

Shoulder

7 Medium Term Outcomes Of Stemless, Ceramic Head, Anatomic Shoulder Replacement In Patients With Type B And C Glenoids. Results Better Than Expected.

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Aim

To review the medium-term outcomes of anatomic shoulder replacements in patients with type B and C glenoids.

Background

Although in general anatomic shoulder replacement has been a successful procedure, there have been reports of poor outcomes in patients with severe glenoid wear, particularly with the Walch B2 glenoid.

Methods

Data from a prospective multi-surgeon trial regarding the outcomes of a short stem humeral shoulder prosthesis system with a double pegged cemented glenoid component was interrogated for all patients who had a type B or C glenoid at the time of surgery. Clinical follow-up was at two years. Radiographic follow-up was at minimum five years.

Results

42 patients underwent anatomic total shoulder replacement over a three-year period. There were 25 males. Average age was 67.8 years. There were 20 B1, 19 B2, and 3 type C glenoids judged at the time of surgery from the CT scan. It was possible to obtain the DICOMs from previous digitalised CT scans in 27 of the shoulders. Assessment using the Blueprint Planning software demonstrated a mean retroversion of 21 degrees (range 5 – 42), mean posterior subluxation of 76 degrees (61 – 91), and mean superior inclination of 7 degrees (0 – 26). The demographics of these patients was similar to the remainder. The overall ASES improved from 40 to 88, the Constant improved from 33 to 80, active elevation improved from 62 degrees to 154. No shoulder required revision and there were no complications. X-rays from 5 – 7 years postoperatively demonstrated that all glenoid components remained solidly fixed with minimal radiolucent lines. There was only minor proximal humeral osteolysis.

Conclusions

In this paper good results were obtained in this group of patients with glenoid retroversion up to 42 degrees.

23 Scapula Morphology. Chicken And Egg Debate?

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Aim

The hypothesis of this study was that variations in scapular morphology (CSA) reflect bone adaptation to repetitive stress or activity.

Background

Several shoulder pathologies, such as rotator cuff lesions, gleno-humeral arthritis or posterior instability, are believed to be associated with variations in native scapular morphology, mostly represented by the CSA. The latter concept is mainly based on retrospective non comparative studies. The shape of the scapula reflects changes which have been brought about by more unusual or specialized functional demands. In unilateral overhead athletes, greater muscle strength on the dominant arm is known to stimulate bone adaptations, including scapular lateralization with internal rotation, anterior tilt, and reduced subacromial space.

Methods

The authors prospectively evaluated true antero - posterior radiographs of 19 competitive tennis players aged 40.4 ± 10.0 years (range, 22.0 – 61.0). The cohort comprised 17 men (89 %) and 2 women (11 %) who had been trained at a competitive level for over 10 years. A priori sample size calculation suggested that a minimum of 8 patients was required to confirm if a difference in CSA of $3.5^\circ \pm 2.5^\circ$ between dominant and non-dominant arms is statistically significant, with a power of 90 %. The inter-observer agreement for CSA measurements was high (intra-class correlation coefficient, 0.88; CI, 0.76 – 0.94).

Results

Dominant shoulders had a CSA of $36.9^\circ \pm 3.9^\circ$ (median, 36.0° ; range, $30.0^\circ - 43.5^\circ$) while non-dominant shoulders had a CSA of $34.6^\circ \pm 3.3^\circ$ (median, 34.5° ; range, $29.4^\circ - 41.0^\circ$). The CSA was greater in dominant than non-dominant shoulders by $2.3^\circ \pm 2.3^\circ$ (median, 2.6° ; range, $-2.9^\circ - 5.2^\circ$, $p < 0.005$).

Conclusions

Unilateral overhead sports may lead to bone adaptation and increase the CSA on the dominant shoulder compared to the non-dominant side. Even if this study does not question the whole CSA philosophy, it seems premature to state that scapular morphology is responsible for most shoulder pathologies. On the contrary, activities or underlying pathologies could be responsible of bone remodeling creating lateral extension of the acromion. Further high level prospective studies seem mandatory.

22 Early Versus Delayed Surgical Treatment Of High Grade Acromioclavicular Joint Dislocations

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Aim

To compare functional outcomes of early and delayed surgical treatment of high grade acromioclavicular joint (ACJ) dislocations.

Background

Although non-operative treatment of low-grade ACJ dislocations is widely accepted, the benefits of surgical treatment of high-grade ACJ dislocations remains controversial. Only few studies compared outcomes of early versus delayed surgical treatment of high-grade ACJ dislocations, but none of them used specific or contemporary techniques or scores.

Methods

We retrospectively reviewed 43 consecutive patients who underwent open stabilization of high-grade ACJ dislocations (Rockwood types \geq III): 23 underwent early stabilization (< 2 weeks after injury), performed with tied acromioclavicular and coracoclavicular cerclages, while 20 underwent delayed stabilization, performed by the modified Mazzoca technique. Patients were evaluated clinically at mean follow-up of 3.5 years using ACJI and Taft scores, as well as pain on visual analogic scale, subjective shoulder value (SSV) and overall satisfaction. Multi-variable regressions were performed to test associations between postoperative scores and timing of surgery, age, gender, and Rockwood types.

Results

The two groups did not differ in terms of preoperative patient characteristics or ACJ Rockwood types. At last follow-up, there were no significant differences between early and delayed surgery in terms of ACJI score (84.4 ± 14.6 vs 88.3 ± 14.3 , $p = 0.171$), Taft score (10.0 ± 1.3 vs 10.7 ± 1.3 , $p = 0.085$), pain (0.3 ± 0.6 vs 0.7 ± 1.1 , $p = 0.263$), SSV (95.1 ± 7.8 vs 92.5 ± 9.0 , $p = 0.352$) or satisfaction (9.6 ± 0.9 vs 9.4 ± 1.1 , $p = 0.444$). Multi-variable analyses confirmed that timing of surgery has no impact of ACJI and Taft scores.

Conclusions

Both early and delayed surgical treatment of high-grade ACJ dislocations showed satisfactory results. Early surgical treatment may not be appropriate in all cases, as most patients could benefit from non-operative treatment, and if necessary, can be operated with success at a later stage surgery.

Elbow

20 Factors Affecting Outcome Of Partial Radial Head Fractures: A Retrospective Cohort Study

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Aim

The purpose of this study is to evaluate which factors will affect range of motion (ROM) and function in partial radial head fractures. The hypothesis is that conservative treatment yields better outcomes.

Background

Radial head fractures are relatively common, representing approximately one-third of all elbow fracture. However, despite their high incidence, few studies have focused on this subject in the literature. Treatment algorithms are usually guided by the modified Mason classification, and range from nonoperative treatment to radial head excision, with or without arthroplasty, depending on fracture type and the amount of displacement.

Methods

This retrospective comparative cohort study included 43 adult volunteers with partial radial head fracture, a minimum 1-year follow up, separated into a surgical and non-surgical group. Risk factors were: associated injury, heterotopic ossification, worker's compensation, and proximal radio ulnar joint (PRUJ) impaction. Outcomes included radiographic ROM measurement, demographic data, and quality of life questionnaires (PREE, Q-DASH, MEPS).

Results

Mean follow up was 3.5 years (1-7 years). Thirty patients (70%) had associated injuries with decreased elbow extension (-11° , $p=0.004$) and total ROM (-14° , $p=0.002$) compared to the other group. Heterotopic ossification was associated with decreased elbow flexion (-9.00° , $p=0.001$) and fractures involved the PRUJ in 88% of patients. Only worker's compensation was associated with worse scores. There was no difference in terms of function and outcome between patients treated non-surgically or surgically.

Conclusions

We found that associated injuries, worker's compensation and the presence of heterotopic ossification were the only factors correlated with a worse prognosis in this cohort of patients. Given these results, the authors reiterate the importance of being vigilant to associated injuries.

Shoulder

19 Calcium Sulphate Mixed With Antibiotics Does Not Decrease Efficacy Against Pathological Cutibacterium Acnes Strains (Formerly Propionibacterium Acnes), In Vitro Study

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Aim

To determine the in vitro efficacy of a variety of antibiotics when mixed with calcium sulfate against pathological Cutibacterium acnes strains and to study the behavior of calcium sulfate when mixed with each antibiotic.

Background

Although Cutibacterium acnes (*C. acnes*) is now a well recognized pathogen frequently found in deep post-operative infections of the shoulder, none of the antibiotic impregnated calcium sulfate beads used in reconstructive orthopaedic trauma surgery were specifically designed against this pathogen. It is also unknown whether calcium sulfate could affect antibiotic efficacy.

Methods

Consecutive *C. acnes* isolates collected from orthopaedic infection sites were tested against penicillin, ceftriaxone, vancomycin, clindamycin, rifampin and tobramycin for antimicrobial susceptibility. The Kirby-Bauer method was performed using standard antibiotic impregnated-disks and antibiotic calcium sulfate beads. In both cases, the contact surface for disk or bead was identical (6 mm diameter).

Results

All 22 isolates were susceptible to penicillin, ceftriaxone, vancomycin and rifampin, three were clindamycin-resistant, and all were resistant to tobramycin. The largest inhibition zone diameter values against *C. acnes* were: penicillin (90th perc =68mm), clindamycin (90th perc =60mm), and rifampin (90th perc=56mm). Compared to antibiotic disks, inhibition zone diameters were significantly larger with the beads for all antibiotics, except for ceftriaxone (90th perc =42mm and 46mm in disk). This was also observed in the clindamycin and tobramycin resistant-strains.

Conclusions

Antibiotics-calcium sulphate impregnated beads showed high in vitro efficacy against pathological Cutibacterium acnes strains. Penicillin and rifampin had the largest inhibition zone diameters and no cases of resistance. The clinical correlation of these results remains to be made.

18 High Incidence Rate Of Heterotopic Ossification In Patients With A Shoulder Or Elbow And Associated Mild Traumatic Brain Injury

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Aim

The objective of the current study is to describe the incidence of heterotopic ossification (HO) in patients with isolated limb fracture (ILF) to the shoulder or elbow and an associated mild traumatic brain injury (mTBI). Secondly, this study aims to assess delay to bony union of fractures and the impact of mTBI on function in these patients.

Background

The outcome of upper limb fractures is unpredictable. Forty percent of patients operated for upper limb fractures will exhibit a significant loss of function 2 years postoperatively and more than 15% will become narco-dependant. Neuroinflammation, from concomitant head injury or peripheral nerve injury, could be involved in chronic pain and stiffness in upper limb fractures and new research must look further than satisfactory radiological results to achieve good outcomes.

Methods

The current study is a retrospective cohort study including ILF patients to the shoulder or elbow with or without a concomitant mTBI, recruited from an orthopaedic clinic of a Level 1 Trauma Hospital. Patients were diagnosed with a mTBI according to the American Congress of Rehabilitation Medicine (ACRM) clinical criteria. Radiographs taken 3 months after the initial trauma were analysed separately by two distinct specialists for the presence of HO and bony union. Delay for return to work was also documented.

Results

Analyses were first conducted for the full sample. A matched cohort was then used in order to control for specific factors, namely age, sex, type of injury, and time elapsed between the accident and the analyzed radiograph. The full sample included a total of 201 patients with an ILF (110 females; 48.11 years old), of which 57 had a concomitant mTBI. The incidence of heterotopic ossification (HO) was 44% in patients with an associated mTBI and a fracture of an extremity, compared to 23% in patients with no mTBI ($p=0.001$). Matched cohort study (55 patients/group) showed similar results. Secondary analysis showed delayed union at 3 months in the mTBI group. HO formation influenced delays to return to work (RTW) only in ILF+mTBI patients (379 days for the mTBI + HO cohort vs 214 days for the mTBI cohort).

Conclusions

Study findings suggest that sustaining a comorbid mTBI puts ILF patients at significantly higher risk of developing HO. Associated TBI and ILF seems associated with delayed fracture union and delayed return to work. The impact of mTBI on HO formation warrants further attention to detect early signs of HO, to identify shared physiopathological mechanisms and, ultimately, to design targeted therapies.

17 Increased Risk Of Cut-Out With The Use Of 45 Mm Screws Or Longer When Fixing Proximal Humerus Fracture With A Locking Plate.

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Aim

To verify whether patients sustaining a PHF treated with screws ≥ 45 mm are subjected to more cut-out and re-operations.

Background

The most common complication after fixation of proximal humerus fracture (PHF) using locking plate systems is intra-articular screw perforation (cut-out). Factors related to screw cut-out are not well defined.

Methods

We retrospectively analyzed the radiographic and demographic data from cases of PHF treated at our institution with the Synthes Philos© locking plate. With the SliceOMatic software, we validated a method to accurately identify screws of 45 mm or longer on AP radiographs using a plate fixed on a synthetic humerus with locking screws of pre-determined lengths.

Results

Eighty-one patients (46%) of the 171 identified patients had at least one screw of 45 mm. Among the 80 reported complications, 34 patients had cut-out (20%) and of these, 14 (41%) were re-operated due to this complication. Patients with screws 45 mm had a 2.5 risk of cut-out ($p=0.016$) and 37% increased risk of reoperation. The presence of cut-out was significantly associated with more complex fracture ($p=0.017$), initial varus deformity (34% vs 15%, $p=0.05$), avascular necrosis (55% vs 21%, $p=0.003$) and longer operating room time ($p=0.019$)

Conclusions

Our study confirms the risk associated with the use of locking screws of 45 mm or longer in treating PHF.

16 Quantitative Localization Of The Entry Point Of The Lateral Ascending Branch Of The Anterior Circumflex Humeral Artery: A High Definition CT-Scan Radiological Study

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Aim

To define the localization of the entry point of the lateral ascending branch of the anterior circumflex humeral artery (LACHA) for better surgical management and prevention of injury to this important vessel. The hypothesis is that the insertion point of the artery will be constant in subjects.

Background

Proximal humeral fractures represent approximately 5% of all fractures and about 50% of all humerus fractures. To properly treat humeral fractures, it is important to have in depth knowledge of the different structures that compose it. Anatomically, the proximal humerus is made of different bony structures; among which the greater and lesser tuberosities, separated by the bicipital groove through which the tendon of the long head of the biceps and the anterolateral branch of the anterior circumflex humeral artery (ACHA) go through. The ACHA, is also known as the lateral ascending branch of the anterior circumflex humeral artery (LACHA).

Methods

A retrospective study of 27 tomographic images was conducted to generate a three-dimensional (3D) model and localize the entry point of the LACHA. Using a coordinate system consisting of three axes: the Proximal-Distal axis, the Anterior-Posterior Axis and the Medial-Lateral Axis (PDA, APA and MLA), the position of a foramen located in the superior portion of the bicipital groove and representing the entry point of LACHA was measured on each reconstructed model.

Results

On average, the foramen was located 10.0mm distal along the PDA from the most proximal point of the greater tuberosity (GT). Along the MLA and with respect to the most medial portion of the GT, the foramen was located 3.4mm medially, on average. No significant differences between men and women or between sides for foramen position measurements were found.

Conclusions

Unnecessary procedures to the proximal biceps, aiming to prevent chronic pain, should be avoided in fracture fixation as they would affect a significant source of blood supply to the humeral head. These findings will help surgeons protect the only vascular supply they can during fixation of proximal humeral fractures when using the anterior or antero-lateral approaches.

6 Long-Term Results Of The Arthroscopic Bankart Procedure For Recurrent Anterior Shoulder Instability In Patients Older Than 40 Years

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Aim

It was the aim of this study, to analyze our long-term results of the arthroscopic Bankart procedure for recurrent anterior shoulder dislocation in patients of at least 40 years of age.

Background

Several studies have suggested that age over 40 years is a risk factor for outcome after stabilization procedures. So far, no long-term results about the arthroscopic Bankart procedure in elderly are available.

Methods

Twenty-nine consecutive patients (30 shoulders) with a mean age of 49 (range, 40-69) years at surgery were personally evaluated at a mean follow-up of 13 (range, 9-18) years. Three patients (10%) received a concomitant single-tendon rotator cuff repair. Long-term results were assessed clinically and radiographically including CT scanning at final follow-up. Recurrent instability was defined as anterior apprehension or recurrent overt instability (subluxation and redislocation).

