroplasty versus stemless total shoulder replacement

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Purpose: To compare the functional outcome and implant survival after Copeland resurfacing arthroplasty (CRA) with stemless hemiarthroplasty (HA) and total shoulder replacement (TSA).

Methods: A retrospective review of anatomic shoulder replacements performed between 2007 and 2024 was undertaken. Demographic, implant and outcome data were obtained from our shoulder database, medical records, imaging system and cross-referenced to ensure accuracy. Patients with traumatic indications and revisions were excluded. Primary outcome was Oxford Shoulder Score (OSS) at serial timepoints during follow up. Secondary outcomes were change in OSS from baseline, EQ5D measures, and revision-free survival assessed by Kaplan Meier curves. Statistical Significance was defined as $P<0.05$.

Results: 137 patients with complete data were included in the study. Mean age was 67.3 and male: female ratio was 1:2. CRA was performed between 2007 and 2011, Arthrex Eclipse HA between 2011 and 2023 and Arthrex Eclipse TSA between 2013 and 2024. There were no significant differences between cohorts at baseline. All implants resulted in significant functional improvement. Comparing OSS over the follow-up period, TSA outperformed HA which in turn outperformed CRA, but the differences only achieved statistical significance at 2, 3 and 6 years. Change in OSS was significantly better after TSA than after HA and CRA at 2 and 3 years. 10-year survival was best for CRA and worst for HA (96.3% survival at 10 years compared to 81.4%) but this difference did not achieve statistical significance ($p=0.07$ Log rank test).

Conclusion: Our experience with anatomic shoulder arthroplasty reflects changes in our philosophy, understanding, materials and implant design and improvements in surgical techniques. Functional outcome after shoulder replacement improved with changes in our implant selection, but implant survival did not.

Are Cemented Humeral Stems Superior to Uncemented Stems in Reverse Total Shoulder Arthroplasty? A Systematic Review and Meta-Analysis

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Background: Reverse shoulder arthroplasty (RTSA) is an established treatment for rotator cuff tear arthropathy and complex shoulder pathology, including fractures. The optimal method of humeral stem fixation, cemented or uncemented, remains uncertain.

Objectives: To compare revision rates, stem loosening, functional outcomes, and complications between cemented and uncemented humeral stems in RTSA.

Methods: A systematic review and meta-analysis was performed in accordance with PRISMA guidelines. Primary outcomes were revision rates and humeral stem loosening. Secondary outcomes included functional scores (ASES, Constant–Murley) and complications. Binary outcomes were pooled as risk ratios (RR) and continuous outcomes as pooled means or mean differences, using inverse variance weighting.

Results: Forty-eight studies reporting on more than 35,000 patients (cemented 15,015; un-cemented 20,506) were included, comprising 27 single-arm and 21 comparative studies. Mean age was 73.9 years(range 68.9–80.0) and mean follow-up 49.5 months(range 15.5–120.0). Uncemented stems had a higher revision risk than cemented stems (RR 1.53, 95% CI 1.26–1.86; $p<0.0001$; $I^2=30.6\%$). Sub-group analyses supported this in elective and mixed-indication cohorts. Stem loosening did not differ significantly (RR 0.81, 95% CI 0.43–1.53; $p=0.52$; $I^2=0\%$). ASES scores were 66.8 (95% CI 64.7–68.9) for cemented stems and 75.4 (95% CI 73.2–77.6) for uncemented stems; Constant–Murley scores were 75.5 (95% CI 70.8–80.2) and 61.9 (95% CI 60.0–63.9), respectively. Comparative analyses showed no statistically significant functional differences. Peri-prosthetic fractures occurred in 0.8% (32/3,957) of cemented and 1.5% (24/1,601) of un-cemented stems without a significant difference.

Conclusion: Cemented humeral stems in RTSA are associated with a lower risk of revision than uncemented stems, while rates of loosening, complications, and functional outcomes are broadly similar. Given the absence of functional benefit and the higher revision risk with uncemented fixation, cemented humeral components should be favoured, particularly in elderly patients, trauma cases, and when minimising revision risk is a priority.

