

## Saturday, August 31st

Scientific Session - Arthroplasty

14:00 - 15:00

Ballroom

14:00 - 14:08

### **36 Does The Orientation Of The Glenoid Rim Respect The Scapula Blade Evolving With Age, Compared To The Glenoid Vault Cortex Plane? Impact In Glenoid Positioning In Total Shoulder Arthroplasty.**

**Thomas Gregory**, Mickael Artuso

CHU AVICENNE, Bobigny, France

#### **Aim**

The goal of this study is to determine if changes over age occur in the Glenoid Rim (GR) orientation related to SB and GVOC planes.

#### **Background**

Restoration of the glenoid anatomy is mandatory in Total Shoulder Arthroplasty (TSA). The optimal glenoid placement is usually determined using Scapula Blade (SB) landmarks. Recently the Glenoid Vault Outer Cortex (GVOC) has been described and seems to correspond better to the surface layer orientation than scapula blade plane in young patients. However, TSA is mostly indicated in patient over 60 years old.

#### **Methods**

129 scans of normal scapulae were extracted from body or shoulder scan from 35 males et 33 females (respectively 64 and 65 scapulae) aged between 30 to 92. It represented 75 and 54 scapulae from patients under and over 60.

The orientation of the Glenoid Rim (GR) was assessed related respectively to GVOC and Scapula Blade (SB).

Using Horos and Cloud-Compare softwares, Reference of Interest points were positioned on the 3D reconstructed images to determine the edges of GR, GVOC and SB planes. The planes were reconstructed using the least-squares method, permitting to calculate their relative position.

#### **Results**

Compared to GR orientation, under 60, GVOC plane version ( $1,6^\circ \pm 3,7^\circ$ ), inclination ( $1,6^\circ \pm 6,6^\circ$ ), off-set distance ( $1,1\text{mm} \pm 1,4\text{mm}$ ) were lower than SB plane version ( $5,9^\circ \pm 7,3^\circ$ ), inclination ( $22,2^\circ \pm 10,9^\circ$ ), off-set ( $5,2\text{mm} \pm 3,0\text{mm}$ ).

Over 60, GVOC plane version ( $3,0^\circ \pm 4,7^\circ$ ), inclination ( $2,0^\circ \pm 3,1^\circ$ ), off-set distance ( $2,3\text{mm} \pm 2,2\text{mm}$ ) were lower than SB plane version ( $10,0^\circ \pm 7,2^\circ$ ), inclination ( $23,4^\circ \pm 10,7^\circ$ ), off-set ( $7,6\text{mm} \pm 4,9\text{mm}$ ).

(p value < 0,001)

#### **Conclusions**

The Glenoid Rim orientation related to the Scapula blade is changing over time whereas the GR orientation related to GVOC plane showed little variation whatever the patient age.

GvOC is therefore a reliable plane to determine the pre-eroded Glenoid Rim orientation in TSA.

14:08 - 14:16

## **34 TOTAL SHOULDER ARTHROPLASTY IN PATIENTS YOUNGER THAN 60 YEARS RESULTS OF THE NICE MULTICENTER STUDY**

Marc-Olivier Gauci, VanDerMeijden Olivier, Vincent Lavoue, **Mikael Chelli**, Romain Ceccarelli, Pascal Boileau

IULS, CHU de Nice, Nice, France

### **Aim**

To report here the subjective and objective outcomes of a series of TSA, in patients younger than 60 years at the time of surgery, reviewed clinically and radiographically at a minimum of 2 years after surgery.

### **Background**

Total shoulder arthroplasty (TSA) is currently preferred in young patients however, due to the limited survival of the glenoid component, the optimal treatment remains unclear for younger patients.

### **Methods**

We performed a retrospective multicenter study. Our inclusion criteria were all the stemmed-TSAs implanted in patients under the age of 60 with a minimum of 2 years of follow-up. Resurfacing and stemless arthroplasties as well as patients over 60 were excluded. Between 1993 and 2016, 460 primary TSAs were performed. Due to loss to follow-up, 65 patients had to be excluded leaving 395 shoulders in 332 patients for clinical and radiological analysis. The primary etiology of the arthritis was recorded. Clinical and radiological parameters were assessed before surgery, within 6 months after surgery, and then annually

### **Results**

Glenoid complications and cuff tears were the most frequently observed complications. 98 shoulders were revised, mainly for glenoid failure or infection, and 16 shoulders were re-operated, mainly for cuff tears or stiffness. At a mean follow up of 15 ypo, the survival-free revision was 63%. A statistical improvement of the range of motion, Constant score and satisfaction was observed at last follow-up. At last follow-up, 30% of patients presented a failure on the glenoid implant: either implant migration or loosening. Glenoid complications and revision are increasing with time. The clinical subjective and objective results were significantly better for patients without glenoid failure. The RLL score was significantly higher in patients with initial malposition.

### **Conclusions**

TSA is a reliable implant at mid-term follow up in younger patients with significant improvement in functional outcomes. However, there is a severe decline in glenoid implant survival over time, with the need to revise the implants.

14:16 - 14:24

## **119 Limited value of current shoulder registries in evidence based shoulder surgery.**

**Anne Karelse**<sup>1</sup>, Alexander Van Tongel<sup>1</sup>, Taco Gosens<sup>2</sup>, Sara De Boey<sup>1</sup>, Lieven De Wilde<sup>1</sup>

1. Department of Orthopaedic Surgery and Traumatology, Ghent University Hospital, Ghent, Belgium
2. Department of Orthopaedic Surgery and Traumatology, Elisabeth Tweesteden Hospital, Tilburg, The Netherlands

### **Aim**

Current national shoulder registries are used to assess incidence, indication, type of prosthesis and revision, but they seem to lack the information to lead to evidence based shoulder surgery.

### **Background**

There appears to be a large difference in registered parameters and in outcome measurement per country. In this study we investigated existing registries.

### **Methods**

We compared 7 registries with respect to all registered parameters, and we evaluated if implant related, patient specific and surgeon related parameters, proven in literature to influence prosthetic failure, were available in these registries.

### **Results**

A large heterogeneity of registered parameters exists between countries. The majority of parameters shown to be relevant to outcome and failure of shoulder prostheses are not included in the studied registries. Survival of the implant is the primary outcome measurement in the existing registries. Proms are introduced in some, but not obligatory.

### **Conclusions**

If we intend to use the registries to provide us with evidence to improve prosthetic shoulder surgery, we need adjustment of the different parameters to be included. Surgeon derived outcome measurement should be connected with patient derived outcome measures as PROMs to enable us to analyse the relationship and importance of different influencing factors to clinical outcome. These changes in the registries will encourage surgeons to use this instrument because it permits them to measure and thus improve their quality of medical care for the patients, and quality control of the implant. Complete and uniform registries can also aid in ODEP benchmarking of the different shoulder prostheses.

14:24 - 14:31

## **69 Does The Teres Minor Muscle Status Affect The Active Rotation Movement In Reverse Total Shoulder Arthroplasty?**

**Paolo Consigliere**, Laura Mariani, Luis Natera, Luigi Piscitelli, Caroline Witney-Lagen, Juan Bruguera, Ofer Levy, Giuseppe Sforza

Reading Shoulder Unit, Reading, United Kingdom

### **Aim**

To assess the correlation between teres minor (TM) integrity and fatty infiltration and postoperative active external rotation (AER) in patients operated with reverse total shoulder arthroplasty (rTSA)

### **Background**

rTSA provide good active elevation, however, there are concerns regarding deficient or absent active external rotation. The Teres Minor degeneration and fatty infiltration has been implicated.