Results

Recurrent instability persisted in 10 shoulders (33%) and a recurrence of dislocation occurred in seven shoulders (23%) after a mean of 7.4 years. Redislocation was significantly associated with severe dislocation arthropathy ($p=0.025$) and revision surgery ($p<0.001$). Revision surgery was necessary in eight patients (27%) and included two re-Bankart and six Latarjet procedures. In the remaining 22 shoulders, the final overall result was rated as good or excellent in all except one patient and the relative preoperative Constant score and SSV had improved from 79% to 91% ($p=0.001$) and from 62 to 84 points ($p<0.001$). Dislocation arthropathy was severe in seven shoulders (32%) and had progressed by at least 2 grades in 11 patients (50%). Patients with severe dislocation arthropathy had already shown degenerative changes preoperatively as opposed to those who ultimately had mild or moderate ($n=15$) dislocation arthropathy ($p=0.002$).

Conclusions

Although the majority of patients remained satisfied up to 19 years postoperatively, the arthroscopic Bankart procedure for recurrent anterior shoulder instability in patients older than 40 years is associated with a high redislocation and revision rate. A third of the patients showed signs of severe dislocation arthropathy, which was found to be associated with recurrent instability and with preoperative degenerative changes.

5 The Value Of Shoulder Joint Aspiration

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Aim

It was the aim of this investigation to (1) analyze the sensitivity and specificity of shoulder joint aspirations in a large patient cohort, (2) the rate of unsuccessful aspirations and (3) the effectiveness of irrigation and re-aspiration in case of punctio sicca.

Background

Despite excellent specificity the sensitivity of shoulder joint aspiration has been reported to be low. In case of unsuccessful (dry) aspiration (punctio sicca) irrigation of the joint with saline solution and subsequent re-aspiration is a common practice.

Methods

We included patients undergoing revision shoulder surgeries that had fluoroscopic verified shoulder joint aspiration performed within 180 days prior to surgery. Intraoperative tissue samples were used to define joint infection and for sensitivity, specificity, PPV, and NPV calculation.

Results

Of 175 analyzed aspirations, 94 were primarily successful and 81 were primarily unsuccessful. In 119 of 175 cases, sufficient intraoperative tissue sampling (minimum of 3 samples) was documented. 31 of those were diagnosed to have a shoulder joint infection. Only 13 of these 31 infections were preoperatively detected through positive culture in the aspirated joint fluid (sensitivity: 42%, specificity: 98%). The sensitivity of the aspiration to detect *Cutibacterium acnes* is 24% and for *Staphylococcus aureus* 55%. None of the 44 primarily unsuccessful but additionally irrigated and re-aspirated joints (with sufficient intraoperative tissue sampling) showed microbiological growth in the aspirate. However, 7 of those 44 (16%) were later diagnosed as infections through positive intraoperative tissue samples. 8 infections that were missed by preoperative dry aspiration were caused by *Cutibacterium acnes* (5x), *Staphylococcus aureus* (2x) and *Staphylococcus warneri* (1x). 10 undetected infections that had an initial successful aspiration but missing growth in the cultures were caused by *Cutibacterium acnes* (7x), *Staphylococcus aureus* (3x) and *Staphylococcus epidermidis* (polymicrobial infection with *Cutibacterium acnes*).

Conclusions

Fluoroscopically verified shoulder joint aspiration has a sensitivity of only 42% and is therefore not reliable to sufficiently exclude shoulder joint infection. With 40%, we found a high number of dry shoulder aspirations. Irrigation in case of such a punctio sicca did not lead to any microbiological results, even in cases of proven infections and is therefore no effective measure.

92 Grammont Humeral Design Versus Onlay Curved-Stem Reverse Shoulder Arthroplasty: Comparison Of Clinical And Radiographic Outcomes With Minimum Two-Year Follow-Up

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Aim

The purpose of our study was to compare the clinical and radiographic outcomes of RTSA patients who received the classic Grammont implant or a curved short-stem onlay humeral component.

Background

There are few investigations comparing lateralized and medialized reverse total shoulder arthroplasty (RTSA) in patients with cuff tear arthropathy (CTA). This study assesses the outcomes of two RTSA designs.

Methods

Sixty-eight consecutive CTA patients (74 shoulders) with a follow-up of at least 24 months received a Grammont or an onlay curved short-stem humeral component, with or without glenoid lateralization; a cementless humeral stem was implanted in > 90%. Clinical outcome measures included active range of motion (anterior and lateral elevation, external and internal rotation), pain, and the Constant-Murley score. Radiological outcomes included radiolucency, condensation lines, cortical thinning (CT), spot weld (SW), loosening and subsidence, and tuberosity resorption (humeral component); radiolucency, scapular notching, formation of scapular bony spurs, ossifications, and loosening (glenoid).

Results

Both prostheses provided significant differences between preoperative and postoperative scores and showed a similar complication rate. Scapular fractures were found only in the patients who received the curved short-stem implant. Glenoid bone grafting did not significantly affect clinical scores. Both implants provided similar postoperative shoulder mobility, even though the lateralized curved stem was associated to higher delta scores for external rotation ($p=0.002$) and to lower rates of scapular notching ($p=0.0003$), glenoid radiolucency ($p=0.016$), and humeral bone remodeling ($p=0.004$ and $p=0.030$ for CT and SW, respectively).

Conclusions

Medialized and short-stem lateralized RTSA implants provided similar mid-term clinical outcomes and range of motion. The curved short stem was associated to higher delta scores for external rotation and to a lower rate of radiographic risk factors

Elbow

64 MID-TERM SURGICAL RESULTS OF PROXIMAL ULNAR AND RADIAL FRACTURE-DISLOCATIONS CLASSIFIED AND TREATED WITH A NEW COMPREHENSIVE CLASSIFICATION SYSTEM

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Aim

The aim of this study was to analyse the mid-term clinical results of a large sample of patients with complex fracture-dislocations of the proximal ulna and radius classified and treated with a new diagnostic and therapeutic classification system in order to assess its clinical usefulness.

Background

Complex fracture-dislocations of the proximal ulna and radius (i.e. trans-olecranon fracture-dislocations and "Monteggia-like lesions) represent a challenge even for expert orthopedic surgeons. A new comprehensive classification, the "Proximal Ulnar and Radial Fracture-Dislocation Comprehensive Classification System (PURCCS)", was recently proposed with a detailed diagnostic and therapeutic algorithm.

Methods

We studied 66 patients (67 elbows) with a mean age of 57 years. All patients were classified with the PURCCS by use of standard radiography, computed tomography, and intraoperative fluoroscopy. Surgical treatment was performed according to the PURCCS therapeutic algorithm. Patients were evaluated clinically and radiographically after a mean of 71 months of follow-up (range,6-156). The clinical evaluation was performed with the MEPS, DASH-score and the m-ASES.

Results

Each pattern of fracture-dislocation in our series found its own position within the PURCCS. At the last follow-up, the mean MEPS, DASH-score and m-ASES were 95.4, 8.52 and 100, respectively. The mean extension, flexion, pronation, and supination were 14°, 138°, 81°, and 78°, respectively. According to the MEPI, 88%, 9% and 3% of cases were rated as excellent, good and fair, respectively. Reintervention rate for major complications was 14% (2 proximal R-U synostosis, 2 elbow stiffness and 5 nonunion). A slight or moderate osteoarthritis was observed in 29% of patients.

Conclusions

The surgical treatment of complex fracture-dislocations of the proximal ulna and radius is effective when the main lesions of each injury pattern are treated adequately. This study showed satisfactory clinical results in the majority of cases, with few major complications and reinterventions. The PURCCS helps to identify the main lesions and its therapeutic algorithm helps to select the correct surgical treatment. The PURCCS is a comprehensive classification that may contribute to the surgical management of these difficult injuries.

Shoulder

102 Reverse Shoulder Arthroplasty For Cuff-Tear Arthropathy: Outcome, Revision Rate And Indication For Revision Of 950 Arthroplasties Reported To The Danish Shoulder Arthroplasty Registry

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Aim

To evaluate the patient-reported outcome and the risk of revision after reverse shoulder arthroplasty (RSA) for Cuff-Tear Arthropathy (CTA).

Background

If the non-operative treatment of CTA fails, shoulder arthroplasty can be used to reduce pain and improve shoulder function.

Methods

We included all patients treated with RSA for CTA reported to the Danish Shoulder Arthroplasty Registry from 2006 to 2015. Patient-reported outcome was measured by a postal survey 12 months (10 to 14) post-operatively using the Western Ontario Osteoarthritis of the Shoulder (WOOS) index. Revision rates were illustrated using the Kaplan-Meier method and the hazard ratios were calculated using the Cox regression model.

Results

There were 950 RSAs. The 10-year cumulative rate of revision was 8.5%. For the Delta Xtend the 10-year cumulative revision rate was 4.5%. The most common indications for revision were luxation (2.0%) and infections (1.9%). The hazard ratio for men being revised was 2.7 (95%CI 1.6-4.7; $p < 0.01$). 71% returned a complete questionnaire. The mean WOOS was 70 (IQR 53-92). There were no statistically significant or clinically relevant differences in WOOS between age groups (65/>65 years), gender or arthroplasty brand, but patients who had undergone previous surgery had a statistically significant inferior WOOS score (mean difference: 10.7, 95%CI 6.1-15.4; $P < 0,001$).

Conclusions

We found a satisfactory patient-reported outcome and an acceptable revision rate in a large cohort of RSA for CTA. Patients with previous surgery to the same shoulder had a significant inferior WOOS score and men had an increased risk of revision.

Technical tips and tricks

59 The New Full Arthroscopic Revision Technic After Latarjet Procedure

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Aim

Aim of the study is improve the results of revisions after coracoid transfer procedure.

Background

The Latarjet procedure is method of choice in case of glenoid bone loss and anterior inferior instability or revision procedures. However, recurrence after this procedure is possible. One of the methods for the revision after Latarjet procedure is Eden-Hybinette technique. The recurrence after this bone grafting procedure is described too. One of the reasons of recurrence is graft resorption and capsular deficiency. Long head of biceps transfer for capsular reinforcement was described by several authors and can improve the results.

Methods

We describe a full arthroscopic revision technic after Latarjet procedure , which consists of transposition of the long head of the biceps together with bone block through subscapular split. Tips, tricks and step by step technic are presented.

Results

The early results of first 3 cases are described. After 3 months bone and tendon healing is confirm on MRI and CT. Full range of motion, absence of apprehension and biceps pain was reached at 6 months.

Conclusions

The arthroscopic transposition of bone block together with long head of biceps through the subscapular split like in initial Latarjet procedure can be perspective surgical treatment option for recurrence after coracoid transfer.

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72 Uncemented Reverse Total Shoulder Arthroplasty For Acute Four-Part Proximal Humerus Fractures

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Aim

The aim of the study is to report the preliminary results of a consecutive series of patients, that underwent a reverse total shoulder arthroplasty (rTSA) for acute four-part acute proximal humerus fracture / fracture-dislocation with uncemented rTSA

Background

rTSA is increasingly used for treatment of acute four-part proximal humerus fracture/fracture-dislocation. Cemented implants are usually used

Methods

Between 2009 and 2016, 31 patients (mean age 81.2 ± 7.5 ; 19F, 2M) with acute four-part proximal humerus fracture/fracture-dislocation were operated with an uncemented stemmed rTSA. An impaction grafting technique was used in all the cases to increase the humeral component stability. An antero-superior approach was chosen and a "double row" equivalent intraosseous technique was used to reattach the deltoid to the acromion. All the patients rested the arm 3 weeks in a polysling before starting the rehabilitation protocol. Patients were prospectively clinically assessed preoperatively, at 3 weeks, 3, 6, 12 months and yearly postoperatively: Constant Score (CS), Subjective Shoulder Value (SSV), Patient Satisfaction Score (PSS) were used

Results

At 6 months' follow-up, the mean CS was 49.2 ± 17 . The mean range of movement was: elevation $106.2^\circ \pm 42.3^\circ$, abduction $100^\circ \pm 36.6^\circ$, external rotation $28.8^\circ \pm 21^\circ$ and internal rotation $68.1^\circ \pm 19.3^\circ$. All the patients were satisfied with the results of the procedure and 48% rated the shoulder being much better. Only 1 intraoperative complication was observed

Conclusions

rTSA for acute proximal humerus fracture/fracture-dislocation showed good preliminary results with high satisfaction rate and good improvement in terms of pain, discomfort and function. At 6 months follow-up, most of the patients had already regained a functional range of movement, resuming their daily life activities. rTSA in acute proximal humerus fracture in the elderly, is a viable option that reduce the recovery time and allows the patient to have a quick recovery and return to function after the injury

68 Reverse Total Shoulder Arthroplasty In Patients With Parkinson's Disease

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Aim

The study purpose was to report rTSA outcomes in patients with Parkinson's disease

Background

Parkinson's disease is associated with increased muscle tone, tremor and high risk of falls. Poor outcomes have been reported with anatomic total shoulder arthroplasty and there is concern regarding the potential for poor outcomes of reverse total shoulder arthroplasty (rTSA)

Methods

We identified all patients treated with rTSA who also had a diagnosis of Parkinson's disease. Data was collected prospectively. Clinical outcome assessed with Constant score, Pain score, Subjective Shoulder value (SSV), strength, range of movement and complications. Mean follow-up was 49 months.

Results

There were 9 shoulders in 7 patients, 2 bilateral. 5 were revision surgeries to rTSA: 1 from anatomic TSA, 2 from hemiarthroplasty and 2 from resurfacing. Mean age at surgery was 71y 3m. Mean Constant score improved from 24.1 (Adjusted 32.2) preoperatively to 65.8 (Adjusted 91.1) postoperatively ($p < 0.0001$). Pain Score (No pain = 15) improved from 5.6/15 to 13.7/15 ($p < 0.005$) and SSV from 1.4/10 to 8.4/10 ($p < 0.005$). Strength improved from 2.4lb to 9.5lb ($p = 0.0001$). Mean postoperative movement was 132° forward flexion, 121° abduction, 26° external rotation and 85° internal rotation. All patients could reach to or beyond the top of their head and their sacroiliac joint. There was no difference between 1-year follow-up and final follow-up scores. All patients were happy with surgery rating 8 shoulders as "much better" and 1 as "better" than preoperatively. There were no intra-operative surgical complications. X-ray review showed only 2 cases of non-progressive Grade 1 glenoid notching. There were no lucencies, subsidence or stress shielding. No periprosthetic fractures occurred.

Conclusions

Parkinson's disease should not be considered a contraindication for rTSA. Patients with Parkinson's can expect good clinical and radiographic outcomes, and high rates of satisfaction. rTSA allows return to activities of daily living and functional independence

67 Clinical Results Of A Short Metaphyseal Reverse Total Shoulder Arthroplasty (RTSA) In Patients Aged 65 Or Younger: Minimum 2 Years Follow Up (2 – 11 Years Follow Up)

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Aim

to assess the outcome of a short metaphyseal rTSA in patients aged 65 or younger

Background

Reverse total shoulder arthroplasty (rTSA) are increasingly used in recent years for treatment of glenohumeral arthropathy with deficient rotator cuff. Bone preservation is becoming a major goal in shoulder replacement surgery, especially in young patients. Metaphyseal humeral components without a stem were developed to minimize bone resection and preserve bone.

Methods

We evaluated 44 patients (29 F, 15 M) with a mean age of 59 years (range, 33-65 years) that underwent metaphyseal rTSA between 2006 - 2015. 17 were revisions. Indications were cuff tear arthropathy, rheumatoid arthritis, primary osteoarthritis and fracture sequelae. Constant Score (CS), Pain score, Subjective Shoulder Value (SSV) and patients' satisfaction were used preoperatively and postoperatively with mean follow up 49 ± 25.7 months.

Results

Mean CS improved from 18.1 ± 11.9 to 60.1 ± 18.6 ($p < 0.001$) (Age/sex adjusted to 83.5 ± 25.2). Pain score improved from 3.5/15 to 11.1/15. Mean active elevation $141.1^\circ \pm 41.9^\circ$ ($p < 0.001$), active abduction $136.8^\circ \pm 44.7^\circ$ ($p < 0.001$), active external rotation $36.9^\circ \pm 21.4^\circ$ ($p < 0.001$) and active internal rotation $66.2^\circ \pm 23.1^\circ$ ($p < 0.001$). All the patients rated their shoulder as much better or better, with 68% excellent. There were no statistically significant differences between outcomes at 12 months and the last follow up; however, some further improvements were seen in almost all shoulders with time. No differences were observed between primary and revision cases. No lucencies, loosening, subsidence or stress shielding were evident radiographically. One case of grade-2 glenoid notching. 2 cases had postoperative complications.