Does graft thickness affect outcomes in massive rotator cuff repairs with on-lay and bridging graft augmentation? A systematic review and meta-analysis

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Aims & Objective: To evaluate whether graft thickness influences functional outcomes and re-tear rates in massive rotator cuff repairs (RCRs) with graft augmentation, and to compare effectiveness of on-lay versus bridging/interposition techniques.

Methods: A systematic review was performed according to PRISMA guidelines. MEDLINE, Embase and CINAHL databases were searched between April 2006-April 2025. Clinical studies reporting shoulder-specific functional outcomes scores and re-tear rates evaluating RCRs with graft augmentation (on-lay or bridging) using allografts, xenografts and synthetic grafts, as well as comparative studies with standard repair with minimum 12-months follow-up were included. Studies were stratified by graft thickness (≤2mm vs >2mm) and technique (on-lay vs bridging).

Results: Thirty-eight studies (n = 1,761; 23 with grafts ≤2 mm, 15 with grafts >2 mm) with a mean follow-up of 34.2 ± 18.6 months were included. On-lay augmentation with grafts ≤2 mm yielded the greatest reduction in re-tear risk (OR 0.15; 95% CI: 0.05–0.49; p = 0.04) and lowest failure rate (8%). Bridging with ≤2 mm grafts reduced re-tear risk by 67% (RR 0.33; 95% CI: 0.20–0.55), while grafts >2 mm reduced risk by 55% (RR 0.45; 95% CI: 0.27–0.74). The pooled re-tear rate was 12% (95% CI: 9–15%). On-lay augmentation with grafts ≤2 mm significantly improved functional outcomes compared with standard repair (mean difference 9.39 points; 95% confidence interval 1.09–17.68; p = 0.03), whereas no significant difference was observed for grafts>2 mm (MD +4.28 points; 95% CI: 0.09–8.46; p = 0.05). Bridging with grafts ≤2 mm demonstrated the highest pooled mean Constant scores (76.29; 95% CI: 69.56–83.68).

Conclusion: Both on-lay and bridging augmentation techniques significantly reduced re-tear rates compared with standard repair alone. Grafts ≤2 mm provided a greater reduction in re-tear risk with both techniques and showed a trend toward superior functional outcomes.

Proximal Humerus Megaprosthesis in Revision Shoulder Arthroplasty - Outcomes in Non-Tumour Patients

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Purpose: To assess clinical and radiological outcomes in revision shoulder arthroplasty with proximal humeral megaprosthesis (PHM) in non-tumour patients.

Methods: Retrospective analysis of prospective data from patients who had a PHM for non-tumour indications was performed, with the following data collected: patient demographics, indication, previous surgery, length of follow up, Oxford Shoulder Score (OSS), Visual Analogue Scale (VAS) for pain, arc range of movement, and Single Assessment Numerical Evaluation (SANE), pre operatively and at latest follow up. Complications and revision surgery were also recorded. Radiographic evaluation was performed by two senior authors, who assessed implant fixation, and proximal humerus bone loss, which was graded using Proximal Humeral Arthroplasty Revision Osseous inSufficiency (PHAROS) classification.

Results: In total 34 PHM from 34 patients were analysed (24 female and 13 male). Mean age 71.9 years (range 48-99). Mean follow up was 52 months (range 6 – 155). The mean number of previous surgeries was 3 (SD 0.66). Indications for custom implant were 8(24%) for infection, 7(20%) for instability, 16(47%) for aseptic loosening and 3(9%) for trauma sequelae. (PHAROS) grading: Type 2 n=25, Type 3 n=9. Implant fixation: resorption n=6, apposition n=14, osseointegration n=14. An improvement in mean OSS (p = 0.003), VAS (p = 0.001), SANE (p = 0.04) was observed. Overall, there were n=10 (18%) complications. Of these, n= 4 (12%) had implant revision and a further n=2 (6%) had an infection managed with debridement and implant retention.