### **Methods**

Between 2005 - 2015, 109 shoulders in 97 patients (mean age  $75.7 \pm 8.9$ ; 31 M, 66 F) underwent a primary metaphyseal rTSA for painful cuff tear arthropathy or massive irreparable rotator cuff tear with glenohumeral joint degeneration. 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.

TM fatty infiltration was evaluated according to Goutallier classification, while TM muscular degeneration according to Walch morphological classification. Consequently, all the shoulders were divided in 2 groups respectively: group A, Goutallier grade 0-1-2; group B, Goutallier grade 3-4 and group A1, Walch hypertrophic/normal and group B1, Walch atrophic/absent

### **Results**

The CS, SSV and AER improved significantly at 12-month follow-up assessment in all the patients ( $p < 0.001$ ). However, CS, AER and SSV have not shown statistically significant differences when comparing the different subgroups (A/B and A1/B1). Mean AER improved from  $22.4^\circ \pm 21.6^\circ$  preoperatively to  $40.6^\circ \pm 17.5^\circ$  postoperatively ( $+18.1^\circ \pm 21.5^\circ$ ) in all the subgroups.

### **Conclusions**

It seems that TM degeneration does not affect AER in patients that underwent rTSA for cuff tear arthropathy. It may relate to specific design concepts of the implant used or to the surgical technique used. Additional clinical and biomechanical studies are necessary to understand the reasons that have led to these results.

14:31 - 14:39

## **70 Outcome Of A Metaphyseal Stemless Reverse Total Shoulder Replacement In Rheumatoid Arthritis**

Paolo Consigliere, Caroline Witney-Lagen, Laura Mariani, Luis Natera, Ehud Atoun, Juan Bruguera, Giuseppe Sforza, **Ofer Levy**

Reading Shoulder Unit, Reading, United Kingdom

### **Aim**

To assess the clinical and radiological results of a metaphyseal reverse total shoulder arthroplasty (rTSA) in patients with rheumatoid arthritis

### **Background**

Use of reverse total shoulder arthroplasty (rTSA) in rheumatoid arthritis (RA) has been questioned in the literature due to the poor bone quality and high complication risk. Anatomic shoulder replacements have been used over the years leading to moderate functional outcome

### **Methods**

Between 2005 - 2015, 45 shoulders in 36 consecutive RA patients underwent cementless rTSA with a bone impaction technique. 9 had staged bilateral rTSA. 11 were revisions. Patients assessed clinically and radiographically preoperatively, at 3 weeks, 3 months, 6 months, 1-year postop and yearly thereafter, using the Constant Score (CS), pain score, Subjective Shoulder Value (SSV) and patient satisfaction score.

### **Results**

44 shoulders, 27 females (32 shoulders) and 9 males (13 shoulders) were available for follow-up (FU). Mean FU 67 months (range 24m – 146m (12y)). Mean age at surgery 68.7 years (range 39-86). CS improved from 17.5 preoperatively to 60.9 (Age/Sex adjusted 86.5) at last follow-up, results maintained over time.

Pain score improved significantly from 3.2/15 to 12.1/15. SSV improved from 1.2/10 to 8.9/10. Mean ROM improved to 140° active flexion, 134° active abduction, 47° active external rotation (AER) and 70° active internal rotations (AIR). The mean AIR with the hand behind the back was thoracolumbar spine.

No lucencies around the implants, loosening, subsidence or stress shielding was evident radiographically. 38 implants showed no glenoid notching. There were two grade-I, two grade-II and two grade-III Sirveaux-Nerot glenoid notching.

### **Conclusions**

Short metaphyseal rTSA shows to be successful and safe in RA patients. Impaction grafting technique improves humeral component stability. Patients restore good function, resume daily activities and have high satisfaction rates. Improvement is maintained over time. No signs of implant loosening, subsidence or stress shielding were observed.

14:39 - 14:47

## **32 9-13 Year Results Of Stemless Humeral Head Replacement. A Prospective Study.**

Peter Habermeyer<sup>1</sup>, Sven Lichtenberg<sup>2</sup>, **Petra Magosch**<sup>1</sup>

1. German shoulder centre, ATOS Clinic Munich, Munich, Germany
2. German joint centre, ATOS Clinic Heidelberg, Heidelberg, Germany

### **Aim**

The aim of the study was the evaluation of long-term results of shoulder arthroplasty using a stemless humeral head component.

### **Background**

Since their introduction in 2005, the stemless humeral head prostheses have been established. Long-term functional and radiological results are not available until now.

### **Methods**

Since 2005 we documented stemless humeral head replacement prospectively. Eighty-seven patients with a mean age of 58 years at surgery (40 hemi-shoulder arthroplasties (HSA), 47 total shoulder arthroplasties (TSA), 46 female, 41 male) were clinically and radiologically followed-up after a mean of 128 months (range, 105-157 months). Functional results were documented using the age- and gender-normalized Constant score (rel. CS).

### **Results**

The rel. CS improved significantly ( $p < 0.0001$ ) from 56 points (p) pre-op to 88p post-op. Its subcategories pain (8p pre-, 12p post-OP;  $p < 0.0001$ ), ADL (10p pre-OP, 15p post-OP;  $p < 0.0001$ ), ROM (20p pre-OP, 28p post-OP;  $p < 0.0001$ ) and strength (6p pre-OP, 11p post-OP;  $p = 0.001$ ) improved significantly as well.

Results for HSA (mean follow-up 128 months):

- Rel CS: 57p pre-OP, 90p post-OP;  $p < 0.0001$
- CS pain: 7.8p pre-OP, 11.9p post-OP;  $p < 0.0001$
- CS ADL: 9.5p pre-OP, 14.5p post-OP;  $p = 0.001$
- CS ROM: 19.8p pre-OP, 27.5p post-OP;  $p = 0.001$
- CS strength: 6p pre-OP, 12.2p post-OP;  $p = 0.01$

Results for TSA (mean follow-up 128 months):

- Rel CS: 55p pre-OP, 87p post-OP;  $p = 0.001$
- CS pain: 7.9p pre-OP, 12.4p post-OP;  $p = 0.003$
- CS ADL: 10.4p pre-OP, 14.8p post-OP;  $p = 0.014$
- CS ROM: 19.5p pre-OP, 28.9p post-OP;  $p = 0.001$
- CS strength: 6.1p pre-OP, 9.8p post-OP;  $p = 0.033$

There is no significant ( $p > 0.05$ ) difference of pre- and post-op CS as well as its subcategories between HSA and TSA.

Radiologically we observed no loosening of the stemless humeral head component. An incomplete radiolucent line of the humeral component was found in 7.9%. Stress shielding around the humeral component was not detected. Upward migration of the humeral head was observed in 23% (23.7% HSA, 15% TSA;  $p = 0.334$ ). No implant failure was observed at the humeral side. One humeral head replacement was explanted 7 months post-op because of early infection.

18.4% had a rotator-cuff deficiency at follow-up (HSA: 7.5%, TSA 27.7%;  $p = 0.039$ ). Overall, 12.6% of stemless shoulder arthroplasties were revised to reverse total shoulder arthroplasty (5% of HSA, 19.1% of TSA). 8.5% of TSA required an anatomic glenoid replacement. TSA had significantly ( $p = 0.014$ ) more frequently revision surgery than HSA.

### **Conclusions**

Stemless humeral head replacement showed no loosening with a significant improvement of shoulder function after a mean of 11 years. There is no difference of functional results between HSA and TSA. TSA showed a significant higher revision rate than HSA.