Conclusions

rTSA can be used with good results and high satisfaction in patients aged 65 years or younger. The use of a short metaphyseal implant that preserves the bone, allows its use in young patients as all options are preserved if any future surgeries will be needed. Good clinical and radiological results are maintained over time.

66 Manipulation Under Anaesthetic For Frozen Shoulder Using Codman's Paradox

- Safe And Early Return Of Function

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Aim

We utilise Codman's paradox to manipulate the shoulder, avoiding rotational torque on the humerus. The aim of our study was to assess shoulder function in the early post manipulation under anaesthetic (MUA) period.

Background

Although previously frozen shoulder was thought to resolve by 2-3 years, recent studies demonstrated the symptoms can remain for much longer. Manipulation under anaesthetic (MUA) has been shown to be successful in relieving pain and restoring function. Yet, concerns have been raised regarding its safety and the risks of complications.

Methods

212 consecutive patients (224 shoulders) (mean age 52.4 years) underwent MUA using Codman's paradox for frozen shoulder as sole procedure between 2005 and 2013. All evaluated clinically, preoperatively and postoperatively, at 3 weeks and 3 months, for Constant score (CS), pain, range of motion (ROM), patient satisfaction and subjective shoulder value (SSV).

Results

At 3 weeks and 3 months, a significant improvement was found in CS from 30.7 to 66 and 70 respectively. Forward elevation improved from 91° to 154° and 160°, Abduction from 69° to 150° and 156°, Internal rotation from 12° to 62° and 66°, and External rotation from 10° to 46° and 50°. Pain score improved from 4.4/15 to 9.6/15 and 10.4/15, SSV improved from 1.5/10 to 6.5/10 and 6.7/10. ($p < 0.001$).

Conclusions

Use of Codman's paradox provides a safe and efficient way to perform MUA for frozen shoulder. It results in dramatic early improvement in ROM, functional outcomes and high satisfaction, as early as 3 weeks postoperatively.

65 Clinical And Radiological Outcomes Of Large And Massive Rotator Cuff Tears Treated With Arthroscopic Augmented Rotator Cuff Repairs Using Extracellular Matrix Patch: Minimum 1-Year Follow Up

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Aim

The primary aim of the current study is to assess the structural integrity of a series of augmented RCR utilising magnetic resonance imaging (MRI), at 1-year follow up. The secondary aim is to report the functional outcome.

Background

Healing of rotator cuff tendons is still a challenge especially in the elderly population. Failure rate of rotator cuff repairs(RCR) is still high(25-70%): augment patches may provide both a structural and a biological support.

Methods

Between 2014 and 2016, 45 patients with large-massive rotator cuff tears were prospectively enrolled in the study. They all underwent arthroscopic double-row RCR with extracellular porcine dermal matrix augmentation. At 1-year, an MRI scan was performed to assess integrity of the repair. Oxford Shoulder Score(OSS), Constant Score(CS) and Visual Analogue Scale(VAS) pain score were used preoperatively and at 3, 6, 12-month follow-up. Minimum follow-up: 1-year.

Results

Patients mean age was 70(53-81). MRI scans performed at 1-year showed 7 rotator cuff tears out of 34 patients(20%). Both mean CS and OSS improved postoperatively at 3,6 and 12-month, with statistically significant improvement($p < 0.01$) already at 3-month. Range of movement significantly improved: mean abduction improved from $95.8^\circ (\pm 33.3^\circ)$ to $161.8^\circ (\pm 21^\circ)$ ($p < 0.05$); mean forward flexion from $107^\circ (\pm 37^\circ)$ to $165.9^\circ (\pm 24.3^\circ)$ ($p < 0.05$). The pain also decreased significantly postoperatively ($p < 0.01$). No complications or adverse reactions were observed.

Conclusions

This study showed a healing failure rate of 20%, which is low compared to what is described in the literature for standard rotator cuff of large-massive tears in similar patient age groups to ours. Augmented patches were shown to be a safe and reliable support to RCR for large-massive tears. Patients recovered good shoulder function and returned to their daily life activities with good control of pain.

Basic Science

41 Regional Differences In The Three-Dimensional Bone Microstructure Of The Radial Head: Implications For Observed Fracture Patterns

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Aim

The aim of this study is to describe the trabecular bone microstructure of the radial head, using high-resolution three-dimensional micro-computed tomography (micro-CT).

Background

In radial head fractures, the anterolateral quadrant is found most frequently involved. Several hypotheses about the influence of the trauma mechanism and gross bone anatomy exist; however, a clear explanation is still missing. A characterization of the underlying bone microstructure could provide a better understanding of the common fracture patterns.

Methods

Six dry cadaveric human proximal radii were scanned by micro-CT (17 $\mu\text{m}/\text{pixel}$, isotropic). Stacks of sagittal and axial slices were created, and quantitative and qualitative assessments performed. The trabecular bone microstructure was quantified in 4 quadrants (subdivided into 3 sectors each, in which a cylindrical volume was inscribed for analysis, 3 mm height x 3.5 mm diameter): the anterolateral (AL), posterolateral (PL), posteromedial (PM) and anteromedial (AM) quadrant. For each quadrant, the average value of the 3 cylinders was obtained.

Results

Groups of trabecular struts were observed, spanning from the foveal joint surface to the medial and lateral cortices, with more multidirectional trabeculae on the medial side of the radial head. The AL and PL quadrants displayed the lowest bone volume fraction and trabecular number (BV/TV 18.5 \pm 4.3 %, Tb.N 0.95 \pm 0.14 mm⁻¹) and highest trabecular separation (Tb.Sp 0.72 \pm 0.08 mm) compared to the PM and AM quadrants (BV/TV 27.8 \pm 5.0 %, Tb.N 1.29 \pm 0.19 mm⁻¹, Tb.Sp 0.59 \pm 0.08 mm) ($p=0.03$).

Conclusions

Our microstructural results suggest that the lateral side is the "weaker side", exhibiting lower bone volume fraction, less trabeculae and higher trabecular separation, compared to the medial side. As the forearm is pronated during most falls, the underlying bone microstructure could explain commonly observed fracture patterns of the radial head, particularly more often involving the AL quadrant. If screw fixation in radial head fractures is considered, surgeons should take advantage of the "stronger" bone microstructure of the medial side of the radial head, should the fracture line allow this.

Shoulder

101 The Coracohumeral Interval In Patients With Subscapularis Tendon Tears

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Aim

The aim of the present study was to analyze the relationship between the CHI and both healing of the SSC as assessed by MRI as well as clinical outcome following SSC reconstruction.

Background

The association between the coracohumeral interval (CHI) and the incidence of subscapularis tendon (SSC) tears is well established. Coracoplasty at the time of SSC repair has been advocated to diminish subcoracoidal impingement and thereby improve SSC healing.

Methods

53 shoulder joints in 53 patients with a mean age of 61.8 ± 9.8 years were followed for a minimum 24 months (range, 24 to 36). There were 19 isolated and 34 combined subscapularis lesions. According to Fox and Romeo, there were 31 grade 2, 18 grade 3, and 4 grade 4 lesions. All patients underwent arthroscopic reconstruction and coracoplasty of the subscapularis tendon as part of their surgical treatment. The CHI was measured as the minimal distance between the tip of the coracoid process and the humeral head on transverse slices. MR healing of the SSC was graded according to Sugaya. Clinical outcome was assessed by the Western Ontario Rotator Cuff (WORC) Index.

Results

The mean CHI increased from 8.9 ± 2.7 mm preoperatively to 9.9 ± 2.7 mm postoperatively ($p < 0.001$). Significant differences were found between mean postoperative CHI values stratified according to the Sugaya classification (ANOVA, $p = 0.017$). No correlation was found between the WORC Index and postoperative CHI.

Conclusions

Arthroscopic reconstruction of the SSC and coracoplasty leads to a significant increase in CHI. High CHI values were associated with improved MRI healing of the SSC. While a narrow CHI has been shown to promote SSC tearing, the results of the present study indicate that a wide CHI may promote SSC healing.

76 Latissimus Dorsi Tendon Transfer Vs. Superior Capsular Reconstruction For Treatment Of Irreparable Rotator Cuff Tears: A Retrospective Comparison Study With Short-Term Clinical Results

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Aim

The aim of this study was to compare two treatment methods for massive, irreparable, posterosuperior rotator cuff tears: latissimus dorsi tendon transfer (LDTT) and arthroscopic superior capsular reconstruction (SCR), to determine if one is superior to the other regarding improvement in range of motion (ROM) and patient reported outcomes (PROs).

Background

Irreparable massive rotator cuff tears are a common problem, and represent a challenging clinical scenario with limited options, especially in younger patients for whom reverse shoulder arthroplasty may not be appropriate, due to concerns around complication rates and revisions.

Methods

This retrospective cohort study assessed 43 patients with an irreparable posterosuperior rotator cuff tear who underwent either LDTT or SCR at two centres. Patients with a minimum of six months' follow-up were included. Changes in pre-operative vs post-operative forward flexion and external rotation were evaluated. Patient reported outcomes (PROs) including ASES score, visual analogue score (VAS), and subjective shoulder value (SSV) were assessed. T-test and Chi-Square statistical tests were performed.

Results

Only the SCR group demonstrated a statistically significant pre- to post-operative improvement in mean active forward flexion (85° preoperatively to 138° postoperatively ($p = 0.001$)) compared to the LDTT cohort (123° preoperatively to 139° postoperatively ($p = 0.157$)). Pre- to post-operative mean active external rotation improved significantly in the LDTT cohort (41° preoperatively to 62° postoperatively ($p = 0.032$)) while remaining unchanged for the SCR cohort (43° preoperatively to 44° postoperatively ($p = 0.868$)). Reported ASES scores, VAS, and SSV improved across both groups but showed no significant differences between the two groups.

Conclusions

LDTT and SCR both result in functional improvement in range of motion, with SCR improving forward flexion to a greater extent and LDTT improving external rotation to a greater extent. Patient reported outcomes are similar at short term follow up. Longer term studies are necessary before determining whether one treatment is optimal as well as establishing the appropriate indications for each.

44 SUPERIOR CAPSULAR RECONSTRUCTION USING A PORCINE XENOGRAFT FOR IRREPARABLE ROTATOR CUFF TEARS: SHORT- TO MID-TERM CLINICAL RESULTS.

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Aim

To evaluate the early to midterm outcomes of arthroscopic superior capsular reconstruction(SCR) using a decellularized porcine dermal xenograft in patients with massive, irreparable rotator cuff tears.

Background

Massive irreparable rotator cuff tears in young active patients with minimal glenohumeral arthritis remain a challenge. For patients with irreparable rotator cuff tears, a reverse shoulder arthroplasty or a tendon transfer are often performed. However, both procedures have high complication rates. In order to avoid these type of surgeries, SCR represents a treatment option that may delay the need for more invasive surgery.

Methods

Retrospective study of patients with minimum six-month follow-up. Pre-operative and post-operative range of motion, American Shoulder and Elbow Surgeons(ASES) score, Subjective Shoulder Value(SSV), and Visual Analogue Score(VAS) for pain were measured. Post-operative data was collected at 24 weeks, 12 months and 24 months.

Results

50 patients with a mean age of 65+-9 years were included, 34 males(68%). Mean follow-up was 22+-7 months.

Failure of the SCR graft was observed in six patients with three of them needing a reverse shoulder replacement.

In the remaining patients, there was a statistically significant improvement in all outcome scores at the six-month follow-up: mean ASES preop. 42 +- 20 vs postop. 79 +-18, $p < 0.001$; mean VAS preop. 6.8 +- 1.7 vs postop. 1.4 +- 2.2, $p < 0.001$; mean SSV 38 +-17 vs postop. 72 +- 19, $p < 0.001$.

At one-year follow-up, patients continued to improve (ASES 86 +- 16, $p < 0.001$; VAS 0.8 +- 1.3, $p = 0.004$; SSV 77 +- 18, $p = 0.014$).

There were no statistically significant differences found in forward flexion and external rotation after SCR.

Eight patients were pseudoparalytic prior to surgery; in four cases pseudoparalysis was reversed after SCR.

Patients with pseudoparalysis pre-operatively had worse mean SSV at 12 months than those without pseudoparalysis (64.3+-7.5 vs 95.5+-0.70; $p = 0.011$).

There were no differences between patients with an intact or repaired subscapularis in ASES, SSV, VAS or range of motion.

There was no association between preoperative Hamada grade and postoperative outcome scores.

Conclusions

SCR can alleviate pain and disability from irreparable rotator cuff tears and provide significant improvements in shoulder function. In our experience, SCR results in inconsistent reversal of pseudoparalysis.

Elbow

94 OLECRANON FRACTURE DISLOCATION WITH DISRUPTED ULNOHUMERAL AND PROXIMAL RADIOULNAR JOINT. NECESSITY FOR LESSER SIGMOID NOTCH FRACTURES TO BE INCLUDED IN THE CURRENT CLASSIFICATION SYSTEMS

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Aim

To present the surgical technique and outcome of a case series of patients that were operated at our department for olecranon fracture dislocations (OFD) with radial head and coronoid fractures that lead to disrupted proximal radioulnar joint except from disruption of ulnohumeral joint.

Background

Olecranon fracture dislocation injuries, either anterior or posterior are characterized by the disruption of the ulnohumeral joint, while typically the proximal radioulnar joint is considered intact in these types of lesions.

Methods

Seven patients [4 male, mean age 56.8years (SD 9.6, 43-70)] were operated for OFD (5 posterior, 2 anterior) with both radial head and coronoid fractures. The fracture patterns were all radial head fracture type III Mason, and for coronoid fractures: 5 type III (III), 1 type II (II subtype III) and 1 type I (I) according to Regan Moorey (in parenthesis according to O Driscoll) classification. For all patients the proximal radioulnar joint was disrupted due to the fracture pattern. A posterior transolecranon fracture approach offered excellent visualization to the proximal radius and the coronoid fracture after reflecting the proximal ulna fragment either proximally or by the two sides of ulna as open book. For determining the appropriate height of the prosthesis when radial head arthroplasty (RHA) was required (n=5), the proximal border of the radial head implant is flush with the proximal edge of the lesser sigmoid notch (LSN) and care was taken for anatomical restoration of LSN when involved in the coronoid fracture (3/5). From the two patients that radial head osteosynthesis was performed, one had LSN fracture and anatomic restoration was also required for both fractures. The coronoid fracture was stabilized with transosseous sutures, suture anchor, K-wires or with screw through the olecranon plate according to the fracture type.

Results

At mean 17.6 months follow-up (SD 8.9, 12-33) the patients had mean (SD) elbow ROM flexion/extension 114(5.5)/-14(6.5), and pronation/supination 66(5.5)/64(5.5). Two patients presented with ulnar neuritis that resolved spontaneously. None of the patients had postoperative dislocation or needed revision and no evidence of malsizing was observed for RHA. Mean (SD) Mayo elbow performance and DASH scores were 100(0) and 10.2(6.9) respectively.

Conclusions

Except from the disruption of ulnohumeral joint, olecranon fracture dislocations may also include disruption of proximal radioulnar joint as indicated from the radial and coronoid fracture patterns. Lesser sigmoid notch fracture is usually found in such lesions. It is important to anatomically restore also the LSN fracture in order to achieve a stable and anatomic proximal radioulnar joint both for cases with RHA or radial head osteosynthesis. The findings of this small case series may indicate that it might be clinically useful to include lesser sigmoid notch fracture involvement in the current classification systems for coronoid fracture. Further studies are needed to confirm these findings.

Shoulder

12 Shoulder Arthroplasty For Sequelae Of Complex Proximal Humeral Fractures

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Aim

The aim of this study is to present the long term outcome of 43 late prosthetic shoulder replacements carried out on patients who had failed conservative or operative treatment for complex fractures of the proximal humerus.