Conclusion: We report good clinical and radiographic outcomes in the early to mid-term with a 12% rate of implant revision at a mean follow up of 4.33 years. Patient reported outcomes were satisfactory and comparable with existing literature. With diligent planning, use of PHM may avoid excision of native bone, accurately restore humeral length, and provide a reliable option in complex revision surgery.

Temporal Trends in Shoulder Replacement Populations, Indications and Implant Choice: An Analysis of National Joint Registry Data

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Purpose: To evaluate whether use of reverse total shoulder replacements (RTSR) within the National Joint Registry (NJR) is evolving over time by 1) determining temporal trends in use of RTSR across osteoarthritis (OA)-only and cuff tear arthropathy (CTA) indications; and 2) comparing unadjusted revision rates between specific indications and by early and current RTSR procedures.

Methods: Primary shoulder replacement (SR) procedures performed in England from Jan 2012-Dec 2024 were identified from the NJR database. Frequency of procedures by SR type was identified per year and specific indication and expressed as n(%). Unadjusted cumulative revision rates (CRR) up to five-years were calculated using Kaplan-Meier survival analysis for SR type, indication and year of procedure.

Results: The proportion of SR procedures performed for OA-only that were RTSR increased from 11.14% in 2012 to 59.67% in 2024. Greater number of RTSR procedures were performed for OA-only (37.65% of all RTSR) than CTA (35.27%) in 2024. Unadjusted five-year CRR is higher in RTSR performed for CTA (CRR 2.76%,95% CI 2.46–3.11) than OA-only (CRR 1.96%,95% CI 1.62–2.36). Early RTSR procedures (all indications) performed from 2012-2013 had higher CRR compared to later RTSR procedures performed 2018-2019 beyond one-year (5-year CRRs: ‘early’ 3.64%,95% CI 2.91-4.55; ‘later’ 2.51%,95% CI 2.19-2.87).

Discussion: Increasing RTSR use is reflective of increasing use for OA-only indications. While outcomes are typically reported for acute trauma and elective indications separately, this study suggests specific elective indications differ in terms of unadjusted revision and should be reported independently within national reporting. Overall RTSR procedures are not comparable in terms of revision over time and this should be considered within analysis and reporting.

A Pilot Randomised Trial of Human Dermal Patch Augmentation for Large Rotator Cuff Repairs

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Introduction: We conducted a pilot randomised controlled trial to assess if augmenting a standard open double-row rotator cuff repair with a human acellular dermal allograft patch improves outcomes for large (3-5 cm) tears. We aimed to compare the 12-month retear rates and functional scores between the two techniques.

Materials & Methods: We randomly assigned patients undergoing open repair of a 3-5 cm tear to receive either an augmented repair (with the patch) or a standard complete repair. We assessed the primary outcomes—retear on MRI and the Oxford Shoulder Score—at 12 months post-surgery. We collected functional scores at baseline and at 3, 6, and 12 months. We also recorded all adverse events and evaluated the trial's feasibility.

Results: We screened 73 patients and randomized 38 (19 per group). The mean tear size was 4.2 cm in the augmented group and 4.0 cm in the standard group. At 12 months, we observed retears in 7 of 19 patients (37%) in the augmented group and 8 of 18 patients (44%) in the standard group. Both groups showed significant and clinically meaningful improvement in all functional scores, with no difference between them. We found that larger tears predicted a higher retear risk.

Discussion/Conclusions: Augmenting repair with a human dermal patch produced clinically meaningful functional improvement and demonstrated a comparable safety profile. This pilot study confirms the technique's feasibility but a larger, definitive trial is required.

Fragment specific internal fixation for locked posterior dislocation of shoulder: mean 6-year outcomes

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Purpose of the Study: To evaluate functional outcomes, complication rates, and the incidence of avascular necrosis (AVN) following fragment-specific internal fixation for locked posterior shoulder dislocations.

Methods and Results A retrospective review was conducted of all locked posterior dislocations treated with fragment-specific internal fixation between 2012 and 2024. Eleven shoulders (mean age 46) were included; mechanisms of injury included seizure (n=6), trauma (n=3), and electrocution (n=1 bilateral). Nine shoulders required iliac crest autograft for reverse Hill-Sachs lesions. Fixation utilised headless compression screws or small fragment screws, with supplemental plate fixation in two cases.