14:47 - 14:55

## **98 The Short-Term Survival Of Total Stemless Shoulder Arthroplasty For Osteoarthritis Is Comparable To That Of Total Stemmed Shoulder Arthroplasty: A Nordic Arthroplasty Register Association Study**

**Jeppe Vejlgaard Rasmussen**<sup>1</sup>, Jenni Harjula<sup>2</sup>, Erica Arverud<sup>3</sup>, Randi Hole<sup>4</sup>, Steen Lund Jensen<sup>5</sup>, Stig Brorson<sup>6</sup>, Anne Marie Fenstad<sup>4</sup>, Björn Salomonsson<sup>3</sup>, Ville Äärimaa<sup>2</sup>

1. Herlev University Hospital, Copenhagen, Denmark
2. Turku University and University Hospital, Turku, Finland
3. Karolinska Institutet, Danderyds Sjukhus AB, Stockholm, Sweden
4. Haukeland University Hospital, Bergen, Norway
5. Aalborg University Hospital, Aalborg, Denmark
6. Zealand University Hospital, Koge, Denmark

### **Aim**

To compare the short-term survival rate of total stemless, metaphyseal fixated, shoulder arthroplasty with that of total stemmed shoulder arthroplasty in treatment of osteoarthritis (OA).

### **Background**

The stemless humeral component relies on adequate bone quality and the risk of component loosening could be higher than with stemmed components

### **Methods**

Data was prospectively collected by the national arthroplasty registries in Denmark, Finland, Norway and Sweden and merged into one dataset under the umbrella of the Nordic Arthroplasty Register Association. For the present study we included all patients with OA treated with stemless (n=761) or stemmed (n=4,398) shoulder arthroplasty from 2011 to 2016.

### **Results**

21 (2.8%) stemless and 116 (2.6%) stemmed shoulder arthroplasties were revised. The 6-year cumulative survival rates were 0.953 for stemless shoulder arthroplasty and 0.958 for stemmed shoulder arthroplasty,  $P = 0.77$ . The most common indication for revision of both arthroplasty types was infection. Five (0.7%) stemless and 16 (0.4%) stemmed shoulder arthroplasties were revised because of loosening of either the glenoid or the humeral component. In the multivariate cox regression model, which included age category, gender, year of surgery, previous surgery and arthroplasty type, the hazard ratio for revision of the stemless shoulder arthroplasty was 1.00 (95%CI, 0.63-1.61),  $P = 0.99$  with the stemmed shoulder arthroplasty as reference. Male gender (HR=1.50(95%CI, 1.06-2.13),  $P=0.02$ ) and previous surgery (HR=2.70(95%CI, 1.82-4.01),  $P<0.001$ ) were associated with increased risk of revision.

### **Conclusions**

The short-term survival of total stemless shoulder arthroplasty appears comparable to total stemmed shoulder arthroplasty, but longer observation time is needed to confirm if they continue to perform equally.

## Sunday, September 1st

Scientific Session - RCT-Instability

08:00 - 09:00

Ballroom

08:00 - 08:08

### **25 Dynamic Anterior Shoulder Stabilization Using The Long Head Of The Biceps Tendon: A Biomechanical Study**

Alexandre Lädermann, Philippe Collin, Julian Mehl, Alexander Otto, Florian Imhoff, Elifho Obopilwe, Mark Cote, Knut Beitzel, Augustus Mazzocca, **Felix Dyrna**

La Tour Hospital, Meyrin, Switzerland

#### **Aim**

The purpose of the study was to biomechanically investigate the stabilizing effect of the DAS technique in comparison to standard Bankart repair in different defect models.

#### **Background**

A new concept of dynamic anterior shoulder stabilization (DAS) combining Bankart repair with the additional sling effect of the long head of the biceps (LHB) tendon to treat anterior glenohumeral instability has recently been introduced.

#### **Methods**

24 fresh frozen cadaver shoulders (average  $\pm$  SD: age  $60.1 \pm 8.6$  years) were mounted in a shoulder-testing system allowing 6 degrees of freedom. Glenohumeral translation was tested in  $60^\circ$  abduction and  $60^\circ$  external rotation (ABER position) while forces of 20 N, 30 N and 40 N were applied. The translation was measured using a 3D-digitizer and the total translation and the relative translation in relation to the native starting position were determined. Maximal external and internal rotation after application of 1.5 Nm torque to the humerus were measured. All specimens went through for 4 different conditions (Intact, defect, isolated Bankart repair, DAS) and were randomized to 3 different defect groups (Isolated Bankart lesion; 10% anterior glenoid defect; 20 20% anterior glenoid defect).

#### **Results**

Both surgical techniques resulted in decreased anterior glenohumeral translation in comparison to the defect conditions in all defect groups. In comparison with isolated Bankart repair DAS showed significant less relative anterior translation in 10 23 % glenoid defects (30 N:  $2.6 \pm 3.4$  mm vs.  $5.3 \pm 4.2$  mm;  $p = 0.044$ ) and in 20 % glenoid defects (40 N:  $2.1 \pm 6.6$  mm vs.  $6.0 \pm 5.7$  mm;  $p = 0.035$ ). However, in 20 % defects DAS led to a relevant posterior and inferior shift of the humeral head in ABER position and to a relevant increase of inferior glenohumeral translation. Both surgical techniques did not limit the rotational range of motion.

#### **Conclusions**

In the context of minor glenoid bone defects the DAS technique demonstrates superior results in comparison to isolated Bankart repair.

08:08 - 08:16

## **81 Tranexamic Acid In The Latarjet Procedure – A Randomized Controlled Trial**

Eoghan T Hurley<sup>1</sup>, Daren Lim Fat<sup>2</sup>, Leo Pauzenberger<sup>2</sup>, **Hannan Mullett<sup>2</sup>**

1. Royal College of Surgeons in Ireland, Dublin, Ireland
2. Sports Surgery Clinic, Dublin, Ireland

### **Aim**

The aim of the present study was to assess whether tranexamic acid (TXA) could reduce the incidence of postoperative swelling and hematoma formation, pain and opioid use following the Latarjet procedure.

### **Background**

TXA is commonly used in orthopaedic surgery to reduce peri-operative bleeding and the need for transfusion. Recently, TXA has been used in shoulder arthroplasty, where it has been shown to reduce blood loss and postoperative pain levels through reduced swelling and hematoma formation.

### **Methods**

A randomized controlled trial was conducted in 100 patients undergoing open Latarjet surgery for anterior shoulder instability. Patients were randomized to receive either 1g TXA intravenously prior to skin incision or a placebo. Outcomes measured were 1) intra-operative blood loss, 2) post-operative blood loss (via drain output), 3) postoperative soft tissue swelling or hematoma formation, 4) Visual Analogue Scale for pain (VAS score), and 5) postoperative opioid use (in morphine mg equivalents). A p-value of < 0.05 was considered to be statistically significant.

### **Results**

There was no significant difference in baseline patient demographics or characteristics in terms of age ( $23.8 \pm 3.4$  vs  $25.1 \pm 6.5$  years), gender (f/m: 2/48 vs 2/48), body mass index ( $24.8 \pm 2.9$  vs  $26.5 \pm 3.9$ ), and surgical time ( $43 \pm 7$  vs  $45 \pm 8$  minutes) between the two groups. There was no significant difference in intra-operative blood loss (61.8mls vs 68.5mls,  $p = 0.18$ ). However, there was significantly lower post-operative blood loss in the TXA group (29.8mls vs 65.5mls,  $p < 0.01$ ). There was a significantly lower rate of painful postoperative swelling and hematoma formation (4% vs 30%,  $p < 0.01$ ). No postoperative hematoma requiring further management was reported during the study period. Additionally, we found a significantly lower VAS score for pain (1.8 vs 3.0,  $p < 0.01$ ), significantly less postoperative opioid use (9mg vs 21.4mg,  $p < 0.01$ ) and a significantly lower rate of patients requiring opioid analgesia during the postoperative period (36% vs 67%,  $p < 0.01$ ) in the TXA group.