Background

Sequelae of proximal humeral fractures is one of the most difficult situations to manage in shoulder reconstruction. An anticipated and reliable functional result is difficult to obtain because of the complexity of bone pathology and the impaired soft tissue envelope, especially if the patient had already undergone surgery. The surgeon has to deal with malunion, nonunion or AVN of the proximal humerus, displacement of the tuberosities, rotator cuff tears, and associated soft-tissue contractures. In the presence of severe osteoporosis, significant bone loss, articular incongruity and glenoid erosion the only indication is prosthetic replacement of the proximal humerus.

Methods

Over an 6-year period (2007-2013), 43 patients with failed treatment of a complex proximal humerus fracture underwent shoulder arthroplasty in our Department. There were 19 men and 22 women with a mean age of 58.1 years old. The average period from the initial treatment (conservative in 9 cases and operative in 34) was 14.9 months. Sequelae included malunion in 19 cases, nonunion in 4, avascular necrosis (AVN) in 16 and neglected posterior dislocation in 4. 32 patients underwent hemiarthroplasty, 4 total shoulder arthroplasty and 7 reverse shoulder arthroplasty. Follow up investigation included radiological assessment of stem properties and greater tuberosity displacement and clinical evaluation using the Constant score and a visual analogue scale for pain assessment.

Results

After a mean follow up period of 76.3 months the median Constant score was 68.7 points, improved by 52% in comparison to preoperative values (mean, 47.9 points) Pain was improved from 4 to 8 points on average, mean active forward elevation increased from 56 to 100 degrees and active external rotation from 8 to 30 degrees. Greater tuberosity displacement, large rotator cuff tears and severe malunion were the factors that most affected the final outcome. No cases of stem loosening or severe migration were noted. One patient developed postoperative infection, successfully treated with surgical debridement and antibiotics. At final follow up 52% of the patients were able to do activities up to shoulder level compared with 24% before reconstruction.

Conclusions

Shoulder arthroplasty for the management of posttraumatic complications of proximal humerus fractures is a technically demanding procedure with unpredictable results. The high rate of complications is often related to technical difficulties, a scarred deltoid, adhesions of rotator cuff tendons, and malunion of the tuberosities. Careful selection of the patients, detail preoperative planning and meticulous surgical technique are essential elements for a successful outcome

11 High-Energy Comminuted Midshaft Clavicle Fractures: Midterm Clinical And Radiological Results Of Operative Treatment Using Assisted Suture Loop Reduction And Internal Fixation With Anatomical Locking Plates

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Aim

The purpose of the study was to evaluate the midterm clinical and radiological results in patients with comminuted midshaft clavicle fractures treated with anatomical locking plates and assisted suture loop reduction.

Background

Comminuted high-energy clavicle fractures are difficult to treat; during conventional plate fixation, wedge-shaped fragments often need to be fixed with lag screws but sometimes this is not feasible due to high comminution and severe fragmentation. Assisted open reduction with double suture loop can bind the fragments together thus facilitating the application of a bridging anatomic locking plate.

Methods

Between 2015-2017, 16 patients with high-comminuted midshaft clavicle fractures after high-energy trauma underwent assisted suture loop reduction and internal fixation with anatomical locking plates. All patients were males with a mean age of 34 years-old (range, 16-60 years) and sustained the injury after fall from height (4 patients) or road traffic accidents (12 patients). According to Robinson classification there were 7 patients with 2B1 fractures and 9 with 2B2 fractures. In all patients open reduction was facilitated with the use of double loop suture (Ethibond 2-0) around the clavicle for approximation of the fragments; the fractures were stabilized thereafter with anatomical locking plates (7-hole or more). The plate was applied in the superior aspect of the clavicle except for 3 cases that was applied anteriorly. The patients were followed up radiologically at 1, 3, 6, 12 and 24 months. Last clinical evaluation was performed with the Constant score.

Results

Mean follow up time was 32 months (range, 24-43 months). Union was achieved in all fractures in a mean period of 3.3 months (2.5 to 4.3 months). The mean Constant score at the last follow up was 88 (75-100) and 92% in comparison with the non-affected shoulder. Two patients developed hypertrophic scars and in one patient the plate had to be removed for cosmetic reasons as it was palpable under the skin.

Conclusions

Comminuted fractures of the midshaft of the clavicle, especially after high-energy injuries, require open reduction and internal fixation because of their high rate of nonunion and delayed union. Anatomical bridging plate fixation assisted by suture loop reduction of the fragments, can lead to high rates of union and excellent clinical outcome.

53 Can The West Point-View-Radiograph Accurately Detect Glenoidal Bone Defects In Patients With Anterior Shoulder Instability?

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Aim

The aim of the present study was to investigate the diagnostic accuracy of West Point-view-radiographs in detecting glenoidal bone defects in patients with anterior shoulder instability.

Background

In patients with anterior shoulder instability, diagnostic imaging plays a key role. The aim of the radiological examination is the detection of bone defects, including bony Bankart lesions. Routinely, West Point-view-radiographs are used to assess glenoidal bone defects, but little is known about their diagnostic validity.

Methods

54 consecutive patients with a history of anterior shoulder instability receiving shoulder arthroscopy were included in the present study. Preoperative West Point-view-radiographs and CT-scans of all patients were retrospectively analyzed. To assess the sensitivity, specificity, positive and negative predictive values, accuracy, likelihood ratio, and area under the curve (AUC), the diagnostic accuracy of the Westpoint-view-radiograph were compared with the diagnostic accuracy of the CT-scans.

Results

Sensitivity, specificity, positive and negative predictive values and likelihood ratio of West Point-Radiographs were: 0.71, 0.92, 0.91, 0.74, 28.7 (5.4-151.4). The Westpoint-view-radiograph showed a good AUC (0.817) and a significant correlation with the findings of the CT-scans ($p < 0.001$).

Conclusions

The results of the present study show that West Point-view-radiographs were able to accurately detect glenoidal bone defects in the majority of patients with anterior shoulder instability.

100 Increased Use Of Total Shoulder Arthroplasty And Improved Patient-Reported Outcome For Osteoarthritic Patient In Denmark From 2006 To 2015: A Nationwide Cohort Study From The Danish Shoulder Arthroplasty Registry.

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Aim

To investigate the use of different arthroplasty types for osteoarthritis in Denmark from 2006-2015, to report the patient-reported outcome, and to study if changes in the use of arthroplasty types have changed the outcome from 2006-2015.

Background

Because of limited information from randomized trials and large observational studies, data from the Danish Shoulder Arthroplasty Registry has been an important source of information regarding patient-reported outcome of different arthroplasty types.

Methods

We included 2,867 shoulder arthroplasties performed for osteoarthritis between 2006-2015 and reported to the Danish Shoulder Arthroplasty Registry. The Western Ontario Osteoarthritis of the Shoulder (WOOS) index at one year was used as patient-reported outcome. The raw score was converted to a percentage of a maximum score. General linear models were used to analyze differences in WOOS.

Results

The proportion of anatomical total shoulder arthroplasty and reverse shoulder arthroplasty increased from 3% and 7% in 2006 to 53% and 27% in 2015. The mean WOOS score was 70 (SD26) after resurfacing hemiarthroplasties (n=1,258), 68 (SD26) after stemmed hemiarthroplasty (n=500), 82 (SD23) after anatomical total shoulder arthroplasties (n=815) and 74 (SD23) after reverse shoulder arthroplasties (n=213). The overall WOOS increased with 18 (95%CI12:22, P<0.001) in the univariate model and 10 (95%CI5:15, P<0.001) in the multiple model. We found improved WOOS scores for anatomical total shoulder arthroplasty (14, 95%CI:5-23, P=0.003) from 2006-2015.

Conclusions

We found an increased WOOS from 2006-2015 which was primarily related to a higher proportion of anatomical total shoulder arthroplasty and reverse shoulder arthroplasty towards the end of the studied period, and to improved outcome of anatomical total shoulder arthroplasty.

3 Could It Be An End For Era Of Laterjet Procedure? A Cadaveric Study Of Open/ Arthroscopic-Assisted/Arthroscopic Technical Feasibility Of Biceps Re-Routing And Tenodesis To The Deficient Antero-Inferior Glenoid

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Aim

As an alternative to Laterjet procedure; (1) "Is re-routing and tenodesis of long head of biceps brachii to the deficient antero-inferior glenoid technically feasible through either open, arthroscopic-assisted or all-arthroscopic approach?", (2) "Is this tenodesis able to restore gleno-humeral stability?", and (3) "Does this tenodesis increase the risk of nearby neurovascular injury?".

Background

Laterjet procedure represents the gold standard management of significant anterior glenoid bone loss in recurrent gleno-humeral instability. However, concerns about short and long term complications do still be reported.

Methods

-Study Design: Cadaveric laboratory study.
-Materials & Methods: Six shoulders (of 3 cadavers) were prepared. Through delto-pectoral approach, significant (>20%) antero-inferior glenoid bone defect was created. Then, long head of biceps brachii was tenotomized from the superior labrum, mobilized from the bicipital groove, passed through a subscapularis window and fixed to the deficient antero-inferior glenoid using 2 suture anchors. Pre- and post-tenodesis humeral head translation during provocative 90°-90° abduction-external positioning were compared. Following subscapularis repair, biceps tendon excursion was evaluated. The transverse distance between the subscapularis window and the axillary nerve was measured.

Results

Statistical analysis revealed significant reduction in post-tenodesis gleno-humeral translation compared to pre-tenodesis one (P-value<0.002). Following tenodesis, the average biceps excursion was 10.15mm (range: 10-13mm) and the distance between the axillary nerve and the subscapularis window is 19.8mm (range: 18-22mm).

Conclusions

Re-routing and tenodesis of long head of biceps brachii to the deficient antero-inferior glenoid are technically feasible and safe and can effectively restrain gleno-humeral translation.
-Clinical relevance: Re-routing and tenodesis of long head of biceps brachii to the deficient antero-inferior glenoid provide the chance for new open, arthroscopic-assisted and all-arthroscopic gleno-humeral stabilizing interventions as alternatives to Laterjet procedures while avoiding the complications of the later.

Elbow

42 Determination Of Carrying Angle Of Elbow Among Adult Pakistani Population

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Aim

To determine the carrying angle of elbow among adult Pakistani population presenting to a tertiary care hospital.

Background

The elbow joint is a compound synovial joint consisting of the distal humerus, proximal radius and ulna with two articulating surfaces, humeroulnar and radioulnar joints. The average value of the carrying angle is considered 12.5 ± 0.57 degrees in males and 15.26 ± 0.45 degrees in females. Determination of carrying angle in our population will assist in better understanding of elbow biomechanics, improvement in prosthesis designs and development of pre contoured anatomic implants for our population.

Methods

This Descriptive cross-sectional study was done at The Indus Hospital Karachi, a free of cost tertiary care facility, for a period of six months after approval from IRB. Population who met with inclusion criteria were recruited and carrying angle of both elbow and length of forearm measured with the help of Goniometer and inch tape respectively. The data were entered in SPSS V.24.0 and analyzed using SPSS and R studio. Mean \pm SD/Median (IQR) were computed for all the categorical variables as appropriate. Kruskal Wallis/ANOVA was applied as appropriate to assess significant difference in age, height, weight, carrying angle, length of arm and extension among ethnicities. Independent sample T-test/Mann-Whitney U test was applied as appropriate to assess significant difference in aforementioned quantitative variables between both the genders. Furthermore, linear quantile model was applied to assess significant difference in carrying angle for all the pairwise combination of ethnicity adjusting for age, height, weight and gender. Wilcoxon signed rank test was applied to assess dominant hand wise significant difference in right and left hand carrying angle. All the categorical variables were presented as frequency along with percentage. P-value < 0.05 was considered statistically significant.

Results

A total of 500 participants were enrolled in the study, out of which 353 (70.6%) were males, 142 (28.4%) were females and 5 (1%) had missing information regarding gender. Approximately, half of the patients were Urdu speaking (49.2%) followed by Punjabi (16%), Sindhi (12.4%) and Pathan (9.2%) (Figure-2). Majority (96%) of the patients had right dominant limb and only 4% had left dominant limb (Figure-3).

Men were found to be significantly taller and heavier than women (Median: 167 vs 155 cm, 65 vs 56.5 kg, respectively $p < 0.0001$). However, no significant differences were observed in BMI between both the genders ($p = 0.291$). Men had longer median length of forearm as compared to women ($p < 0.0001$). Women were found to have higher median of upper limb carrying angle as compared to men ($p < 0.0001$). Also, the distribution of extension of arms was found more variable in women than men ($p = 0.002$ and 0.023).

Punjabis had higher carrying angle followed by Urdu speaking, Pathan and Sindhi adjusting for age, height, weight and gender.

Right dominant hands had higher right hand carrying angle in comparison to left hand (Median (IQR): 10 (8-13) vs 10 (8-12), $p = 0.000$). Whereas it was not true for left dominant hand. (Median (IQR): 10 (8.2-12) vs 10 (8-12), $p = 0.880$)

Conclusions

Mean carrying angle in male was 9.5 ± 3.1 degree (dominant hand), whereas for female was 14.4 ± 3.2 degrees (dominant hand). This is consistent with published literature. The carrying angle of

right elbow was higher in right hand dominant people, whereas it was not true for left hand dominance. This is statistically significant difference as compared to previous literature. We recommend a larger scale multicentric study to further substantiate our findings in our population.

Shoulder

55 Characteristic And Definition Of The Degenerative Acromioclavicular Joint

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Aim

The aim is to analyze degenerative AC joints in MRI for objective structural changes and to have clear criteria for surgical intervention.

Hypotheses: 1) The AC joint of symptomatic patients shows typical structural changes compared to asymptomatic patients and healthy subjects. 2) The use of a score allows the differentiation of symptomatic and asymptomatic patients.

Background

Degenerative AC joint changes are common; The arthroscopic AC joint resection is one of the most commonly performed operations on the shoulder joint.

There is no specific definition of AC joint arthritis. The decision on the operative intervention depends on the clinic and the subjective assessment of the examiner.

Methods

Study design: retrospective monocentric diagnostic study

Inclusion criteria:

Group 1: healthy asymptomatic adults between 18-40 years (n = 54)

Group 2: Adults > 40 years with asymptomatic AC joints (n = 100).

Group 3: Adult patients with symptomatic AC joints and ACG resection (n = 100).

Exclusion criteria: relevant pathologies (anamnesis, previous operations, etc.)

Assessment: MRI in transversal level. Joint gap width anterior, central, and posterior. AC angle (angle between the articular surface of acromion and clavicle, anterior open with positive values) in T1.

Assessment of cartilage, disc and bone signal in T2.

Classification based on a score for joint space (anterior, central, posterior), cartilage degeneration, bone marrow edema and joint contact (anterior, central, posterior).

Significance level $p < 0.05$. Sample comparison according to Mann-Whitney or Kruskal-Wallis.

Correlation after Spearman.

Results

Good to very good interobserver reliability. Significant differences in the groups for the investigated parameters.

Score Gr1 4.6 (2-22), Gr2 13.6 (0-30), Gr3 17.1 (6-30) $p = 0.001$.

The joint gap decrease and the extent of the degen. Changes are significantly negatively correlated with age ($r = -1.74$ to -0.6 , $p = 0.001$ to 0.006).

Conclusions

There are typical age-related changes with narrowing of the joint space and increased cartilage degeneration. The posterior joint space is particularly affected; a joint contact posterior is found almost exclusively in the third group.

The score used, distinguishes significantly between the groups and can be used as a tool for decision making.

54 AC Joint Morphology And Movement Patterns - A Functional MRI Study

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Aim

Hypotheses: (1) The adduction of the arm in the horizontal plane (cross-body test) narrows the entire joint space between the acromion and clavicle. (2) The joint partners move in conformity without major changes in the alignment.

Background

Little is known about the morphology of the healthy acromioclavicular joint and its movement patterns, especially in the transverse plane.

Methods

Study design: Monocentric experimental diagnostic study

Inclusion criteria: Healthy asymptomatic adults aged 18-30 years.

Exclusion criteria: contact and overhead sports, ACG occupational exposure, shoulder injuries, symptoms and history of surgery.

N = 16 AC joints, a total of 32 MRI sectional images (1.5T without contrast medium). Ø Age 27 years (22-30).

Assessment: MRI T1 / T2 in the transversal plane - cutting plane individually adapted to the acromion form.

First measurement in neutral position then cross-body: Joint width anterior, central, and posterior. AC angle (angle between the articular surface of acromion and clavicle, anterior open with positive values) in T1.

