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EFFECT OF PARATHYROID HORMONE ON MICROARCHITECTURE AND BIOMECHANICAL PROPERTIES OF THE BONE-TO-SUTURE ANCHOR INTERFACE IN A RABBIT MODEL OF DISUSE OSTEOPOROSIS

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Aim & Background: Suture anchor loosening due to poor bone quality significantly compromises pullout strength and surgical outcomes after arthroscopic rotator cuff repair. We aim to evaluate the effectiveness of systemic recombinant human parathyroid hormone (rhPTH) in enhancing the bone-to-suture anchor interface in a rabbit model of disuse osteoporosis.

Methods: A total of 24 rabbits were assigned into the three groups: osteoporosis (group A), control group (group B), and osteoporosis treated with rhPTH (group C). Disuse osteoporosis model was induced by forelimb immobilization with a cast for 6 weeks. Biocomposite suture anchors were inserted into the greater tuberosity in all groups. Group C received a daily dose of 10ug/kg of teriparatide for 8 weeks following anchor insertion. Outcomes assessed 8 weeks after surgery included microarchitecture parameters (bone volume [BV], percent bone volume [PBV] and bone mineral density [BMD]) using micro computed tomography, and biomechanical properties (load-to-failure) using a universal testing machine.

Results: For microarchitecture analysis, Group C showed the highest BV (27.87 ± 3.33 for group A, 37.45 ± 3.81 for group B, and 41.72 ± 6.43 for group C, $p < 0.001$), PCV (29.92 ± 3.49 for group A, 40.12 ± 4.34 for group B, and 45.96 ± 6.94 for group C, $p < 0.001$), and BMD (0.10 ± 0.02 for group A, 0.13 ± 0.03 for group B, and 0.15 ± 0.04 for group C, $p = 0.041$) at 8 weeks after surgery. Biomechanical testing showed the highest load-to-failure in group C (29.0 ± 4.0 for group A, 36.9 ± 3.5 for group B, and 38.6 ± 3.7 for group C, $p = 0.008$).

Conclusion: Systemic administration of rhPTH significantly improved bone ingrowth and biomechanical integrity at the suture anchor interface. These findings demonstrate that rhPTH effectively mitigates anchor loosening and enhances pullout strength in cases of arthroscopic rotator cuff repair, particularly in osteoporotic proximal humerus.

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IMPLANTATION-SPECIFIC FEATURES OF A NEW METAPHYSEALLY ANCHORED AND CONVERTIBLE SHORT STEM SYSTEM

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Aim & Background: The aim was to investigate the clinical and radiological results after anatomic (TSA) and reverse (RSA) total shoulder arthroplasty with a metaphyseally anchored and convertible press-fit short stem system with a collar.

Methods: We included patients treated with RSA (for primary osteoarthritis, OA); and cuff tear arthropathy, CTA) and TSA (for OA) with a metaphyseally anchored, convertible press-fit short stem system with a collar.

Radiographically, the filling ratio (FR) of the short stem was evaluated in 2 planes (anteroposterior, AP; axial, AX) and in relation to the deviation of the short stem from the longitudinal axis of the humerus using intraoperative images. In TSA, the FR was also evaluated in relation to the planned center of rotation. Postoperatively, alignment and osseous remodeling were analyzed. Clinical scores (Constant Score, CS; Subjective Shoulder Value, SSV; Shoulder Pain Index, SPADI and functional limitation, DASH) were recorded.

Results: Forty-nine patients (25 males; mean age 72.0 years; follow-up 1.46 years) were included: Thirty-five cases with RSA (20 CTA, 15 OA) and 14 cases with TSA. Patients with RSA were older [74.8 years (95% CI, 71.9–77.7 years) vs. 64.9 years (61.0–68.9 years); $p < 0.001$].

The stem was centered in 80% of cases ($n=39$), in varus in 14% ($n=7$) and in valgus in 6% ($n=3$) of cases.

A larger metaphyseal FR was associated with less malalignment in both radiographic planes (AP: $r=-0.438$; $p=0.011$; AX: $r=-0.387$; $p=0.026$). FOR TSA in AP, however, it was associated with an increasing deviation from the planned center of rotation (overstuffing) ($r=0.664$; $p=0.014$).

TSA patients showed better scores in absolute terms, although not statistically significant [CS: 79.5 points (63.8–95.2 points) vs. 73.9 points (69.8–78.0 points); $p=0.525$; SSV: 90.0 (82.4–97.6) vs. 84.9 (78.2–91.6); $p=0.827$; SPADI: 6.0 points (0–15.7) vs. 16.3 (7.9–24.7); $p=0.183$; DASH: 12.3 (0–27.3) vs. 22.0 (14.2–29.8); $p=0.285$].

Mean subsidence was 0.5mm (0.1–0.9mm). Two patients (4%) showed a secondary varus malalignment. Stress shielding was seen in 18% ($n=9$) (exclusively laterally); 12% ($n=6$) had a condensation line.

Notching in RSA occurred in 10% ($n=5$). Loosening of the glenoid in TSA was present in 29% ($n=5$).