### **Conclusions**

The current study found that TXA significantly decreased postoperative blood loss, painful soft tissue swelling and hematoma formation, and subsequently reduced post-operative pain and opioid use following the Latarjet procedure.

08:16 - 08:24

## **86 Determining On/Off Track Lesions In Glenohumeral Dislocation Using MPR CT Is Easier And More Reproducible Than Using 3D-CT.**

**Nicole Pouliart**, Laura Mulleneers

UZ Brussel/VUB, Brussels, Belgium

### **Aim**

The present study evaluates a new method for determining the glenoid track using CT-scan with multiplanar reconstruction (MPR) in comparison with using 3D reconstructed images (3DR). Our hypothesis is that the MPR-method is easier to standardize and more reproducible.

### **Background**

The glenoid track is a useful tool to predict engagement and therefore the risk of recurrence of dislocation, in the presence of Hill-Sachs and/or Bony Bankart lesions. To assess the glenoid track preoperatively, only methods using 3D reconstructed images have been described, but these lack a standardised, reliable and easy description.

### **Methods**

52 patients whose (arthro-) CT-scan revealed a Hill-Sachs lesion whether or not in combination with a Bony Bankart lesion were included. DICOM data from the 52 CT-scans were all analysed in Horos. Glenoid width with or without associated bony defect, as well as the Hill Sachs interval (HSI) were measured on MPR as well as on 3DR images. All measurements obtained with both methods were directly compared and evaluated for intra- and interobserver reliability.

### **Results**

In absolute values, only small differences were seen between the MPR and the 3D, amounting to a maximal difference of 0,7 mm for the HSI and 0,4 mm for the glenoid width. For glenoidal measurements, both methods were similar. For humeral measurements, the MPR-method demonstrated a higher inter- and intraobserver reliability than the 3DR-method.

### **Conclusions**

The newly described MPR-method for the assessment of the glenoid track and HSI is at least as accurate as the published 3DR-method, with a better intra- and interobserver reliability. Since MPR are also easier to obtain, this method could be recommended for on/off track evaluation in daily practice.

08:24 - 08:32

## **26 Mobilization After Superior Rotator Cuff Repair: Sling Versus No-Sling. A Randomized Prospective Study**

**Alexandre Lädermann**

La Tour Hospital, Meyrin, Switzerland

### **Aim**

The study aimed to compare clinical and radiographic outcomes up to 6 months following rotator cuff repair (RCR) with sling immobilization and without sling immobilization.

### **Background**

Patients are commonly advised to wear a sling for 4–6 weeks after RCR despite negative effects of early immobilization and benefits of motion rehabilitation.

### **Methods**

We randomized 80 patients scheduled for arthroscopic repair of small or medium superior rotator cuff tears into 2 equal groups: 'sling' and 'no-sling' groups. Passive mobilization was performed in both groups during the first 4 postoperative weeks followed by a progressive active mobilization.

### **Results**

The two groups had similar preoperative patient characteristics, function, or adjuvant procedures. At 10 days, there was no difference in pain among the two groups ( $5.2 \pm 2.3$  vs  $5.2 \pm 1.9$ ,  $p = 0.996$ ). In comparison to the sling group, the no-sling group showed greater external rotation ( $23.5 \pm 15.6$  vs  $15.3 \pm 14.6$ ,  $p = 0.017$ ) and active elevation ( $110.9 \pm 31.9$  vs  $97.0 \pm 25.0$ ,  $p = 0.038$ ) at 1.5 months, as well as better active elevation ( $139.0 \pm 24.7$  vs  $125.8 \pm 24.4$ ,  $p = 0.015$ ) and internal rotation ( $>T12$  in 50% vs 27.5%,  $p = 0.011$ ) at 3 months. Ultrasound revealed no differences at 6 months in tendon thickness anteriorly ( $p = 0.472$ ) or posteriorly ( $p = 0.639$ ), bursitis ( $p = 1.000$ ), echogenicity ( $p = 0.422$ ), or repair integrity ( $p = 0.902$ ). Multi-variable analyses confirmed that ASES score increased with patient age (beta, 0.60;  $p = 0.009$ ), SANE decreased with sling immobilization (beta, -6.3;  $p = 0.014$ ), and that pain increased with sling immobilization (beta, 0.77;  $p = 0.022$ ).

### **Conclusions**

No immobilization after RCR is associated with better early mobility and functional scores in comparison to sling immobilization. Postoperative immobilization with slings may therefore not be required for patients treated for small or medium tears.

08:32 - 08:40

## **4 Changes Of Supraspinatus Muscle Volume And Fat Fraction After Successful Or Failed Arthroscopic Rotator Cuff Repair**

**Karl Wieser**, Jethin Joshy, Philipp Kriechling, Lukas Filli, Reto Sutter, Martin Flück, Philipp FÜRnsthäl, Domink C Meyer, Christian Gerber

Balgrist University Hospital, Zurich, Switzerland

### **Aim**

It was the aim of this investigation to perform a quantitative analysis of atrophy and fatty infiltration of the supraspinatus muscle following healed and failed rotator cuff (RC) tendon to bone repair.

### **Background**

Muscle atrophy and fatty infiltration are limiting factors for successful rotator cuff repair. Quantitative data regarding these hallmarks of degenerative muscle changes after RC-repair in man are scarce. With the recently introduced Dixon – MRI technology, 3-dimensional volume and fat fraction analysis of the whole rotator cuff muscle has become possible.

### **Methods**

Muscle volume and intramuscular fat fraction were measured preoperatively and at 3 and 12 months postoperatively in 19 failed and 21 healed arthroscopic supraspinatus tendon repairs using full muscle volume segmentation and MRI DIXON sequences.

### **Results**

In both groups the muscle volume initially decreased 3 months after RC-repair by -3% (intact-) ( $p=0.140$ ) and -10% (failed repair) ( $p=0.004$ ) but recovered between 3 and 12 months to 103% ( $p=0.274$ ) in intact and 92% ( $p=0.040$ ) in failed repairs compared to the preoperative volume (difference of change between groups preoperative – 12 months:  $p=0.013$ ). The supraspinatus muscle's fat fraction did not significantly change after successful repair (6.5% preoperative, 6.6% after 3 months and 6.7% after 12 months (all  $p=n.s$ ). There was however a significant increase from 7.8% to 10.8% at 3 months ( $p=0.014$ ) and 11.4% at 12 months ( $p=0.020$ ) after failed repair (difference between groups at 3 months follow-up  $p=0.018$  and at 12 months follow-up  $p=0.001$ ).

### **Conclusions**

RC tendon tear induced fatty infiltration can be almost stopped and muscle atrophy can even be slightly reversed after successful arthroscopic RC repair. In case of a failed repair these changes are however further pronounced during the first 3 post-operative months but seem to stabilize thereafter. The assessment of the small but probably clinically relevant changes in fat content requires however the use of quantitative measurement protocols such as the MRI Dixon sequence.