Assessment of cartilage, disc and bone signal in T2.

Results

Mean (Cross Body): AC angle (22.0 °, 11.5 °, p = 0.014), anterior joint space (9.1mm, 8.3mm, 0.916, p = 0.341), central joint space (4.9mm ; 8.3mm; 0.941; p = 0.696), posterior joint space (5.0mm; 6.8mm; 0.847; p = 0.003)

Very good interobserver reliability (ICC; p value): AC angle 0.964; 0.001, anterior joint space 0.916; 0.001, central joint gap 0.941; 0.001, posterior joint space 0.847; 0.001.

Conclusions

The healthy AC joint shows an anterior wide joint space and V-shaped alignment in the transverse plane. With adduction of the arm in front of the body, in this plane (cross body action), the scapula moves with the acromion around the relatively stable clavicle. The posterior joint gap widens and thus the AC angle is reduced. This leads to an alignment change and the second hypothesis is rejected.

Elbow

31 10 Years After Distal Biceps Tendon Repair In Modified Double-Incision Technique By Morrey: A Patient Reported Outcome Study

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Aim

The purpose of the following study is to evaluate patient-reported long-term outcome after distal biceps tendon repair in modified double-incision technique by Morrey.

Background

Distal biceps tendon rupture is a relatively rare, but the most common acute tendinous injury around the elbow. While in the setting of complete tendon rupture surgical refixation has become the standard of care to optimally restore elbow function, the ideal approach and method of tendon fixation is subject of debate and remains controversial without any clear consensus for more than half a century.

Methods

We retrospectively reviewed primary distal biceps tendon repairs after isolated tendon rupture using the modified muscle-splitting double-incision approach and transosseous suture fixation by Morrey, performed at our Level 1 trauma center over a 13-year period between 01/2000 and 12/2013.

The survey included the subjective elbow value (SEV), the Oxford Elbow Score (OES) with its three unidimensional domains ("function", "pain", "social-psychological"), a self-performed both-sided hook test and the EQ-5D-3L as a measure of health status. Levels of overall satisfaction were determined asking whether the patient would consent to an operation again. In addition, patients were asked for reporting complications occurred postoperative or over time without mentioning any examples or answer options by the assessor. All measurements were performed by one independent assessor. Exclusion criteria included the presence of an associated fracture, joint dislocation, any concomitant soft-tissue damage and other approaches or fixation methods.

Results

30 patients met the inclusion criteria and 25 were available for the survey (mean age at the time of rupture: 47 ± 10.53 years, all male, mean follow-up: 120 ± 49.38 months, range: 57-207 months, follow-up rate: 83.34%). The right elbow was injured in 68% (n=17), the dominant arm in 84% (n=21) of all the cases. 92 % (n=23) acute ruptures were treated (<6 weeks after trauma). The following outcome results were obtained: SEV: 88.16 ± 25.18 %, OES: 43.80 ± 10.56 of 48 points and its three subdomains OES-Pain: 92.50 ± 23.03 %, OES-Function: 92.25 ± 22.19 % and OES-Social-psychological: 89 ± 23.68 % of 100 points. EQ-5D-3L: 1 ± 0.21 . All patients described a negative hook test. Patient-reported complications were: Limited, painless forearm rotation 4.17 % (n=2), reduced flexion and forearm rotation force with and without pain 4.17 % (n=2) and 2.08 % (n=1), respectively. Synostosis after 1 year with external revision 2.08 % (n=1), depression 2.08 % (n=1) and transient wrist drop 2.08 % (n=1). Overall complication rate: 32 % (n=8/25). 96 % (n=24) would consent to an operation again.

Conclusions

Despite the assumed approach-related morbidity, we can state an excellent patient-reported long-term outcome.

Shoulder

99 A Bibliometric Analysis: 200 Most Cited Papers In The Field Of Shoulder Surgery

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Aim

The purpose of this study was to identify the most cited articles related to the field of shoulder surgery to understand how the literature of this topic has shaped our studies over time

Background

Bibliographic studies are increasingly being recognised as a valuable tool for assessing the impact of literature on any field and this is particularly relevant in Shoulder surgery where certain landmark papers have been cornerstone in advancement of this subspecialty in the recent past.

Methods

In this study, we utilised three most widely used search tools in the form of Google Scholar (GS), Web of Science (WoS), and Scopus (Sco) with the keyword search of Shoulder Surgery to identify articles relevant to the field of shoulder surgery. We selected and analysed the 200 most frequently cited articles in this field. The articles were included in our database based on titles and abstract analysis. Statistical analysis was used to characterise citation number, citation index, Source journal, author frequency, type of study and levels of evidence.

Results

The 200 most cited articles were published between 1923 and 2012. The decades of 2000's (36%) followed by 1990's (33%) were the most productive era of the articles . All the articles were written in English except for one in French and were published in forty journals. The majority of articles originated from United States, followed by France and Switzerland. Articles related to rotator cuff (18%) and Instability (17.5%) were the most discussed topics. Most cited articles were clinical series, the most common level of evidence was level IV. Only a small percentage of articles utilized patient rated outcome measures. GS consistently found the largest percentage of citations across all areas, far ahead of Scopus and WoS.

Conclusions

The field of shoulder surgery has witnessed numerous milestones and this article identifies and analyses the most frequently cited articles in this field.

Our data show that despite recent advancements in this field, most highly cited studies are of low-level evidence.

Basic Science

46 Supraspinatus Muscle Fiber Composition In Rotator Cuff Tear Condition

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Aim

The aim of this study was to assess the composition of muscle fiber myosin heavy chain (MHC) isoforms in tear conditions and to establish gender specific differences in fiber types. We also assessed fiber atrophy and/or hypertrophy by measuring the Feret's diameter and cross-sectional area (CSA) of the Supraspinatus (SS) muscle fibers to give an insight into the size of the muscle cells. We further aimed to explore if changes in muscle composition were caused by a loss of fibers types or a shift from one fiber type to another.

Background

Rotator cuff (RC) tears are associated with secondary RC muscle pathology that is decisive for the prognosis of RC repair. The importance of the compositional and degenerative changes in the RC muscles as a cause to surgical failure has become more and more apparent. However, the pathophysiology of the RC muscles in tear conditions are poorly understood. Skeletal muscles in humans are composed of a mixture of type 1 (slow twitch) and type 2 (fast twitch) fibers. A non-pathological SS muscle consists of approximately 54% type 1 fibers (15), but physical activity and tear of the SS tendon may alter the fiber type composition.

Methods

Muscle biopsies were obtained from 21 patients undergoing surgery for RC tendon tear. Biopsies were obtained from the musculotendinous junction of the SS muscle and control biopsies were harvested from the deltoid muscle (DT). Biopsies were immunohistochemically processed for detection of type 1 (slow type) and type 2 (fast type) fibers and analyzed using unbiased, stereological principles. We counted the total numbers of type 1 and 2 muscle fibers/mm² and Feret's diameter was used to estimate muscle fiber atrophy and hypertrophy.

Results

We found significantly more type 2 cells/mm² in the SS compared to the DT ($p < 0.01$). In addition, we found a significantly higher fraction of type 1 fibers than type 2 fibers in the DT ($p < 0.01$), whereas both fiber types were equally present in the SS. The diameters of SS cells were generally smaller than those of DT cells. Atrophy of especially SS type 2 fibers was also demonstrated. Fiber atrophy was more pronounced in men than women.

Conclusions

The changes in the composition of SS muscle cell types suggest a shift from type 1 to type 2 muscle fibers and atrophy of both type 1 and 2 fibers. This composition indicates loss of endurance and rapid fatigue of the SS muscle under RC tear conditions

Shoulder

82 A Prospective Analysis Of Biceps Pulley Lesions – Concomitant Pathologies And Classification Update

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Aim

To prospectively analyze 100 consecutive pulley lesions and concomitant pathologies and to reassess the current classification system by Habermeyer et al.

Background

Lesions to the biceps pulley (BPL) result from partial or complete tearing of a soft tissue stabilization complex, especially the superior glenohumeral ligament (SGHL) and the medial and lateral fibers of the coraco-humeral ligament (CHL). Furthermore, in more extensive lesions, the adjacent rotator cuff fibers of the subscapularis and/or supraspinatus tendon can get involved. It was hypothesized, that the lateral pulley system is often injured without involvement of the SGHL and therefore not all lesions would be classifiable according to the used classification system.

Methods

Between January and July 2018, 100 consecutive patients with diagnosed pulley lesions were included in this study. During arthroscopy, the integrity of the SGHL and the medial/lateral CHL was investigated and lesions were documented. Concomitant lesions to the adjacent rotator cuff were also documented and classified as partial or complete tears. Postoperatively, the lesions were classified according to the system by Habermeyer et al. and the incidence of the subgroups was analyzed.

Results

Classification of the 100 lesions revealed (34f, 66m, average age 59.1y) there were 3 type I lesions, 20 type II lesions, 6 type III lesions and 35 type IV lesions according to Habermeyer et al. 36 lesions were not classifiable since the SGHL fibers were not affected. In 95% of the lesions a lesion of the direct lateral pulley sling (CHL) and in 64% a lesion of the direct medial pulley sling (CHL/SGHL) was present. In only 5% of the patients an isolated lesion of the direct medial sling was found while 36% of the patients showed an isolated lesion of the direct lateral sling. In 59% the medial and the lateral slings were affected. Regarding concomitant indirect lesions of the pulley system, 39 articular sided partial tears and 47 complete tears of the supraspinatus were found. 28 patients showed a partial lesion and 50 patients a complete tear of the subscapularis tendon.

Conclusions

This prospective analysis showed that the lateral pulley sling is more often affected than the medial while the SGHL is not affected in all cases and isolated lesions of the direct medial sling are rare. For simplification but exact classification of pulley lesions we propose the following update:

Direct pulley sling

Type I: Lesion of the medial pulley sling (CHL/SGHL)

Type II: Lesion of the lateral pulley sling (CHL)

Type III: Lesion of the medial and lateral pulley sling

This simple classification allows for a clear statement regarding biceps instability and its direction. Concomitant lesions to the indirect pulley stabilizers (rotator cuff fibers) can be mentioned additionally according to the well-known classifications if desired.

96 Reverse Shoulder Arthroplasty With Humeral Lateralization Improves Active External Rotation In Patients With Fatty Infiltration Of Infraspinatus And Teres Minor

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Aim

The purpose of this study was to compare AER after RSA using Grammont humeral design (GHD) versus RSA using Onlay humeral design (OHD).

Background

The active external rotation is deficient in patients with posterosuperior rotator cuff tear with fatty infiltration of infra-spinatus and teres minor. The implantation of a reverse shoulder arthroplasty (RSA) improves clinical outcomes but active external rotation (AER) may remain limited.

Methods

A prospective and monocentric study has been led between January 2015 and June 2018. Inclusion criteria were patients managed by RSA with fatty infiltration grade III or IV of Infra-spinatus and teres minor according to Goutallier, and a minimum of 6 months follow-up. Patients with tendon transfer were excluded. Between January 2015 and August 2017, the humeral stem used was the GHD (group 1), and between September 2017 and June 2018 the OHD (group 2). Clinical outcomes measures included AER, active anterior elevation, internal rotation and the Constant and Murley score.

Results

forty-seven patients were included, 24 in the group 1 with a mean age of 75 years and a mean follow-up of 35 months, and 23 in the group 2 with a mean age of 75 years and a mean follow-up of 9 months. Active anterior elevation and the Constant and Murley score improved significantly in each group, respectively from 87.9° to 140.4° and from 33.3 to 67.7 in group 1, and from 92.4° to 128.9° and from 33.4 to 67.5 in group 2, without difference between the 2 groups. Internal rotation did not change postoperatively in the 2 groups: from 5.58 to 5.0 (group 1) vs from 5.22 to 5.74 (group 2). AER did not improve in the group 1: from 0.83° ± 4.08° to 1.88° ± 3.85° (P>0.05), and improved significantly from 4.57° ± 8.91° to 11.96° ± 15.79 in the group 2.

Conclusions

The implantation of a RSA increases the Constant and Murley score and anterior active elevation in patients with irreparable posterosuperior rotator cuff tear. Moreover, the lateralization of the humeral component using an Onlay stem increases active external rotation whereas it was unchanged after GHD.

93 Which Procedure Between Arthroscopic Partial Repair And Latissimus Dorsi Tendon Transfer Produces The Best Clinical Outcomes In Patients With Massive And Irreparable Posterosuperior Rotator Cuff Tears?

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Aim

The purpose of our study was to compare the clinical outcomes between Arthroscopic Partial Repair (APR) and Latissimus Dorsi Tendon Transfer (LDTT) in these patients.

Background

It still exists some controversies regarding the surgical procedure that induces the best outcomes in young patients with irreparable posterosuperior massive rotator cuff (PSMRCT) without glenohumeral arthritis.

Methods

A multicenter prospective comparative study was led between May 2015 and May 2016. The Inclusion criteria were patients with irreparable PSMRCT managed by either APR or LDTT, and a minimal follow-up of 18 months. The Exclusion criteria were subscapularis tear and acromiohumeral distance < 6mm. The outcome measures were the Constant and Murley score, the active forward elevation and external rotation, the Quick-dash score and the subjective shoulder value (SSV).

Results

eighty-two patients were included and analyzed at a mean follow-up of 21.8 months. The mean age was 65.5 years. Fifty-seven (70%) patients were managed by APR and 25 (30%) were managed by LDTT, depending on surgeon's preference. The active forward elevation increased from $134^{\circ} \pm 40$ to $157^{\circ} \pm 27$ in APR group ($P < .05$) and from $131^{\circ} \pm 40$ to $142^{\circ} \pm 40$ in LDTT group ($P < .05$), without significative difference between the 2 groups. The active external rotation was $31^{\circ} \pm 23$ preoperatively and $32^{\circ} \pm 19$ postoperatively in APR group and increased from $22^{\circ} \pm 24$ to $36^{\circ} \pm 20$ in LDTT group. The Constant and Murley score increased from 44 ± 19 to 65 ± 14 in the APR group, and from 39 ± 11 to 58 ± 18 in the LDTT group. The Quick-dash score improved from 62 ± 16 to 21 ± 18 in the APR group and from 63 ± 19 to 34 ± 23 in the LDTT group ($P < .05$).

Conclusions

this prospective study confirms that APR and LDTT procedures improve clinical scores in patients with irreparable PSMRCT. Nonetheless, clinical scores are not better after LDTT compared with APR, except for the postoperative active external rotation.

88 Functional Outcomes And Clinical Strength Assessment After Infraspinatus Sparing Surgical Approach To Scapular Fracture. Does It Really Make A Difference?

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Aim

The aim of our retrospective study is to compare infraspinatus strength and functional outcomes in patients treated with Classic Judet versus Modified Judet approach for scapular fractures.

Background

Surgical treatment of scapular fracture with posterior approach is frequently associated with infraspinatus postoperative hypotrophy. The Classic Judet approach (CJ) require the infraspinatus muscle lateral reflection. The Modified Judet approach (MJ) consists in a blunt dissection through the interval between infraspinatus and teres minor.

Methods

We enrolled 20 patients with scapular neck and body fracture treated with posterior approach for lateral border plate fixation. In 11 of 20 cases we used MJ Approach and in 9 cases we used CJ approach. All fractures were classified according to AO Classification system. At the follow-up examinations patients had X-Ray assessment with Acromion Humeral Distance (AHD) measurement, clinic evaluation, active ROM examination, Constant Shoulder Score, DASH Score. Infraspinatus strength assessment was measured using a dynamometer during Infraspinatus strength test (IST) and Infraspinatus Scapular Retraction Test (ISRT).

Results

Demographic data did not significantly differ between CJ Group and MJ Group. All X-ray examinations showed fracture healing. The AHD was significantly decreased in CJ Group ($p=0.006$). We did not find significant differences in active ROM between MJ and CJ ($p<0.05$). The Constant Score and DASH score were not statistically different ($p> 0.05$). The IST and ISRT tests showed a mean strength statistically higher in MJ group ($p=0.002$). Infraspinatus ipotrophy was detected in 6 patients, 5 of CJ group and 1 of MJ group and it was strictly related to infraspinatus strength weakness in IST and ISRT ($p<0.001$).