At a mean follow-up of 6.6 years, radiographic and clinical union was achieved in 100% of cases. Crucially, there were no cases of AVN, non-union, infection, or metalwork failure, and no patients required conversion to arthroplasty. One patient underwent early revision (at 7 days) from plate fixation to fragment-specific fixation due to malreduction. Two patients died from unrelated causes. Functional outcomes were excellent, with a mean Oxford Shoulder Score (OSS) of 44/48 (converted to the modern 0–48 scale).

Conclusion: Fragment-specific internal fixation for locked posterior dislocations is a safe, joint-preserving alternative to arthroplasty, achieving universal union with no cases of AVN at mid-to-long-term follow-up. These results challenge existing literature reporting AVN rates of 10–20%, suggesting that anatomical reconstruction provides durable clinical success across a broad age range, whilst recognising that larger multi-centre cohorts are required to define true long-term AVN and arthroplasty conversion rates.

Outcomes of Trabecular Metal Glenoid Baseplates in Reverse Total Shoulder Arthroplasty: A Minimum 10-year Follow-up Study

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Background: Robust glenoid baseplate fixation in reverse shoulder arthroplasty is vital to a stable implant construct. Trabecular metal-backed implants possess a number of unique properties which make them suited to this challenge. We report on a consecutive series of patients treated with a trabecular metal-backed glenoid baseplate at a minimum of 10 years follow up to establish long term patient-reported outcomes, range of motion and radiographic complications.

Method: From a prospectively maintained in-house arthroplasty database, 223 cases (197 patients) were identified. Oxford Shoulder Score, Constant & Murley Score, and range of motion data at 5- year and latest follow up were captured. Check radiographs at 5-year and latest follow up were also reviewed to establish presence & grade of scapular notching. Statistical analysis was performed using SPSS software.

Results: Mean implant survival was 94% at an average of 11.2 years. Average OSS and CMS at minimum 10 years were 33 and 52, respectively. Both scores were significantly worse than the same matched cohort at 5 years. There was no difference in range of motion at mid- and long-term follow up. Scapular notching was present in 85% of radiographs at mean 11.1 years, but average Sirveaux grade had not declined, and did not appear to correlate with worse patient outcomes.

Conclusion: Whilst patient-reported outcomes appear to decline over time, this may be more reflective of increasing age and co-morbidity, as range of motion and radiographic features remain largely static. Despite a high rate of scapular notching, implant survivorship beyond 10 years remains high at 94%. TM-backed glenoid baseplates provide a valuable and robust long-term solution for RTSA.

Does Acromial Contact with the Greater Tuberosity Predict Incidence of Acromial Stress Fracture in Grammont Style Prostheses?

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Aim: This study aimed to determine whether potential contact between the greater tuberosity (GT) and the undersurface of the acromion predicts scapular stress fracture following Reverse Shoulder Arthroplasty (RSA) using a Grammont-style prosthesis. Previous work has shown an association between contact and fracture in lateralised implants.

Methods: This was a single-centre, retrospective, matched cohort study. Stress fractures were identified through review of all primary RSAs performed at our centre between 2014 and 2024. Revision cases and those with less than one year of follow-up were excluded. Stress fracture cases were matched 2:1 to non–stress fracture controls for age, surgical indication, osteoporosis diagnosis, and comorbidities to control for established risk factors. Standardised mean differences were <0.1 for all variables, indicating excellent matching. Implant centre of rotation (COR) was templated, and distances from the COR to the GT (DGT) and to the lateral aspect of the acromial undersurface (DA) were measured. When DA < DGT, potential GT–acromial contact was present. The study was powered to detect moderate to large effects. Conditional logistic regression assessed the association between GT–acromial position and stress fracture occurrence. Secondary analysis evaluated DA–DGT as a continuous variable to assess the effect of overlap magnitude.