08:40 - 08:48

## **87 Latissimus Dorsi Tendon Transfer For Irreparable Rotator Cuff Tears: Clinical, EMG And Kinematic Results Of Arthroscopically Assisted Approach Vs Fully Open Approach**

Giuseppe Porcellini<sup>1</sup>, Antonio Padolino<sup>2</sup>, Giovanni Merolla<sup>2</sup>, Paolo Paladini<sup>2</sup>

1. Modena University - Orthopedic Clinic, Modena, Italy
2. Unit of Shoulder and Elbow Surgery, Cattolica, Italy

### **Aim**

The aim of the study is to compare outcomes of patients treated with Open (OLDTT) and arthroscopic (ALDTT) latissimus dorsi tendon transfer, using Constant and Simple Shoulder Test scores associated with kinematic motion analysis and upper limb electromyography.

### **Background**

Irreparable posterior-superior cuff tears lead to severe limitations for young and active patients in their daily activities for severe pain and limited function. The management of irreparable cuff tears is controversial, going from partial repair to tendon transfer. Latissimus dorsi tendon for irreparable lesions of the posterior-superior cuff. The Latissimus Dorsi Tendon Transfer (LDTT) is indicated for irreparable posterior-superior rotator cuff tears with deficiency in active external rotation of the shoulder with dropping sign and hornblower's sign positive. Main contraindications are deltoid dysfunction, subscapularis tears and arthritis of glenohumeral joint. In literature different techniques of LDTT have been described and can be summarized in two big groups: open and arthroscopic.

### **Methods**

From September 2007 to March 2016, 171 patients were treated with OLDTT and from March 2014 to January 2016, 37 patients were treated with arthroscopic ALDTT at our Shoulder Unit. The two groups were clinically evaluated with the Constant-Murley score and the Simple Shoulder Test. Each patient underwent motion kinematic analysis and surface EMG. Two senior Surgeons (GP and PP) performed both techniques. Kinematic examination of the shoulder was performed with stereophotogrammetry system with 10 cameras and surface electromyography with 8 EMG canals. The mean follow-up was 16,61 months (range 14-24) for ALDTT group and 20,73 months (range 17-27) for OLDTT one. The mean age was 58,9 ys (range 50-76) for arthroscopic and 58,6 ys (range 49-68) for arthroscopic ones. External rotation sling was placed after surgery for 6 weeks. During this time, the shoulder was passively mobilized to 90° of elevation and abduction. The active mobilization started in the sixth week.

### **Results**

The mean duration of surgery is 78 minutes (range 60-100) for ALDTT group and 75 minutes (range 55-105) for OLDTT. In ALDTT group forward elevation raised from 125,38° (range 30-170) to 159,23° (range 100-180); in the OLDTT group raised from 141,3° (range 70-170) to 165° (range 130-180). The active external rotation (ER) increase in both groups with the disappearance of dropping sign in all patients. In ALDTT group ER of adducted arm passed from -9° (range -45 to 45) to 15,8° (range 0 to 45). In OLDTT group the ER raised from 2,3° (range -45 to 45) to 26,6° (range 0 to 45). The Constant score raised from 34,5 pts (range 18-45) to 67,2 pts (range 50-79) in ALDTT group, and from 42,5 pts (range 18-66) to 68,9 pts (range 43-85) in OLDTT. The SST increased from 2,76 (range 0-7) to 6,6 (range 4-10) in ALDTT group and from 4,06 pts (range 0-7) to 7,6 pts (range 3-10) in OLDTT. EMG activation of the upper portion of the latissimus dorsi is present in all cases and shows how it is active in the external rotation movements.

### **Conclusions**

Latissimus dorsi tendon transfer is a complex surgical procedure that requires at least six months of rehabilitation. It doesn't restore normal shoulder function and kinematics but can rather be considered as a salvage procedure. We have good clinical and functional results in both series of patients. The mean observed active forward elevation and external rotation improve clinically in both groups. Our study shows that LDTT using a combined open and arthroscopic technique is a

valid treatment for irreparable posterior-superior rotator cuff tear. Clinical results are similar for both groups. Kinematic analysis does not show statistical differences between the two groups of patient. The EMG data are encouraging for a function recovery of the transferred latissimus dorsi but it is still unclear if it act in tenodesis or as in contractile way.

08:48 - 08:56

## **108 A Prospective, Blinded, Clinical Trial Comparing The Efficacy And Accuracy Of Needle Diagnostic Arthroscopy With Magnetic Resonance Imaging In Diagnosing Shoulder Pathology**

**Eric R. Wagner**<sup>1</sup>, Jarret Woodmass<sup>2</sup>, Kevin X. Farley<sup>1</sup>, Katy M Welp<sup>3</sup>, Michelle J Chang<sup>3</sup>, Jon J Warner<sup>3</sup>

1. Emory University, Atlanta, United States
2. Pan Am Clinic, Winnipeg, Canada
3. Harvard, Boston, United States

### **Aim**

The purpose of this study was to evaluate the safety of needle diagnostic arthroscopy, and compare its efficacy and accuracy to magnetic resonance imaging (MRI) for identifying shoulder pathology.

### **Background**

MRI is expensive and often not consistently accurate in diagnosing many problems with the rotator cuff, cartilage, and labrum within the shoulder. Therefore, shoulder arthroscopy represents the gold standard to evaluate and ultimately treat a patient's shoulder pathology after a failure of nonoperative management strategies. Currently, there are not reports on more affordable alternatives that can be performed in-office with a similar accuracy and specificity. The Mi-eye device (Trice Medical, Malvern, PA) is a United States Food and Drug Administration (FDA) approved device cleared for use in diagnostic and operative arthroscopic and endoscopic procedures

### **Methods**

From January, 2018 through July, 2018, we performed a prospective, blinded clinical trial on 50 patients who presented to the clinic with shoulder pathology that required arthroscopic intervention. The patients age was between 18 and 75 years, while their body mass indices were between 19 and 45 kg/m<sup>2</sup>. Each patient underwent a clinical evaluation, MRI, needle arthroscopy performed in the operating room, and surgical diagnostic arthroscopy. The videos and images were reviewed by blinded fellowship trained providers.

### **Results**

Our findings demonstrate that needle arthroscopy was either equivalent or more effective than MRI at diagnosing intra-articular shoulder pathologies. It was especially effective when utilized to "rule in" various diagnoses, with high specificities and PPV for rotator cuff tears of the supraspinatus and infraspinatus, glenoid and humeral articular cartilage, biceps pathology and anterior labral tears. For example, the specificity of needle arthroscopy for diagnosing rotator cuff tear and cartilage lesions was 1.00 and 0.97, compared to 0.72 and 0.86 for MRIs, respectively. Alternatively, there were a reasonable number of false negatives for each of these pathologies, demonstrating it is slightly less effective at "ruling out" intra-articular pathologies. The sensitivity of needle arthroscopy for cartilage lesions were 0.89 and 0.74, respectively. In comparison, the MRI had a relatively high number of false positives and worse specificities, but slightly less false negatives and higher sensitivities. For most of the intra-articular pathologies, the needle arthroscopy was equally or more accurate than MRI at diagnosing intra-articular shoulder pathologies, with similar or high kappa statistics when correlated with surgical arthroscopic findings.

### **Conclusions**

Across all pathologies, needle arthroscopy is very effective at "ruling in" a diagnosis (high specificities), but is slightly less effective at "ruling out" a diagnosis (lower sensitivities). In comparison to MRI, it was either equivalent or more effective for diagnosing articular cartilage, rotator cuff, and biceps pathology. Needle arthroscopy that has the potential to be used in an office setting represents a promising diagnostic modality for the treatment of most intra-articular shoulder pathologies.