Conclusions

Infraspinatus sparing surgical approach for scapular fractures avoids infraspinatus hypotrophy and external-rotation strength weakness. We suggest to use mainly Modified Judet approach for scapular fracture and to restrict as much as possible Classic Judet approach to scapular fractures extending to medial border

85 Outcome In Reverse Shoulder Arthroplasty Regarding One Material Design – Is There A Benefit In Different Etiologies To Observe?

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Aim

The aim of the study was to prove mid-term results of reverse shoulder arthroplasty (RSA) regarding material design in a homogeneous monocentric collective in different etiologies (such as primary or secondary fractures or CTA). As hypothesis was defined that especially in fracture arthroplasties the prosthesis design may increase functional outcome.

Background

Reverse shoulder arthroplasty (RSA) is meanwhile a common technique in complex shoulder situations. As established procedures obtain rotator cuff tear arthropathies (CTA), primary and secondary fractures. Cause of demographic changes, the incidence of proximal humeral fractures is increasing in past decades. Accordingly, primary and secondary fracture RSA implantation rates rose in the last years.

Methods

Hundred-twenty (n=120) RSA patients with same material design between 2008 and 2016 were matched and included (ø 71 years, ø follow-up 59 months). The functional outcome was evaluated using age and gender related Constant Score (CSa), Quick DASH (QD) and Subjective Shoulder Value (SSV). Material Specifications, radiological outcomes, complications and adverse events were documented and statistically analyzed.

Results

Good to excellent mean results could be observed regarding etiologies (fracture vs. CTA): CSa: 70 (Ia + b) vs. 82 (2) {p = 0.021}, QD: 25 (Ia + b) vs. 15 (II) {p = 0.019}, SSV: 71% (Ia + b) vs. 81% (II) {p = 0.048}. Improved radiological and functional outcomes could be observed in primary fracture situations regarding material specifications in this RSA design. In RSA patients no significant benefit regarding material factor could be evaluated.

Conclusions

Good mid-term functional results with a slightly range in clinical outcome and high patient satisfaction could be demonstrated in all groups, especially CTA patients protrude in superior functional results. In fracture circumstances certain material factors result in increasing clinical outcome.

109 The Effect Of Tobacco Smoking On Short-Term Outcomes In The Shoulder Arthroplasty Patient

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Aim

Evaluate the effects of tobacco use on 90-day complications and healthcare utilization after anatomic total or reverse shoulder arthroplasty.

Background

The effect of tobacco smoking on infectious complications in total hip and knee arthroplasty has been well characterized, however, there remains a paucity of literature evaluating this effect in the shoulder arthroplasty patient. We aimed to characterize the risk of 90-day readmissions, revisions, and prosthetic joint infections (PJI) in this patient population. We hypothesized that current smokers will be at an increased risk of complications in the immediate post-operative period.

Methods

The National Readmission Database was queried for all primary shoulder arthroplasty procedures performed between 2011-2015. Current smokers were identified. 90-day readmissions and complications were documented through validated coding methods. Coarsened exact matching was employed to match current smokers to non-smokers on demographics, comorbidities, and hospital-level confounders. Multivariate regression was performed on matched cohorts to assess the contribution of smoking status on 90-day readmissions and complications.

Results

86,879 patients underwent shoulder arthroplasty in the study period. 7.0% (6,066) were current smokers. The 90-day readmission risk for shoulder-arthroplasty specific complications was 1.3% for non-smokers and 2.4% for current smokers. The unadjusted incidence of acute PJI was 0.23% for non-smokers and 0.63% for current smokers. On multivariate regression, current smokers had an increased odds of PJI (Odds Ratio [OR]: 1.56), 90-day revision surgery (OR: 1.46), all cause readmission (OR: 1.18), dislocation (OR: 1.82), and myocardial infarction (OR: 2.47). Current tobacco users had a decreased risk of non-home discharge or an extended length of stay past 3 days. There were no differences in cost.

Conclusions

Active tobacco use is a significant risk factor for PJI, revision, dislocation, and readmission following shoulder arthroplasty. This is commensurate with findings in lower extremity arthroplasty. We encourage shoulder surgeons to enforce a strict no smoking policy to avoid potential complications in the active tobacco user.

105 The Incidence Of Shoulder Arthroplasty: Rise And Future Projections Compared To Hip And Knee Arthroplasty

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Aim

Examine recent trends and predict future projections of hemiarthroplasty, anatomic total shoulder arthroplasty, and reverse shoulder arthroplasty in the United States, as well as compare to the predictions for total hip and knee arthroplasty.

Background

The incidence of shoulder arthroplasty continues to rise exponentially in the United States. However, there remains a paucity of epidemiologic data in recent years, especially how it relates to the reverse prosthesis.

Methods

The National Inpatient Sample (NIS) was queried from 2011 to 2016 for Hemiarthroplasty (HA), anatomic shoulder arthroplasty (aTSA), and reverse shoulder arthroplasty (RSA), as well as total knee (TKA) and total hip (THA) arthroplasty. The NIS represents all hospital discharges within the United States. The international classification of diseases (ICD) procedure code for RSA was not separated from the aTSA code prior to 2011, thus these years were excluded. Linear and Poisson regression analysis was performed to project annual procedural incidence and volume to the year 2025. aTSA and RSA growth rates were compared to those of TKA and THA.

Results

Linear regression analysis estimated the volume of aTSA and RSA to increase 91.9% by the year 2025, an estimated 187,952 procedures (RSA: 129,284 procedures; TSA: 58,667 procedures). Poisson regression estimated annual shoulder arthroplasty procedural volume to increase 349% by 2025, an estimated 439,206 procedures (RSA: 373,121 procedures; TSA: 66,086 procedures). These estimates far outpace those of total hip and knee arthroplasty. The linear and Poisson models estimate that the volume of THAs performed in 2025 will increase by 57.8% and 92.1%, respectively. Additionally, the linear and Poisson models predict TKA to increase by 29.4% and 36.0%, respectively. HA was projected to decrease by around ~70% to ~2,500 cases in 2025.

Conclusions

The number of shoulder arthroplasties has been increasing in recent years, largely due to the exponential increases in RSA. The overall incidence is increasing at a greater rate than TKA or THA, with projections continuing to rise over the next decade. This data and projections can be used by policymakers and hospitals to drive initiatives aimed at meeting these projected future demands.

90 Evidence-Based Thresholds For Hospital Volume In Reverse Shoulder Arthroplasty

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Aim

Determine the effect of reverse shoulder arthroplasty hospital volume on 90-day readmission, complications, and health care utilization in a national database.

Background

With increasing utilization of reverse shoulder arthroplasty (RSA), hospital procedure-specific volume cut-offs should be analyzed in relation to RSA outcomes. We hypothesized that higher RSA volume hospitals would be associated with superior outcomes, and that stratum-specific likelihood ratio (SSLR) analysis would delineate concrete definitions of volume to provide more useful data than classic arbitrary quartiles.

Methods

The Nationwide Readmission Database was queried from 2011-2015 for patients undergoing elective RSA. Annual hospital volume and outcome data was collected, including 90-day readmission, 90-day revision, 90-day complications, length of stay (LOS, > 2 days considered "extended"), cost (median=\$18,452), and discharge disposition. SSLR analysis was performed to determine hospital volume cut-offs per outcome to define risk for a particular adverse event. Cut-offs generated through SSLR analysis were confirmed via binomial logistic regression. These cut-offs were then compared to traditional quartile analysis (≤ 14 , 15-31, 32-57, ≥ 58 procedures/year) by comparing the Akaike information criterion (AIC) values of the quartile and the SSLR-based binomial logistic regression models.

Results

The proportion of patients receiving care at centers that performed <20 procedures/year decreased from 2011 (46.4%) to 2015 (26.8%), while the proportion of patients that received care at a center that performed >100 procedures/year increased from 2011 (3.3%) to 2015 (13.3%). SSLR analysis produced hospital volume cut-offs for each outcome studied. SSLR analysis for 90-day readmission produced three hospital volume categories, each statistically different from each other (≤ 16 , 17-69, ≥ 70). These were similar to the strata for 90-day revision (≤ 16 , 17-53, ≥ 54) and 90-day complications (≤ 9 , 10-68, ≥ 69). SSLR analysis produced 6 hospital volume categories for cost of care over the median value (≤ 5 , 6-25, 26-47, 48-71, 72-105, ≥ 106), 5 categories for an extended LOS (≤ 10 , 11-25, 26-59, 60-105, ≥ 106), and 4 categories for non-home discharge (≤ 31 , 32-80, 81-105, ≥ 106). SSLR analysis resulted in a better model fit for all outcomes assessed (7.2% to 18.6% improvement in AIC values compared to quartile analysis).

Conclusions

There has been a substantial increase in high-volume reverse shoulder arthroplasty centers. Outcomes improved in higher volume hospitals. SSLR-based volume categories performed superiorly to quartile-based volume categories in determining risk of adverse events. We have defined concrete surgical volumes that maximize outcomes, findings likely related to surgical experience, ancillary staff familiarity, and protocolized pathways. These centers may be targeted as institutions providing maximal value and should be considered as preferred destinations of care by both payers and patients.

106 The Effect Of Operative Time On Postoperative Outcomes In Total Shoulder Arthroplasty

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Aim

We hypothesized that increased operative time, as measured in 20-minute intervals, would be significantly associated with increased complications following TSA.

Background

Total shoulder arthroplasty (TSA) has been demonstrated to be an effective treatment for arthritis of the glenohumeral joint. Prior studies have identified longer operative times as a risk factor for complications after numerous types of procedures.

Methods

Patients undergoing TSA from 2006-2015 were identified using Current Procedural Terminology (CPT) codes from the ACS-NSQIP database. Patient demographic information, perioperative parameters, and 30-day postoperative complications were retrieved. The Pearson's chi-square test and a multivariate Poisson regression with robust error variance were used to analyze the relationship of operative time and postoperative complications.

Results

10,082 patients undergoing TSA were identified. The average patient was 69.15 years old (Range 23-89) and was overweight (mean body mass index [BMI] = 31.21). Multivariate analysis revealed that for each increase in 20 minutes (17.5% of mean operative time) of operative time, there were significantly increased rates of any complication (relative risk [RR] 1.24, 95% confidence interval [CI] 1.19-1.26), anemia requiring transfusion (RR 1.33, 95% CI 1.26-1.4), peripheral nerve injury (RR 1.88, 95% CI 1.53-2.31), and urinary tract infection (RR 1.24, 95% CI 1.09-1.41).

Conclusions

The findings of this study indicated that increasing operative time by an interval of 20 minutes confers significantly increased risk for postoperative complications following TSA. We anticipate the results of this manuscript will be used for provider education, policy decision-making, and potentially to derive algorithms that can improve safety and efficiency after shoulder arthroplasty.

103 Does Posterior Half-Wedge Augmented Glenoid Restore Version And Alignment In Total Shoulder Arthroplasty For The B2 Glenoid?

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Aim

This study aims to review anatomical restoration of glenoid version and humeral head centring in anatomic total shoulder replacements (ATS) in B2 glenoids using CT scans.

Background

Uncorrected retroversion in B2 glenoid causes eccentric loading and failure of the glenoid component in TSA. It also leads to humeral head decentring with posterior rim loading, early glenoid wear and component loosening.

Methods

This is a retrospective review of TSA for glenohumeral osteoarthritis with B2 glenoid morphology. All polyethylene posterior wedge augmented glenoid component (Tornier Aequalis Perform Plus, TN, USA) was used. Patients underwent pre and post operative CT scans. Glenoid version was calculated using neoglenoid line and medial scapula border as reference point. This was done at mid-glenoid height on axial CT-scan with best-fit ellipse method. Pre and Post-operative humeral head centering was calculated using offset of centre of humeral head with plane of scapula on axial CT-Scan. During surgery, eccentric reamer with depth stop on paleoglenoid was used to ream neoglenoid to accept posterior wedge augment.

Results

Ten patients with 11 TSA were recruited between June 2017 and July 2018. Mean age was 59 (45-80) years with 5 females and 5 males (one patient had bilateral arthroplasty). Average follow-up interval between CT scan and surgery was 11 months. Mean preoperative retroversion was 16(13-23) degrees. This was corrected to a mean of 0 degrees retroversion postoperatively, ranging from 8 degrees of anteversion to 3 degrees of retroversion. All patients achieved retroversion less than 5 degrees. Hence, 63% had good radiological correction (0-5 degrees retroversion). Mean pre-operative humeral head scapula offset was 9.7mm (13.7-2.9mm). Humeral head was well centred post-operatively with mean humeral scapula alignment offset of 2.1(0.8-4.5) mm posteriorly. All the cases had well-centered humeral head postoperatively with offset less than 5 mm.

Conclusions

Total shoulder replacement in B2 glenoid is technically demanding. Our radiological results show favourable outcome in terms of correction of glenoid retroversion and eliminating posterior instability using wedge glenoid component.

Basic Science

58 THE ANATOMY AND VARIATION OF THE SUBCLAVIUS MUSCLE, ITS CORACOID ATTACHMENT, AND RELATION TO THE CLAVI-CORACO-AXILLARY APONEUROSIS

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Aim

To describe the anatomy of the subscapularis muscle (SM) and the lateral aponeurotic extension of the pars paramuscularis (the medial coracoclavicular ligament, MCCL) and its attachment to the coracoid in relation to the clavi-coraco-axillary aponeurosis (Testut, 1904).

Background

During a surgical anatomy programme conducted at the Division of Clinical and Functional Anatomy at the Medical University of Innsbruck we noted additional fibrous structures contiguous with, and extending from, the SM epimysial fascia inserting into the base, medial margin and tip of the CP. This observation, suggested (1) that anatomical variations of the coracoid insertion of the SM are more common than previously reported, and (2) that the function of the SM is more subtle than simply that of stabilising the clavicle at the sternoclavicular joint. Furthermore, the fact that the SM has a discrete nerve supply supports the notion that the SM has (or had) a more important role in the function of the upper extremity than conventionally considered.

Methods

Embalmed human cadavers, preserved using an arterial injection of a formaldehyde-phenol solution and immersion in phenolic acid in water for one to three months, were used. The bodies were donated to the Division of Clinical and Functional Anatomy at the Medical University of Innsbruck, Austria, following pre-mortem informed consent for their use in scientific studies. 52 upper extremities (26 bodies; 14 male; mean age 78 years (range: 58-93)) were dissected to demonstrate the SM, including variants of the muscle and its attachments to the coracoid. The nerve to subclavius was dissected (in 44 of the 52 specimens), while the artery was dissected in 19 specimens.

The following dimensions were measured: (1) the axial (apparent) length of the clavicle (from the anterior rim of the sternal facet of the clavicle in the midline of the shaft to the anterior rim of the acromial facet in the midline of the shaft); (2) the (real) length of the clavicle measured between the two points given but on the external surface. An estimation of overall curvature of the clavicle was calculated by comparison of the two length measurements expressed as a ratio, a larger ratio being indicative of greater overall curvature (medial antecurve and lateral retrocurve combined) of the clavicle; (3) The overall length of the SM (muscular part and fibrotic extension) was measured from the lateral extent of its origin on the first rib to (a) the coracoid and (b) the lateral end of the insertion in the sulcus m. subclavii; (4) the length of the insertion of the SM in the sulcus M subclavii; (5) the distance from the origin of the SM on the first rib at which the nerve to subclavius entered the muscle; and (6) the distance, as defined for the nerve, at which the artery to the muscle entered the muscle where this was possible. Measurements were recorded to the nearest millimetre. Variations in the extent and dimensions of the origin and insertions of the SM were recorded. Variations in the gross anatomy of the SM including duplications were noted. Measurement data were entered into an Excel spreadsheet (Microsoft Office 2010; Excel 14.6.6) and recorded as mean values, and minima and maxima. The dissection sequences were photographed at intervals for documentation purposes.

Results

The mean age of the specimens was 78 years (range: 58 – 93). The origin of the SM was invariant. 23% of specimens had muscular variation(s). Three variants of the lateral aponeurotic insertion of the SM were observed in 49 (94%) of the specimens: a strong cord-like band in 18

(37%), a planar twisted sheet-like structure in 16 (32%), and small or thin cord-like structures in 12 (24%). Males had more strong cords (14/24, 58% v. 9/28, 32%) and sheet-like structures (11/24, 46% v. 5/28, 18%) than females. The nerve to subclavius entered the muscle at a mean of 52% (in females) and 57% (in males) from the point of origin of the muscle.