Conclusion: There are good clinical and radiological results of a metaphyseally anchored, convertible press-fit short stem with a collar.

These results show no significant differences between RSA and TSA, but implant and FR may influence the results. A higher metaphyseal FR in RSA is associated with a centered implant position, while overstuffing should be avoided in TSA.

SECEC00459

REVERSE SHOULDER ARTHROPLASTY: HOW TO REACH THE BACK? A MOTION CAPTURE STUDY TO ANALYSE GLENOHUMERAL STRATEGIES TO PERFORM FUNCTIONAL INTERNAL ROTATION AFTER RSA AND IN CONTROL CASES

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Aim & Background: Reverse shoulder arthroplasty (RSA) often restores satisfactory forward flexion and external rotation, but internal rotation with the hand behind the back (IR1), crucial for daily activities, remains unpredictable. This study explores the mechanisms enabling IR1, its anatomical correlations, and the minimal required amplitudes to achieve this motion.

Methods: A retrospective motion capture analysis of upper limbs was conducted. Control cases were assessed for humeral torsion, glenoid version, and scapular type. Maximal glenohumeral motions (flexion/extension [EXT], adduction [ADD]/abduction [ABD], and internal rotation [IR]) were measured and grouped by back-reaching strategies using k-means clustering. These strategies were correlated with anatomical features and compared between RSA and control groups. Strategies were further correlated with IR1 in the RSA group to identify optimal patterns.

Results: Results

Among controls ($n=40$), four groups were distinguished by EXT, ADD/ABD, and IR:

Group A ($n=16$): EXT $26^\circ \pm 6^\circ$, ABD $3^\circ \pm 5^\circ$, IR $24^\circ \pm 7^\circ$

Group B ($n=11$): EXT $19^\circ \pm 7^\circ$, ADD $3^\circ \pm 7^\circ$, IR $42^\circ \pm 5^\circ$

Group C ($n=6$): EXT $26^\circ \pm 7^\circ$, ABD $17^\circ \pm 6^\circ$, IR $49^\circ \pm 7^\circ$

Group D ($n=7$): EXT $12^\circ \pm 6^\circ$, ABD $4^\circ \pm 8^\circ$, IR $63^\circ \pm 8^\circ$

Humeral torsion showed very weak correlations with EXT, ABD/ADD, or IR ($r < 0.2$). Glenoid version correlated weakly with ABD/ADD ($r=0.37$) and very weakly with EXT and IR ($r < 0.2$). Scapular type did not significantly affect motions, except for IR, which tended to be greater in type C vs. type B ($48^\circ \pm 14^\circ$ vs. $33^\circ \pm 14^\circ$, $p=0.098$).

In the RSA group, 4 out of 10 reached their back. Successful and unsuccessful groups did not differ significantly in EXT ($16^\circ \pm 13^\circ$ vs. $19^\circ \pm 10^\circ$, $p=0.914$) or

ABD ($15^\circ \pm 16^\circ$ vs. $10^\circ \pm 4^\circ$, $p=0.761$), but successful patients tended to have greater IR ($39^\circ \pm 25^\circ$ vs. $22^\circ \pm 13^\circ$, $p=0.199$). Successful RSA patients exhibited motions resembling control group C, characterized by the highest EXT ($26^\circ \pm 7^\circ$) and ABD ($17^\circ \pm 7^\circ$).

Conclusion: Humeral torsion and glenoid version were not associated with ROM patterns. Scapular type C showed greater IR compared to type B. RSA patients achieving IR1 exhibited ROM patterns similar to controls with the highest EXT and ABD values. These last two amplitudes should be improved to regain IRI.

SECEC00460

BIOMECHANICAL EFFECTIVENESS OF LOWER TRAPEZIUS TENDON TRANSFER WITH INTERCALARY TENDON-BONE GRAFT VERSUS THE MODIFIED L'EPISCOPO PROCEDURE IN REVERSE TOTAL SHOULDER ARTHROPLASTY WITH PROXIMAL HUMERAL BONE LOSS

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Aim & Background: In reverse total shoulder arthroplasty (RSA), proximal humeral bone loss (PHBL) is associated with higher complication rates and inferior functional results, particularly loss of active external rotation (ER). Traditionally, adjunct tendon transfers such as the latissimus dorsi transfer (LDT) or the modified l'Episcopo procedure have been employed to address this. Recently, in native shoulders, lower trapezius transfer (LTT) has gained popularity as an alternative method to restore ER. To date, almost no literature exists on its use in RSA. The purpose of this study was to evaluate the biomechanical effectiveness of a novel, modified LTT technique using a tendon-bone allograft (LTT+), that aims to reconstruct the greater tuberosity in situations of PHBL, and to compare it with the modified l'Episcopo procedure. It was the hypothesis of this study, that LTT+ would provide comparatively higher ER and lower adduction (ADD) moments.

Methods: Ten right, cadaveric upper limbs were prepared by resecting the proximal humerus including both tuberosities, thus creating moderate PHBL (~4cm). RSA was performed, and both an LTT+ and a l'Episcopo were added. The specimens were mounted on a custom-built testing apparatus, and an optical motion analysis system was employed to record joint kinematics and tendon excursions. During passive rotational and abduction-adduction motion cycles, the ER and ADD moment arms were computed using the tendon-excision method.