## Sunday, September 1st

Scientific Session - Elbow

09:45 - 10:45

Ballroom

09:45 - 09:53

### **79 The Treatment Of Lateral Epicondylitis: The Effect Of Platelet Rich Plasma On Healing — A Randomized Controlled Double-Blinded Trial**

Janne Tapani Lehtinen<sup>1</sup>, Olli Leppänen<sup>2</sup>, Lasse Linnamäki<sup>1</sup>

1. Hatanpää Unit, Tampere University Hospital, Tampere, Finland
2. Dept. of Hand surgery, Tampere University Hospital, Tampere, Finland

#### **Aim**

The purpose of this study was to compare the effects of platelet rich plasma (PRP), whole blood and saline vehicle on the natural course of lateral epicondylitis (LE).

#### **Background**

Currently, there is no evidence that any treatment, including surgery, is better than placebo or no treatment in management of LE. PRP and autologous blood have been suggested as a potential therapy for LE showing promising results in animal tendon injury models and initial clinical series. However, after initial excitement, the treatments have failed to consistently show superiority over placebo and the conclusions in systematic reviews vary from strong evidence against to positive. Thus, the role of PRB and autologous blood injections in the management of LE remains unclear.

#### **Methods**

We constructed a randomised controlled double-blinded study in which included adults whose symptoms were lasted over three months and primary conservative treatment had been tried. We excluded patients with significant systemic diseases, other concomitant upper limb symptoms and surgical treatment of the elbow. The study was carried out in Hatanpää Hospital, Tampere University Hospital, Tampere, Finland between February 2011 and April 2018. We injected PRP, whole blood or saline vehicle to the proximal insertion of the extensor carpi radialis brevis (ECRB) muscle in a parallel assignment model. We followed the patients at fourth, eighth, twelfth, twenty-sixth, and fifty-second week. The primary outcome measure was pain that was measured with a visual analogue scale (VAS). Secondary outcomes were QuickDASH (Disabilities of the Arm, Shoulder and Hand) -score and grip strength. We allocated the patients to groups in a randomised manner. We used a computer random number generator and concealed the allocation with sealed envelopes. Patients, personnel and outcomes assessors were blinded during the study. In statistical analysis, the groups were compared with each other with Kruskal-Wallis Rank Sum test.

#### **Results**

119 patients participated to the study. 40 of them were treated with PRP, 40 with whole blood, and 39 with saline vehicle. At the baseline, median of the pain-VAS was 6.0 ( $p = 0.746$ ). Pain-VAS of the PRP group decreased during the follow up being 5.0, 4.0, 4.0, 3.5, and 2.0 at fourth, eighth, twelfth, twenty-sixth and fifty-second week, respectively. Corresponding pain-VAS values were 5.0, 4.0, 3.8, 3.0 and 2.0 for the whole blood group and 5.5, 5.0, 4.0, 4.0 and 2.3 for the saline vehicle group ( $p = 0.40$ ,  $p = 0.15$ ,  $p = 0.65$ ,  $p = 0.39$  and  $p = 0.23$ , respectively). Secondary outcome measurements did not differ between the groups either. No complications occurred due to injections.

#### **Conclusions**

PRP or whole blood did not show any advantage when compared with each other or with saline vehicle on the treatment of LE.

09:53 - 10:01

## **84 Hinged Elbow Fixation: A Critical Analysis Of 1225 Consecutive Cases.**

**Konrad Mader**<sup>1</sup>, Jakob Valentin Nüchtern<sup>1</sup>, Sebastian Klötzer<sup>2</sup>

1. Division of Hand, Forearm and Elbow Traumatology, Department of Trauma, Hand and Reconstructive Surgery, University Medical Center, Hamburg, Germany
2. Section Upper Extremity, TOC, Asklepios Klinik Altona, Hamburg, Germany

### **Aim**

In the last 5 years the use of hinged elbow fixation was questioned due to reports claiming high rates of revision due to the uncorrect mounting of the fixator and and high fixator- related complications. The current study critically analyses 1225 consecutive cases, in which hinged elbow fixation was used as integral part in the operative therapy.

### **Background**

More than two decades ago the transarticular external fixator with motion capacity of the elbow was developed and has since then extensively broadened the therapeutic spectrum of treating complex acute elbow trauma and posttraumatic sequelae such as severe posttraumatic elbow and partially changed therapeutic pathways. Since 1996, in three consecutive Level- I- Trauma centers, a standardized prospective treatment protocol was developed, the so- called elbow fixator concept in both the acute trauma and posttraumatic setting.

### **Methods**

Using standardized treatment pathways, during a period of 20 years in three major elbow trauma centers 1225 elbow fixators (2 specific hinged fixators) with motion capacity were included in the treatment concept in adult unstable elbow dislocations (n = 153), adult fracture dislocations (n= 375), acute and chronic pediatric elbow injury (n= 95), referred cases for revision after elbow redislocation or fixation failure (n= 203) and posttraumatic elbow stiffness (n = 350). For this critical analysis the following parameters were prospectively documented and analyzed: Fixator stay, accuracy of fixator placement (i.e. intraoperative passive TROM), time in fixator, fixator related complications (redislocation, pin- related fractures, pin-site infections), the rate of redislocation or subluxation of the elbow joint during and after hinged fixation, nerve complications and the overall functional result.

### **Results**

Mean fixator stay was 6 weeks (range, 5 to 8 weeks). No fixator was removed preplanned due to fixator- related complications. The mounting of the fixator was with a very high accuracy with a mean intraoperative passive TROM of 100 degrees in 99,5 %. There were 5 fixator related complications (namely 2 sagittal and 3 varus subluxations of the elbow in the postoperative period requiring operative reapplication of the center hinge of the fixator). There were 4 fixator - related fractures in the postoperative period, namely 3 ulnar fractures and 1 humeral fracture due to unprotected fall on the fixator, requiring resiting of the ulnar clamp in 2 and plating of the ulna and the humerus in 1 case each. There were 25 pin- site infections, of which 10 required resiting of fixator pins and 15 resolved by intensified pin site care and antibiotic treatment. There were no complications to the radial nerve and 8 postoperative surgery related ulnar neuropathies (PSRUN) in the severe posttraumatic elbow stiffness group, requiring in situ neurolysis of the ulnar nerve. The overall functional result was excellent.

### **Conclusions**

Hinged elbow fixations is a safe, reliable and versatile surgical tool in complex elbow trauma and posttraumatic elbow reconstruction with a very low fixator- related complication rate in specialized elbow centers with elaborated teaching programs and a functioning aftercare unit but may belong in these centers.

10:01 - 10:09

## **35 Arthroscopic Treatment Of Anteromedial Coronoid Fracture: Complete Functional Recovery At One Year Follow Up**

**Michele Cavaciocchi**<sup>1</sup>, Alessandra Colozza<sup>1</sup>, Sara Padovani<sup>2</sup>

1. AUSL della Romagna, Orthopaedic Department of Faenza Hospital, Faenza (ra), Italy
2. University of Ferrara, Ferrara, Italy

### **Aim**

To prove that elbow arthroscopy is a safe, reproducible, low-invasive and effective technique to treat complex coronoid fractures

### **Background**

The coronoid process of the ulna is a fundamental stabilizer of the elbow joint. In Complex Elbow Instabilities (CEI), coronoid fractures are associated with ligaments lesions. In the last 10 years, elbow arthroscopy has been suggested as a feasible and less invasive technique for the coronoid reduction and internal fixation. The purpose of this study was to assess the functional recovery one year after the arthroscopic treatment of coronoid fractures.