Conclusions

A structure corresponding to the MCCL was found to be much commoner than previously reported. The site of entry of the nerve to subclavius suggest that the muscle acts on the pars paramuscularis and lateral aponeurosis, and thence the clavi-coraco-axillary aponeurosis, to improve the accuracy and control of motion in the shoulder girdle, particularly during actions involving the elevated upper extremity. The anatomy of the coracoidal insertion of the SM may be relevant to the aetiology of lateral subclavicular outlet syndromes, the generation of pectoral pain syndromes and to insufficient shoulder girdle function in the scapular protraction syndromes.

Elbow

51 Functional Outcomes Of Elbow Injuries Managed According To The Wrightington Classification Of Elbow Fracture Dislocations.

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Aim

The aim of this study is to review the functional outcomes of patients managed by application of the Wrightington Elbow Fracture Dislocation classification system and its corresponding management algorithm.

Background

Elbow fracture dislocations are complex injuries that can provide a challenge for experienced surgeons. Current classifications fail to provide a comprehensive system that encompasses all of the elements and patterns seen in elbow fracture dislocations.

Methods

This is a retrospective case series of all (operatively managed) adult patients with elbow fracture dislocations presenting in the period from 1st May 2010 to 1st May 2018. All patients underwent surgical management by a single surgeon based on the Wrightington classification summarised below.

A Anteromedial facet fracture

B Bifacet fracture

B+Bifacet fracture and radial head fracture

C Comminuted radial head or combined radial head and anterolateral facet

D Diaphyseal proximal ulna fracture with dislocated intact radial head

D+ Diaphyseal proximal ulna fracture and radial head fracture

All cases were assessed clinically and radiologically by the senior author prior to surgery.

Computed tomography (CT) scans were obtained in 54/60 patients (90%). Post operative review was performed at 2, 6 and 24 weeks with further follow up if clinically indicated.

For the purpose of this study preoperative images were retrospectively reviewed by all investigators and injuries were classified according to the Wrightington classification system. Any disagreement was resolved by discussion. The content validity of the classification was assessed by comparing each subgroup classification with the intraoperative findings.

The primary outcome measures were the range of movement and Mayo Elbow Performance Score (MEPS). Complications were collected as a secondary outcome. Ethical approval was obtained and data was obtained by retrospective case note review

Results

Sixty patients were managed using the Wrightington classification. This comprised thirty two(53%) females and 28(47%) males with a mean age of 48 yrs (range 19-84). In order of observed frequency 20 cases (33%) were classified as type B+, 18(30%) Type C, 11(28%) Type B, and 7(12%) Type A. There were 3 Type D+ and 1 Type D.

Fifty eight(96.7%) patients completed a minimum of 3 months follow up. Average follow up was 5.7 months (range 2-18). The average Mayo Elbow Performance Score (MEPS) at final follow up was 93(range 55-100) and the mean arc of movement was 15- 131. Sub group analysis showed average MEPS of 91(65-100) in group A, 93(70-100) in group B, 92(55-100) in group B+, 94 (65-100) in group C, 100 in group D and 90(70-100) in group D+. The average arc of movement was 10-136 degrees in group A, 22-128 degrees in group B, 17-127 degrees in group B+, 12-134 degrees in group C, 0-130 degrees in group D and 18-131 degrees in group D+.

Four patients underwent secondary surgery. One patient underwent arthrolysis with excellent outcomes, 1 patient underwent revision of radial head replacement due to over stuffing, 1 patient had non-union of radial head fixation and underwent excision surgery and 1 patient had CRPS and prominence of ulna plate and underwent removal of metal work. All 4 patients had improved outcomes with average MEPS score improvement from 65 to 94 and improved arc of motion.

Conclusions

The Wrightington Classification system facilitates pattern recognition and provides an algorithm for management for these complex injuries. Our results suggest that predictably good outcomes can be achieved by application of surgical algorithms related to this classification.

Shoulder

14 Primary Revision Of Anatomic And Reverse Shoulder Arthroplasty: An Analysis Based On The Shoulder Arthroplasty Registry Of The German Shoulder And Elbow Society

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Aim

Hypotheses: The analysis of well documented cases in the Germany Shoulder Arthroplasty Registry (SEPR) can (1) provide valuable detailed information (2) which are useful to improve patient care and guide treatment in the future.

Background

Revisions of shoulder replacement are the inevitable and elaborate consequence of primary implantation.

Methods

Study design: retrospective registry study

inclusion criteria: complete dataset in SEPR of primary revision shoulder arthroplasty from 1994-2018

exclusion criteria: multiple revisions, incomplete data

statistical analysis using SPSS 25.0

Results

The data set screening of n=8410 documented shoulder arthroplasties resulted in n=975 revision cases of which n=433 could be included.

Data (mean, Min-Max; p):

patient age anatomical arthroplasty (TSA) (n=254) 66.3 (28-89) vs. reverse arthroplasty (RSA) (n=179) 77.1 (45-89), p=0.001. No correlation of age and gender to survival.

Frequent reasons for revision (TSA;RSA) (%): rotator cuff insufficiency (51.2; 28.5) p=0.001; dislocation (21.7;39.1) p=0.001; chronic infection (26; 32.4) p=0.146.

Preop. imaging (%;p) (TSA;RSA): radiographs (76;70;0.259), CT (33;31;0.671), Arthro-CT (3;1;0.143), MRI (4;3;0.622), ultrasound (10;7;0.484), scintigraphy (2;2;0.911), biopsy (2;3;0.176).

Frequent types of revision TSA (%): conversion to RSA (47), humerus (19), glenoid (41); RSA (%): other (27), humerus (20), glenoid (17).

Frequent intraop. complications (TSA;RSA) (%): nothing (91;96) p=0.035; fracture of humeral shaft (3;2) p=0.462.

Postop. complications TSA 31%, RSA 39%, p=0.372. Postop. complications TSA stemless none 78%, classic stem none 65%, short stem none 64%, p=0.122.

Survival (m) TSA 42.8 (0-240) vs. RSA 27.7 (0-361), p=0.001; arthroplasty for fracture anat. (FxA) 21.9 (0-182) vs. fracture reverse (FxR) 16.9 (0-46), p=0.795.

Survival cemented stems TSA 37.7 (0-240) vs. uncemented TSA 27.7 (1-107), p=0.018;

Survival cement. stems RSA 24.8 (0-193) vs. uncement. stems RSA 35.1 (0-361), p=0.715;

cement. glenoid TSA 36.1 (0-240) vs. uncement. glenoid TSA 39.8 (0-182), p=0.527; uncement. RSA 27.7 (0-361).

Survival TSA: classic stem 52.3 (0-240), short stem 27.9 (2-121), stemless 33.3 (0-144)

(p=0.205); RSA: classic stem 24.0 (0-216), short stem 30.3 (0-361) (p=0.626). Intraop. complications in TSA stemless 2.3%, classic stem 9.7%, short stem 21.4% (p=0.018).

Constant-Score at time of revision TSA vs. RSA 26.1 (0-65) ; 19.6 (0-49), p=0.001; ROM active Flex. 66 (0-160);57 (0-150), p=0.119; active Abd. 58 (0-160);53 (0-140), p=0.101; active ERO 18 (-30-70);9 (-19-40), p=0.003.

No arthrodesis was performed at all.

Conclusions

Results for TSA and RSA are significantly different for age at revision, survival, intraop. complications, reasons for revision and clinical function before revision (Constant score and active ERO).

The number of patients with RSA at age < 70 is significant with expected further revisions.

The hypotheses could be confirmed. The number of documented cases and quality of documentation can be improved for a better data analysis and prediction for the future.

10 Magnetic Resonance Imaging Grading System For Tears Of The Latissimus Dorsi And Teres Major

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Aim

To: 1) develop a specific magnetic resonance imaging (MRI) classification system for LD/TM tears and report its reliability, 2) correlate LD/TM tear severity with ability or inability to return to sport, and evaluate performance upon return to sport (RTS), 3) identify predictors of failure of non-operative management to allow expeditious surgical repair of LD/TM tears.

Background

Recent awareness of latissimus dorsi/teres major (LD/TM) injuries has led to an increase in diagnosis. No magnetic resonance imaging (MRI) classification system specific to LD/TM exists, nor has tear severity been correlated with ability to return to sport (RTS).

Methods

All patients from two orthopaedic surgeons with LD/TM tears diagnosed by MRI were included. MRI were reviewed and graded by two authors, twice, 60 days apart based on a new classification system. Intra and interobserver reliability was calculated. Timing from injury to RTS was recorded, and performance upon RTS was analyzed.

Results

The proposed grading system has excellent intra- and inter-rater reliability (Cohen's Kappa > 0.850). 20 male patients (mean ± standard deviation age 26 ± 9.3 years) with LD/TM tears were included (80% were baseball pitchers). Of the 16 players treated operatively, 5 were initially treated non-operatively by an outside physician but failed to RTS (all professional baseball pitchers). Tear grades of these players were 2 Grade IIIA and 3 Grade IVA. Among professional baseball players, ultimately 100% were able to RTS regardless of initial treatment at a mean of 8.7 ± 3.3 months although some failed initial non-operative management and necessitated surgical intervention. There were no statistically significant pre and post surgery differences in performance in those professional players that were treated operatively.

Conclusions

The proposed MRI-based grading system for LD/TM tears has excellent reliability. This system may allow physicians to better advise patients and all involved health care providers. Consideration should be given to acutely treat grade III and IV tears with operative repair.

38 Adhesive Capsulitis: Demographics And Predictive Factors For Success Following Steroid Injections And Surgical Intervention

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Aim

The purpose of this study was to examine demographic factors of all patients treated for adhesive capsulitis by a single surgeon, report the treatments and outcomes of these patients, and determine the effectiveness of various treatments including corticosteroid injections and operative intervention in relation to risk factors for adhesive capsulitis, mainly diabetes.

Background

Adhesive capsulitis of the shoulder is a common, painful condition. While multiple conservative and surgical treatment options exist for adhesive capsulitis, much is still unknown regarding at risk populations and ideal treatment options for individual patients.

Methods

All patients treated for adhesive capsulitis by the senior author between 2008-2014 were identified via charts and operative reports and were eligible for inclusion. Demographic information, shoulder range of motion (ROM), specific treatment information (number of corticosteroid injections, etc.) was collected.

Results

Overall, 1377 patients were treated for adhesive capsulitis (945 females vs. 431 males ($p=0.001$)). For patients with adhesive capsulitis: a higher percentage of males were diabetic than females (24.8% vs. 17.3% [$p=0.001$]); non-diabetics presenting had better forward flexion than diabetics (114° vs. 108° [$p=0.015$]); more diabetics required capsular release than non-diabetics (13% vs. 7.3% [$p=0.003$]); more non-diabetic patients resolved adhesive capsulitis without corticosteroid or surgical intervention than diabetics (83.6% vs. 61.7% [$p=0.001$]); more non-diabetic patients resolved adhesive capsulitis following single corticosteroid injection than diabetics (95.9% vs. 86.7% [$p=0.001$]). Multiple intraarticular corticosteroid injections provided no added benefit over a single injection in diabetics and non-diabetics.

Conclusions

In shoulder adhesive capsulitis, diabetics respond less favorably to physical therapy in isolation and physical therapy plus corticosteroid injections than non-diabetics. No benefit from multiple intraarticular corticosteroid injections was seen compared to a single intraarticular corticosteroid injection in diabetics and non-diabetics. Diabetics and non-diabetics do well following capsular release once they fail conservative treatment.

Elbow

8 Surgical Approaches For Total Elbow Arthroplasties Using Data From The Dutch Arthroplasty Register.

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Aim

Using the Dutch Arthroplasty Register, we aimed to reveal whether high-volume centers use different approaches compared to low-volume centers and whether the approach is implant-specific.

Background

Total elbow arthroplasty (TEA) is a relatively infrequently performed procedure, therefore, nationwide databases help to provide more insight into the surgical approach used.

Methods

Using data from 2014 to 2017, we compared the surgical approaches used between high-volume and low-volume centers, as well as for the two most frequently used types of total elbow prostheses (TEP) using chi-square tests.

Results

We analyzed 276 procedures. In 2016 and 2017, when posterior approaches were further specified, the triceps-on approach is used most frequently in the high-volume center (27/42, 64%) and the triceps-flap approach is most often used in the low-volume centers (48/84, 57%) ($p < 0.001$).

For the two most frequently used types of TEP, the Coonrad-Morrey and Latitude EV arthroplasties, surgical approach did not differ. When the high-volume center is compared to the low-volume centers, implant choice differs with the Coonrad-Morrey being most often used in the high-volume center and the Latitude EV in the low-volume centers.

Conclusions

In conclusion, the posterior triceps flap approach is the most frequently used surgical approach in primary total elbow arthroplasty in the Netherlands, yet the triceps-on approach is used more often in the high-volume center. Surgical approach did not differ between two most frequently used types of TEP in the Netherlands.

Shoulder

114 Capsular Release Following Total Shoulder Arthroplasty: An Analysis Of Early Outcomes

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Aim

The purpose of this study is to analyze the outcomes of capsular release (open or arthroscopic) for the treatment of refractory stiffness following total shoulder arthroplasty.

Background

Although persistent shoulder stiffness after total shoulder arthroplasty is likely an underreported complication, there is a paucity of studies analyzing the treatment of this complication.

Methods

A retrospective institutional review from 2002 to 2017 identified 19 patients who experienced persistent shoulder stiffness after anatomic total shoulder arthroplasty refractory to nonoperative treatment, requiring either open (n=5) or arthroscopic (n=14) capsular release. The mean age of the patients was 53 years. There were 7 (39%) patients who had a prior diagnosis adhesive capsulitis requiring capsular release prior to primary total shoulder replacement. The mean time from primary arthroplasty to capsular release was 0.8 years.

Results

At a follow-up of 2.3 years (1-5.5), the patients mean preoperative to postoperative motion improved overall, including forward flexion, abduction, external rotation, internal rotation at 0o, and pain scores ($p < 0.01$). However, there were 3 (16%) that required revision surgery for glenoid loosening, and 1 additional patient who was scheduled to undergo revision surgery for a subscapularis rupture. Of the remaining 15 patients, 7 had refractory stiffness and/or pain, with 4 requiring a repeat intervention, including repeat capsular release (n=3) or arthroscopic debridement (n=1). Of the 3 that required repeat capsular release, 2 had a prior history of adhesive capsulitis. The survival-free of reoperation at 2 and 5 years was 76% and 53%, respectively, while the survival-free of revision surgery at 2 and 5 years was 83%. Of the patients with workman's compensation (n=5), 3 had poor outcomes. There was no difference between open or arthroscopic capsular release. In the remaining patients (n=8), the mean postoperative forward flexion was (89o to 143o), abduction was (49o to 121o), external rotation was (11o to 41o) and internal rotation at 0o was (L5 to T12).

Conclusions

Shoulder stiffness after total shoulder arthroplasty is a rare complication and difficult pathology to treat. Surgeons should have a high suspicion for underlying pathology, such as glenoid loosening or subscapularis injury. Once those pathologies are ruled out, ~50% demonstrate minimal improvement with capsular release, while the others markedly improve in shoulder both motion and pain. There was no difference when performed open or arthroscopic.

113 Is Revision To Anatomic Shoulder Arthroplasty Still An Option? A Systematic Review

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Aim

The purpose of this article was to examine revision to anatomic TSA, the factors associated with outcomes, and recent trends in the revision setting.

Background

With the historical complications when using total shoulder arthroplasty (TSA) to revise failed arthroplasties, and the success of the reverse prosthesis in the revision setting, the question arises whether revision to TSA is still a reasonable option?

Methods

A systematic review was performed for studies of TSA used to revise a failed hemiarthroplasty or TSA. The primary outcome was implant failure leading to a repeat revision arthroplasty. Secondary outcomes included VAS pain scores, shoulder motion and other clinical outcomes of shoulder function. Data were pooled to generate representative frequency-weighted means.