Results: The odds ratio for fracture when DA < DGT was 1.58 (95% CI 0.414–6.007), indicating a non-significant but moderate association. Secondary analysis demonstrated a 7% reduction in stress fracture odds for every 1 mm reduction in GT overlap (OR 0.930, 95% CI 0.871–0.994), equating to a 31% reduction per 5 mm. This association is true even when DA remains greater than DGT.

Conclusion: In conclusion, GT–acromial contact in Grammont prostheses appears to moderately increase stress fracture risk. Larger studies are required, but glenosphere lateralisation such that DGT approaches DA may increase the risk of stress fracture.

Shoulder Instrumentation and Surgeon Ergonomics - Great Danes and Chihuahuas

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Statement of Purpose: This study looks at shoulder implant introducer lengths and its effect on surgeon ergonomic recommendations.

Materials and Methods: The height of humeral stem inserters from a variety of manufacturers was evaluated with a view to gauge the vertical height needed to reach and insert the implant. Standard stemmed implants for reverse total arthroplasty systems were analysed.
The smallest size standard stem implant lengths for each manufacturer varied from 66mm to 132mm with the majority being press fit. Introducer or handle lengths also varied and averaged 30cm, when the implant had not yet been attached.
Negative ergonomic factors at the time of implantation were calculated by hand height required (total implant introducer length) and correlating this to surgeon arm elevation at different created by arm holder position. Step heights required to enable the most ergonomic position were also analysed.

Results: Surgeon heights varying from 142cm to 196cm have a working arm span between 45.5cm and 63.7cm. In a standard beach chair set up, for an implant with a 38.5cm introduction instrument, a step height required to allow ergonomic posture in accordance with guidelines would be 90.5cm for a surgeon of 142cm. Deviations from best ergonomic position can be tolerated, but by increased trapezius work, deltoid fatigue and carpal load.

Implants with an offset handle, give the best ergonomic advantage, by providing a drop of 8cm, at which level the wrist torque is not affected significantly. For every 5cm of handle length increase in a linear direction, an increase in surgeon shoulder elevation by 7-10° is required without compensation for by step height or table adjustment.

Conclusion: For shoulder implantation, handle length adds a linear vertical demand that cannot fully be neutralised by either arm holder position change, operating table height lowering, or even standard operating theatre step usage.

Elbow fracture-dislocations: Is less more? A review of outcomes of conservative and operative intervention from a single centre using the Wrightington classification

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Purpose: This study aimed to assess outcomes of both conservatively and operatively managed fracture-dislocations of the elbow categorised according to the Wrightington classification, as well the influence of co-morbidities and social deprivation on outcomes.

Methods: A retrospective cohort study was conducted from 2015 – 2021 identifying all elbow fracture-dislocations treated at a single tertiary centre. Inclusion criteria were elbow fracture-dislocations and aged over 18. Exclusion criteria were; open injuries and insufficient data.
Data extraction included; Demographics, Wrightington classification, Charlson comorbidity index (CCI), post-code deprivation score, Range of movement (ROM) and complications. For operatively treated patients, time to operation and fixation method were also recorded.
Questionnaires detailing current ROM and Oxford Elbow Score (OES) were sent to all patients.
Statistical analysis was undertaken with univariable logistic regression used to determine if comorbidities or socioeconomic deprivation is associated with post-operative complications.

Results: 89 patients were identified with Wrightington A (21%), C (43%) and D+ (17%) the commonest subtypes. Majority of Type A (79%) were treated conservatively with no complications regardless of treatment. All type B were operatively treated with a complication rate of 20%.
ANOVA analyses demonstrated no significant differences in the OES and flexion arc between the groups. Notably pronosupination in Wrightington C were significantly inferior when compared against all other subtypes. Furthermore largest subset analysis on Type C injuries showed an association between higher CCI and complications ($P=0.05$). Higher CCI was associated with significantly worse pronosupination ($P<0.05$). Deprivation category did not impact on outcomes.

Conclusion: This is the largest series reporting according to the Wrightington classification and the first to assess factors associated with poorer outcomes. We have shown Type A injuries can be reliably treated with conservative management and good functional outcomes. Type C are associated with significant reduction in pronosupination, as are patients with a higher CCI.