### **Methods**

Consecutive patients who underwent arthroscopic reduction and internal fixation (ARIF) of the coronoid process between 2014 and 2017 at the Orthopaedic Department of Faenza Hospital were enclosed. The inclusion criteria were anteromedial coronoid fractures (O'Driscoll type II lesions), absence of type III-IV Mason radial head fracture and 1-year minimum follow-up. We retrospectively reviewed the patients' charts and retrieve the following data, at one year of follow up for each patient: elbow range of motion and stability (MEPS), pain (Numerical Rating Scale, NRS: 0-10), radiological consolidation and complications.

### **Results**

Between January 2014 and December 2017, 22 patients were arthroscopically treated for coronoid fracture (7 F and 15 M, mean age  $46 \pm 14y$ , 13 dominant sides involved): 4 cases were treated with a pull-out technique, fixed by an endobutton system, the other 18 cases underwent an ARIF with cannulated screws. Lateral collateral ligament was torn in 17 cases: we performed 16 open repairs with suture anchors and one full-arthroscopic repair with Van Riet technique. The Medial Collateral Ligament was repaired just in one case, with an open technique with suture anchor. According to MEPS, at the 1-year follow up, 20 patients reported the highest score with no residual disability, with complete range of motion and with a median pain score of 2; the radiological evaluation at final follow-up showed a successful healing in these 20 patients. The other two cases had a new upper limb trauma after the primary surgery, suffering a re-rupture inside the elbow joint, that required a new surgical treatment. No vascular or infective complications were detected at the final FU in all the cases. One case of the 20 ones that reached the primary healing, suffered elbow stiffness and ulnar nerve paresthesias after the surgery, requiring ulnar nerve open neurolysis and elbow manual release, with complete recovery.

### **Conclusions**

This study shows a large sample of anteromedial coronoid fractures healed after an arthroscopic treatment. Our results support the elbow arthroscopy as a safe, low-invasive surgery for coronoid process fracture, even if technically demanding.

10:09 - 10:17

## **50 Clinical And Radiographic Outcomes Of Salvage Radial Head Arthroplasty**

J Singh, Z Hammoudi, **Adam C Watts**

Wrightington Hospital, Wigan, United Kingdom

### **Aim**

The aim of this study is to examine the medium-term outcomes of salvage radial head arthroplasty (RHA).

### **Background**

There is limited evidence on the outcome of radial head arthroplasty as salvage.

### **Methods**

A retrospective review was conducted of fourteen consecutive patients (9F/5M) with an average age of 48 years having revision RHA from 2011 to 2018. The mean follow-up was 27 months (6-84).

The outcome measures were implant removal, range of movement (ROM), Mayo Elbow Performance Score (MEPS) and radiographic loosening.

### **Results**

Twelve patients had revision of a primary radial head replacement. Two patients had radial head arthroplasty as salvage for excisional arthroplasty complicated by stump impingement or valgus instability. Painful loosening of a radial head component was the most common indication for revision (6 patients). Four patient had chronic longitudinal instability and all had interosseous membrane reconstruction in addition to RHA.

Eight patients had revision surgery using a cemented long stem bipolar implant, four with a short stem uncemented implant and 2 with a long stem uncemented implant.

Only 1 of 14 patients had a revision failure and underwent further revision surgery from a short uncemented to a long cemented implant that resulted in an excellent outcome (MEPS score 100).

On average patients had a good functional outcome with an average MEPS of 77 (40-100) and average ROM from 24 to 121 degrees of flexion.

Radiographic assessment showed evidence of loosening in 3 patients with short stem uncemented implants. One patient required revision and 2 have non-progressive asymptomatic loosening.

Three patients had capitellum erosion. Seven patients have ulnahumeral osteoarthritis and one is currently awaiting total elbow replacement.

### **Conclusions**

The overall midterm outcomes with revision radial head surgery are satisfactory. Cemented implants may produce a more favourable outcome in revision surgery.

10:17 - 10:25

## **52 Mid- To Long-Term Results Of Radiocapitellar Arthroplasty Of The Elbow: A Prospective Study**

**Giuseppe Giannicola**<sup>1</sup>, Piergiorgio Calella<sup>2</sup>, Prospero Bigazzi<sup>3</sup>, Alberto Mantovani<sup>4</sup>, Paolo Spinello<sup>5</sup>, Gianluca Cinotti<sup>5</sup>

1. Sapienza University of Rome - Policlinico Umberto I, Rome, Italy
2. Paolo Colombo civil hospital, Velletri, Italy
3. Hand Surgery and Reconstructive Microsurgery Unit, Azienda Ospedaliero-Universitaria Careggi, Florence, Italy
4. Domus Salutis private hospital, Legnago, Italy
5. Sapienza University of Rome, Rome, Italy

### **Aim**

The aim of the study was to analyze the results of two radiocapitellar prostheses in a large case series followed prospectively in the medium to long term and to discuss the indications and results of each prosthesis.

### **Background**

In the last two decades, radiocapitellar arthroplasty (RCA) has been introduced to treat post-traumatic and degenerative conditions of the elbow. Two implants were used: the resurfacing replacement for the lateral compartment of the joint, called the "Lateral Resurfacing Elbow (LRE)", and the "Uni-Elbow Radio Capitellum Implant" (UNI-E). There are few case series on RCA, and the majority of those that do exist are based on small groups of patients and a short- to medium-term follow-up.

### **Methods**

Thirty-one patients with a mean age of 54 years were analyzed. There were 9 primary and 17 cases of post-traumatic osteoarthritis, 3 of capitellum necrosis and 2 of acute fractures. Seventeen Lateral Resurfacing Elbow (LRE) and 14 Uni-Elbow Radio-Capitellum Implant (UNI-E) arthroplasties were performed. Pre- and postoperative evaluations were based on the Mayo Elbow Performance Score (MEPS), the Quick Disabilities of the Arm, Shoulder and Hand score (Quick-DASH) and the modified American Shoulder Elbow Surgeons score (m-ASES).

### **Results**

The mean follow-up was 6.8 years (3.8 to 11.5). Overall, the MEPS, m-ASES and Quick DASH scores improved significantly by 50, 55 and 54 points, respectively. No differences emerged between the two implants, with the exception of worse preoperative pronation-supination values in the UNI-E group; at the last follow-up, pronation was better in the LRE group.

### **Conclusions**

Radiocapitellar arthroplasty yielded a significant and long-lasting improvement in elbow function with a 100% implant survival. The LRE appears to be more suitable for primary osteoarthritis while the UNI-E appears to be more suitable for post-traumatic conditions associated with radial head deformities or capitellum necrosis.

10:25 - 10:33

## **9 Feasibility Of Fast-Track Total Elbow Arthroplasty.**

**Ante Prkic**, Jetske Viveen, Bertram The, Koen Koenraadt, Denise Eygendaal

Amphia Hospital, Breda, The Netherlands

### **Aim**

We reviewed the necessity of a cast and the effect of the implementation of functional discharge criteria at our institution.

### **Background**

To consider feasibility of a fast-track total elbow arthroplasty programme, first an inquiry has to be performed to determine factors associated with length of stay. These factors can be translated to improvements of our daily practice to provide a fast-track programme.

### **Methods**

We retrospectively reviewed all patients' records who received a Coonrad-Morrey total elbow arthroplasty in the period from January 1st 2012 to December 31st 2017. From these records, indications, demographic information and complications were derived. Length of stay was calculated from the hospital administration.