Results

Twelve studies were included, totaling 298 shoulders in 295 patients. The mean age was 58 years and mean follow-up was 68 months. Etiologies for revision included glenoid arthrosis (60%), glenoid component failure (39%), and other (1%). There were 36% of cases that experienced complications and 8% required another arthroplasty revision. Functional scores, along with elevation, abduction, and external rotation improved, but none of these were statistically significant. Patients experienced significant improvement in their VAS pain scores ($p < 0.05$). Unsatisfactory outcomes were higher amongst patients with glenoid bone loss, instability, and soft tissue deficiencies.

Conclusions

Revision to anatomic TSA can be an acceptable option in certain patients. However, the high rate of complications and glenoid loosening, makes this a limited approach for a revision to anatomic TSA procedure.

111 The Impact Of Workman's Compensation On Recovery After Biceps Tenodesis

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Aim

The purpose of this study is to compare the postoperative recovery outcomes of after isolated biceps tenodesis in patients with and without workman's compensation claims.

Background

Workman's compensation (WC) claims have been associated with poor outcomes after a variety of orthopedic surgery procedures, particularly when examining recurrent pain and function. However, the impact of WC on a variety of outcomes after shoulder surgery is not as well understood. Biceps tenodesis is a well-established treatment for isolated biceps or superior labrum pathology. However, the impact of factors, such as workman's compensation have yet to be examined in depth

Methods

Using the surgical outcomes system (SOS) database (Arthrex Inc., Naples, FL), we assessed the postoperative recovery outcomes for all patients who had outcomes recorded at least 6 months after isolated biceps tenodesis. The time points analyzed included, preoperative and postoperative (2 weeks, 6 weeks, 3 months, 6 months, 1 year, 2 years). The outcomes analyzed included visual analog score (VAS), American shoulder and elbow score (ASES), VR-12 mental and physical, simple shoulder test (SST), and SANE.

Results

Overall, 181 patients with WC claims underwent isolated biceps tenodesis, compared to 1,069 patients without WC claims. There were similar demographics and comorbidities in the two groups, including gender (34% females in WC vs 38% females in non-WC), age (mean 47 years in WC vs. 50 years in non-WC), smokers (15% in WC vs. 10% in non-WC), and diabetes (8% in WC vs. 6% in non-WC). The postoperative recovery curves for VAS, ASES, and SANE are displayed in Figure 1 below. Patients without WC claims had significantly improved VAS, VR-12, ASES, SANE, and SST scores at all times points after 3 months when compared to those with WC claims ($p < 0.001$). However, given many with measures were significantly worse preoperatively in patients with WC claims, we also analyzed the preoperative to postoperative change in all outcomes at each time point. At 1 year when compared to those without WC claims, patients with WC claims had worse VAS ($p = 0.03$), ASES ($p = 0.007$), SANE ($p < 0.001$), and SST ($p = 0.08$) (Figure 2 below).

Conclusions

When analyzing the patient's recovery after isolated biceps tenodesis, workman's compensation claims lead to significantly worse pain and functional outcomes at every major time point (3, 6, 12, and 24 months). Furthermore, the patients with WC also had worse preoperative to postoperative improvements in most of the outcomes. This information can be used to educate surgeons and patients on postoperative expectations, as well as analyses focused on health economics, value, and policy.

110 Early Clinical Outcomes Of Superior Capsular Reconstruction Compared To Tendon Transfers

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Aim

The purpose of this study is to compare the early postoperative recovery outcomes of tendon transfers (TT) to SCR.

Background

The management of massive posterosuperior rotator cuff tears is controversial, with no gold standard. Two recently developed techniques that have shown promising initial results include arthroscopic superior capsular reconstruction (SCR) and arthroscopic-assisted tendon transfers (latissimus or lower trapezius). However, there remains a paucity of studies examining each procedure's early postoperative clinical outcomes individually or in comparison to each other.

Methods

Using the surgical outcomes system (SOS) database (Arthrex Inc., Naples, FL), we assessed the postoperative recovery outcomes for all patients who had outcomes recorded at least 6 months after SCR or TT. The time points analyzed included, preoperative and postoperative (2 weeks, 6 weeks, 3 months, 6 months, 1 year, 2 years, and 3 years). The outcomes analyzed included visual analog score (VAS), American shoulder and elbow score (ASES), VR-12 mental and physical, simple shoulder test (SST), and SANE.

Results

Overall, 197 patients underwent SCR and 25 arthroscopic-assisted TT. The mean age for SCR and TT was 60 years and 56, respectively. The mean BMI for SCR and TT was 31 kg/m² and 29 kg/m², respectively. The postoperative recovery curves for VAS, ASES, and SANE are displayed in Figure 1. Patients undergoing arthroscopic assisted TT had improved VAS scores compared to SCR at 1 year ($p=0.02$). When assessing the functional outcomes measures, including ASES, SANE, SST, and VR-12 physical, the TT and SCR had comparable outcomes, with slight but not statistically significant improvements at 12 months with the TTs. When breaking down SCR between those who had concomitant partial supraspinatus or infraspinatus repair ($n=34$) to those who had SCR alone ($n=163$), those who had SCR with repair had improved VAS, ASES, and SANE at 12 months ($p<0.02$). The SCR with repair also trended toward improved VR-12 and SANE functional outcome scores compared to SCR alone, but these were not statistically significant.

Conclusions

When analyzing the early outcomes associated with arthroscopic treatment of massive posterosuperior rotator cuff tears, the arthroscopic assisted tendon transfers had improved pain levels and equivalent early functional recovery outcomes to superior capsular reconstruction. This information can be used to educate surgeons and patients when considering these arthroscopic shoulder reconstructions. While we recognize many confounding variables likely influence these early results, this study serves as a foundation for future studies comparing these treatments in the management of massive posterosuperior rotator cuff tears.

78 Latissimus Dorsi Transfer For Irreparable Subscapularis Tear

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Aim

The purpose of this study is to report the outcome of latissimus dorsi transfer to reconstruct an irreparable subscapularis tear.

Background

Irreparable subscapularis tears is associated with marked shoulder dysfunction and morbidity. Given the variable outcomes with pectoralis major transfer or graft augmented reconstruction, leaving many patients with a reverse shoulder arthroplasty as their only surgical option. Conversely to the pectoralis major, the latissimus dorsi (LD) line of pull is posterior to the body's axis, in the same direction as the subscapularis. Although LD transfer has been described for posterosuperior rotator cuff tears, there is a paucity of information on LD transfer for subscapularis insufficiency.

Methods

Seventy-two consecutive patients with irreparable subscapularis tears who underwent latissimus dorsi transfer. Sixteen of these patients had a prior failed latarjet and subsequently required additional bone grafting, and were excluded. Therefore, 56 patients were included in this study. The average age of 53 years (range, 37-79), with 39 (70%) males, and 30 (54%) performed in the dominant extremity. Every patient had a prior surgery, with a mean number 2 (range, 1-5). Concomitant pathologies included a supraspinatus tear in 37, upper infraspinatus tear in 11, and mild arthritis in 7 shoulders. On radiographic evaluation, 38 patients had evidence of proximal migration, while 27 had anterior subluxation. The surgical technique included open repair in 14 shoulders and arthroscopic repair in 42 shoulders. Outcome measures included visual pain analogue score (VAS), range of motion (ROM), subjective shoulder value (SSV), and Constant shoulder score.

Results

At a mean 13 months follow-up (7-51 months), patients had significant improvements in their pain, flexion, abduction, internal rotation, SSV, and Constant scores when compared to preoperatively ($p < 0.03$). There was an improved subjective lift off test in all patients, but only 12 patients had a complete reversal of the lift off test. Belly press test improved in 43 patients, but similar to lift off, only 16 patients had a complete reversal of the belly press test. At final follow-up, 10 of 38 patients continued to have proximal migration, while 3 of 27 patients continued to have evidence of anterior subluxation. Of note, the patients with frank anterior escape had a higher likelihood of having proximal migration and anterior subluxation, but this was not statistically significant. There was no progression of arthritis stages at final follow-up. Revision surgeries included 2 patients revised to a reverse shoulder arthroplasty for rupture of the tendon transfer. Furthermore, 3 patients had LD transfer ruptures, but did not elect to undergo further surgery.

Conclusions

Latissimus dorsi transfer for irreparable subscapularis tears has the potential to lead to clinical improvements in patients shoulder function. At final follow-up, most patients improve in many of the signs of subscapularis insufficiency, including anterior and/or proximal subluxation, clinical examination maneuvers and shoulder function. Overall, this transfer represents a reasonable option for this difficult pathology.

77 Outcome Of Arthroscopically Assisted Lower Trapezius Transfer To Reconstruct Massive Irreparable Posterior-Superior Rotator Cuff Tears

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Aim

The purpose of this study is to report the outcome of arthroscopically assisted lower trapezius transfer to reconstruct irreparable posterior-superior rotator cuff tear.

Background

Reasonable outcomes has been reported with indirect open lower trapezius transfer extended with an Achilles tendon allograft to reconstruct irreparable posterior-superior rotator cuff tears. Techniques have been developed to perform this procedure arthroscopically. However, the outcome of arthroscopically assisted lower trapezius transfer is largely unknown.

Methods

Forty-one consecutive patients with irreparable posterior-superior rotator cuff tears who underwent an arthroscopically assisted transfer of the lower trapezius transfer were included in this study. There was an associated repairable tear of the subscapularis tendon in 25 shoulders. The average age of the patients was 52 (range, 37-71) years and average follow-up was 13 months (range, 6-17 months). Nineteen patients had true pseudoparalysis of the shoulder on preoperative examination. Outcome measures included visual pain analogue score (VAS), range of motion (ROM), subjective shoulder value (SSV), and Disabilities of the Arm, Shoulder and Hand (DASH) score.

Results

Thirty-seven patients had significant improvement of all outcome scores: VAS, SSV and DASH. At most recent follow-up, range of motion averaged: 133° flexion, 95° abduction, and 47° external rotation. Outcome was not affected by the presence of a subscapularis tear. However, three patients who had preoperative arthritic changes of the shoulder, 2 with Hamada 2 and one Hamada 3, had persistent pain and limited range of motion of the shoulder after surgery, and 2 of them underwent reverse shoulder arthroplasty. One patient had significant improvement of pain but with no improvement of motion, and elected not to have further surgery. Two additional patients had a traumatic rupture of the transfer as result of fall (at 5 and 8 months post op). One underwent revision arthroscopic repair and did well after surgery, and the other had good pain relief but recurrent weakness and limited range of motion, and elected not to have a revision surgery.

Conclusions

Arthroscopic assisted lower trapezius transfer may lead to a good outcome in patients with massive irreparable posterior-superior rotator cuff tears, including patients with pseudoparalysis. The presence of an associated repairable subscapularis tear did not affect the outcome. However, the presence of radiographic degenerative changes did lead to a worse outcome and the need for revision to reverse shoulder arthroplasty.

107 Frailty Predicts Complications, Readmission, Reoperation, And LOS In Elderly Patients Undergoing Total Shoulder Arthroplasty

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Aim

Identify the utility of the 5-item modified frailty index in predicting adverse events after total shoulder arthroplasty.

Background

Frailty, as quantified by the modified frailty index (mFI), has been used in other areas of medicine to identify patients at high risk for complications. Several studies have demonstrated that frailty, rather than age, is more predictive of adverse surgical outcomes. We hypothesized that a 5-item mFI could be used to identify patients at elevated risk for complications following total shoulder arthroplasty.

Methods

Patients who underwent total shoulder arthroplasty were identified by searching the ACS-NSQIP database using CPT code 23472. Patients who were younger than 50 years old, underwent multiple operations, had pre-sepsis or sepsis preoperatively, disseminated cancer, ascites, open wound or infection, and those with missing data were excluded from analysis. 5-item modified frailty index scores were then calculated. 30-day postoperative complication, reoperation, readmission, length of stay (LOS), adverse hospital discharge, and mortality data was collected and analyzed.

Results

9,863 patients were identified with a mean age of 70 years-old. As mFI increased from 0 to ≥ 2 , the following rates significantly increased: post-operative complication from 4.1% to 9.3%, reoperation rate from 0.7% to 1.6%, readmission from 1.7% to 4.5%, adverse hospital discharge from 6.3% to 19.4%, and LOS from 1.88 days to 2.46 days. Multivariate analysis revealed that when controlling for demographic and comorbid data, LOS, and operative time, patients with $mFI \geq 2$ were over twice as likely to sustain a postoperative complication, readmission, and reoperation (OR 2.01, 2.21, 2.41, respectively). Age alone was not significantly associated with complications, readmission, or reoperation.

Conclusions

Frail state is highly predictive of 30-day postoperative complications, readmission, reoperation, adverse hospital discharge, and hospital LOS following total shoulder arthroplasty in patients over age 50. Use of a simple frailty evaluation may help inform decision making and risk assessment when considering TSA in the geriatric patient.

91 Arthroscopic Vs Open Plate Removal In Sequelae Of Proximal Humerus Fracture: Does It Better Outcomes?

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Aim

Aim of the study is to highlight differences in outcomes in patients treated with arthroscopic and open arthrolysis and plate removal for stiff shoulders in sequelae of proximal humerus fracture.

Background

Fractures of the proximal humerus are frequently treated with ORIF with plate and screws. The most frequent complication that affects these patients is a very symptomatic shoulder stiffness. After a failed rehabilitation a plate removal with release could be necessary. This operation usually gives a good ROM with the due exceptions related to arthritic changes.

Methods

We enrolled 43 patients with stiff and painful shoulders as sequelae of proximal humerus fractures. In all cases the plates were implanted in open surgery through a deltoid-pectoral approach. All the patients were evaluated before surgery with X-Ray and CT scans. Constant score and SST score were used. The mean follow-up is of 47 months with a minimum follow up of 23 months. 27 patients (62%) had an open surgical approach with plate removal and subacromial and articular release. Articular release was performed with a subscapularis split and through the rotator interval. Sixteen (38%) patients had an arthroscopic approach with 360° articular release and subacromial release. The plates were removed making two-three additional portals along the humeral axis, following the plate stem, to remove the screws. The removal of the plate was performed through the anterior widened portal.

Results

The recovery of ROM was better in patients undergone to arthroscopic approach respect to patients with open approach ($p < 0,005$). Constant and SST scores too were better in the arthroscopic group even if not statistics ($p > 0,005$). These scores were most influenced by the arthritic changes ($p < 0,005$). None nerve complication was observed.

Conclusions

Athroscopic plate removal and capsular and subacromial release are a powerful approach in case of painful and stiff shoulder in sequelae of proximal humerus fracture.

89 Clinical And Radiographic Evaluation Of Three-Four Fragments Proximal Humerus Treated With CRF-PEEK Or Metal Plates At Two Years Follow-Up

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Aim

The aim of the study is to evaluate the clinical and radiographic outcomes of patients treated with metal or PEEK plates for three-four fragments fractures of the proximal humerus.

Background

Proximal humerus fractures are common in clinical practice and represent 4-5% of all fractures and the most frequent after 65 years. ORIF with plates and screws is the treatment of choice in these three-four fragments proximal humerus fractures. Different materials are now available and metal or CRF-PEEK are the most used. **Methods**

Methods

We enrolled 42 patients who underwent ORIF with CRF-PEEK (21) and metal (21) plates for proximal humerus fractures with a minimum follow up of two years. Patients were evaluated using Constant Score (CS), Simple Shoulder Test (SST), ROM and VAS. Radiographic evaluation, at last follow up, evaluated tuberosities resorption, lateral humeral cortex thickness and Deltoid Tuberosity Index (DTI).

Results

Peek Plates Patients (PPP) (57.1% women, mean age 57.4 years) had a mean CS of 67.3 and a SST of 7. Metal Plates Patients (MPP) (66.6% women, mean age 55.8 years) had a mean CS of 63.4 and a SST of 7. Tuberosity resorption was observed in 9 (42.8%) MPP and in 3 (14.2%) PPP. The mean lateral cortex thickness increased from 3.7 to 3.9 mm in the MPP and from 3.4 to 4.6 mm in the PPP. Pain (mild-moderate) was persistent at the last follow up in 12 patients (57.2%) in the MPP and in 9 patients (42.9%) patients in the PPP. No differences were found in order to ROM recovery, loss of fracture reduction and post-operative complications.

Conclusions

Our study showed a better tolerability of the PEEK plate compared to the metal plates in terms of pain and tuberosity resorption, together with an increase in the thickness of the external cortex.