Results: Both LTT+ and l'Episcopo are biomechanically effective in generating shoulder ER in RSA with PHBL. LTT+ moment arms were higher, significance being reached in end-range ER positions. For pooled internal rotation (-20° to 0° rotation), low (0° to 45° rotation) and high ER (45° to 70° rotation), the mean differences of the ER moment arms were significant in all abduction positions ($p<0.0001$ for all three groups). The ADD moment arms of LTT+, measured in neutral rotation in the scapular plane between 40° and 70° abduction, were significantly lower than l'Episcopo's ($p<0.0001$). The differences were most relevant in lower degrees of abduction.

Conclusion: Biomechanically, both LTT+ and the modified l'Episcopo procedure demonstrated effective shoulder ER capacity when added as adjunct procedure to RSA. LTT+ provided significantly higher ER moment arms and, additionally, lower ADD moment arms, thereby potentially avoiding antagonisms with the deltoid during abduction and elevation. These effects may strongly depend upon the transfers' insertion site and technique.

SECEC00481

EFFECT OF GLENOHUMERAL RADIAL MISMATCH ON ASEPTIC LOOSENING OF THE CEMENTED GLENOID COMPONENT IN TOTAL SHOULDER ARTHROPLASTY IN PATIENTS WITH WALCH A GLENOIDS

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Aim & Background: Aseptic glenoid component loosening is a common cause of revision after anatomic total shoulder arthroplasty (ATSA), with glenohumeral radial mismatch influencing implant outcomes. While smaller mismatches are linked to radiolucency and loosening, no studies have examined their effect on implant survival. This study aims to assess the impact of high (≥ 5 mm) versus low (< 5 mm) glenohumeral radial mismatch on glenoid component survival in Walch A glenoid patients undergoing ATSA.

Methods: In this retrospective cohort study, a total of 1,715 patients were included. The patients were divided into two groups based on glenohumeral radial mismatch: low mismatch (< 5 mm) and high mismatch (≥ 5 mm). The association between radial mismatch group and the survival of the glenoid component was evaluated using a chi-squared test, Kaplan-Meier survival analysis, and Cox regression analysis. For the primary outcome, all revisions for aseptic loosening or a peri-prosthetic fracture in which the glenoid component was replaced were considered a revision for glenoid component failure.

Results: The median radial mismatch was 4.8 mm (IQR: 3 – 6.2). The cohort consisted of 911 patients in the low mismatch group (< 5 mm) and 804 patients in the high mismatch group (≥ 5 mm). The mean age of the cohort was 66 years (range: 32 – 90 years). The primary indication for anatomic total shoulder arthroplasty was osteoarthritis in 89% of the cases. The median follow-up time was 5.3 years (IQR: 2.8 – 7.7). A total of 55 (3.2%) glenoid components were revised, with 23 (1.3%) revisions due to glenoid component failure. No significant associations were found between radial mismatch group and glenoid component survival.

Conclusion: In the current literature, previous studies have demonstrated associations between radiolucency and radial mismatch. However, to date, no clear correlation has been established between radial mismatch and implant survival. Most of the existing research has been limited to biomechanical studies or small cohort studies. This study of 1,715 Walch A glenoid patients undergoing anatomic total shoulder arthroplasty found no significant association between glenohumeral radial mismatch (< 5 mm vs. > 5 mm) and glenoid component survival.

SECEC00489

LONG-TERM OUTCOMES OF THE OPEN LATARJET PROCEDURE FOR RECURRENT ANTERIOR SHOULDER INSTABILITY IN PATIENTS OVER 50 YEARS OLD

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Aim & Background: Anterior shoulder instability affects both young and older patients, although the underlying mechanisms and risk of recurrence vary with age.

While recurrences are particularly frequent in younger patients, their incidence decreases significantly after the age of 50, with reported rates below 10%. In patients older than 50 years, 62% of cases involve rotator cuff tears, making tendon repair the primary treatment. For those without rotator cuff injuries, managing anterior instability remains challenging. The Latarjet procedure is a well-established surgical option for anterior shoulder instability. While its effectiveness has been widely demonstrated in younger patients, data on its application in patients over 50 remain limited. In this context, this study aims to evaluate the long-term clinical and radiographic outcomes of Latarjet stabilization in patients aged 50 and older with recurrent anterior shoulder instability and without rotator cuff tear.

Methods: Inclusion criteria involved patients over 50 years of age who had undergone open Latarjet bone block surgery between January 2003 and February 2023 at 4 different centers in France and Switzerland. Patients with associated rotator cuff tears were excluded. Criteria studied included shoulder mobilities, Walch Duplay (WDS), Constant Murley (CM), Subjective Shoulder Value (SSV) functional scores, existence of recurrence, complication, apprehension and revision surgery. Postoperative radiographs were also analyzed to assess the existence of osteoarthritic degradation according to Samilson and Prieto's classification.

Results: A total of 39 patients were included in our study, with a mean follow-up of 7.5 years (range, 2 – 20 years). At the last follow-up, only one