### **Results**

In total 118 patients receiving 119 Coonrad Morrey total elbow arthroplasties were included with a mean length of stay of 5 days (range 2-23) for the whole group. After introduction of functional discharge criteria in August 2017 mean length of stay declined from 6.4 days to 3.6 days. Reasons for prolonged stay were six times persistent wound leakage, five times blistering of the skin (of whom two superficial surgical site infections requiring antibiotics), three times awaiting cultures, two awaiting rehabilitation, two cases of pneumonia and one evacuation of a hematoma, performed in one of thirteen ulnaropathies.

### **Conclusions**

Omitting a cast and splint as regular post-operative treatment reduced the length of stay significantly without leading to more complications. Introduction of functional discharge criteria lowered the length of stay further to 3.6 days without any complications.

10:33 - 10:41

## **95 Rotational Alignment Of The Humeral Component In Elbow Arthroplasty: Positioning In Complex Fracture Situations**

Angelika Maria Schwarz<sup>1</sup>, Gloria Maria Hohenberger<sup>2</sup>, Martin Sauerchnig<sup>1</sup>, Milan Niks<sup>1</sup>, Martin Liebhauser<sup>1</sup>, Ulrike Maria Schwarz<sup>3</sup>, Georg Feigl<sup>3</sup>, **Michael Plecko**<sup>1</sup>

1. AUVA - Trauma Hospital Styria | Graz, Graz, Austria
2. Orthopedics and Traumatology, Medical University Graz, Graz, Austria
3. Institute of Macroscopic and Clinical Anatomy, Graz, Austria

### **Aim**

The aim of the study was to evaluate the posterior area in the distal humeral region (PDH) in a representative collective regarding the rotational alignment of the flexion/extension axis (FEA). We hypothesized that the PDH is an easily manageable and reliable anatomical landmark with a contralateral side consensus.

### **Background**

Total elbow arthroplasty (TEA) has proven its role in complex elbow fracture management. Particularly, in patients with complex primary and secondary distal humeral fractures this alternative method leads to increasing implantation rates in the last years. An important fact in these complex situations is, that malpositioning of the humeral component may result in abnormal kinematics and implant loosening.

### **Methods**

A hundred elbows (n=50 paired, n=50 unpaired, in total n = 100 specimens; female: male ratio 1.4: 1, mean age: 81 years {range 51 - 96}) were macroscopically and per CT Analysis evaluated. Specimens were divided into two groups according to side correlation: Group I - paired, Group II – unpaired = observer group.

Rotational alignment was defined in anatomical specimens via K-wire positioning and following digital measurements. An intrarater and interrater reliability regarding macroscopic and CT scan congruence as well as side consensus was realized.

Data interpretation was evaluated per descriptive and significance analysis (SPSS, p <0.05, Levine, Wilcoxon-Mann-Whitney and Fisher's exact test, intrarater and interrater reliability).

### **Results**

The FEA has an average angle of 12.5 ° (range 6.8-25.6) compared to the PDH. The anatomical (reference measurements) and CT measurements showed excellent intrarater and interrater reliability (intra-class correlation coefficients > 0.90). Similarly, excellent agreement was found between the CT scan and the primary anatomical measurement of contralateral distal humeral region (correlation coefficients between classes > 0.90).

### **Conclusions**

The posterior distal humeral surface (PDH) represents a representative anatomical landmark with respect to FEA.

The option of a preoperative CT of the contralateral side should be considered in the complex primary and secondary fracture prosthesis management. Our definition based on anatomical landmarks represents a treatment optimization in order to avoid the malrotation of the humeral component and continuously serious complications due to biomechanical failures in TEA.

## Sunday, September 1st

Award Session

10:45 - 11:30

Ballroom

### **120 Anchored vs. anchorless arthroscopic transosseous rotator cuff repair: clinical outcomes and structural integrity of a matched cohort**

**Uma Srikumar**, Eric Huish Jr, Brendan Shi, Jessica Jang, Casey Hannan, Iman Ali, Kelly Kilcoyne

Department of Orthopaedic Surgery, Johns Hopkins University School of Medicine, Baltimore, Maryland, United States

#### **Aim**

It is unknown how clinical outcomes and rotator cuff integrity after repair using this anchored technique compare with those after repair using an "anchorless" transosseous technique.

#### **Background**

A suture bridge, double-row "anchored" technique is the currently standard for arthroscopic rotator cuff repair.

#### **Methods**

We reviewed arthroscopic repairs of full-thickness rotator cuff tears performed by 1 surgeon from December 2011 through July 2016. We matched a cohort of 50 patients who underwent standard anchored technique (anchors placed in a double-row, transosseous-equivalent manner) by sex, age, tear size, and smoking status to 50 patients who underwent anchorless repair during the same period, by the same surgeon. Length of surgery was recorded for each case. The cohorts were followed for at least 2 years (median, 3 years; interquartile range, 2–4 years). The following measures were evaluated before surgery and at follow-up visits: pain (on a visual analog scale), American Shoulder and Elbow Surgeons (ASES) score, range of motion, subjective shoulder value (SSV), and repair integrity, which was assessed using ultrasonography at 1 year. Significance was set at 0.05 level.

#### **Results**

There was no significant difference in procedure duration between treatment groups. Retear rates did not differ significantly between groups during the first year ( $p = 0.790$ ). Both groups had significant improvements in pain score, ASES score, SSV, forward flexion, and abduction from before surgery to 2-year follow-up. We found no significant differences in outcomes between treatment groups at 2-year follow-up.

#### **Conclusions**

At 1 year after arthroscopic rotator cuff repair, the integrity of repairs was similar between patients who underwent anchorless repair versus those who underwent anchored repair. At 2 years after surgery, clinical outcomes were also similar between the 2 groups.

Level of Evidence: III, retrospective matched cohort analysis

# 121 Pre-operative Planning for Total Shoulder Arthroplasty and Component Size Predictive Validation: Implications for Inventory Management

**Michael Freehill**, Jack Weick, Brent Ponce, Asheesh Bedi, Derek Haas, Bethany Ruffino, Chris Robbins, Alexander Prete, John Costouros, Jon Warner

University of Michigan, Ann Arbor, Michigan, United States

## Aim

The rates of Anatomic and Reverse Total Shoulder Arthroplasty (TSA) continue to steadily rise. Preoperative virtual planning offers insight into not only procedure selection, but component selection. This can potentially avoid complications and optimize surgical technique. Moreover, inventory for such cases is quite large and this adds significant cost to the procedure. By predetermining implant sizes needed inventory could be reduced and costs of surgery as well. Patient-specific virtual surgical planning tools offer such insight and planning. Our hypothesis was that this virtual planning tool would accurately predict component sizes for all cases planned.

## Background

.

## Methods

All anatomic TSAs from the six study surgeons that were preoperatively templated using a planning tool based off computerized topography (CT) scanning which provides reproducible, algorithm-based assessments of osseous geometry of the glenoid and proximal humeral. Detailed determination of glenoid and humeral placement, glenoid size, humeral head and stem size, amount of reaming (medialization), and percentage of component seating are all obtained. Retrospective review of planning was done and compared to implants actually used at time of surgery. We excluded reverse TSAs, revision shoulder arthroplasties, hemiarthroplasties, fracture cases, and cases where components were not able to be placed for any reason. Statistical analysis was conducted using SPSS v. 25.0. Primary analysis consisted of an unweighted Cohen's kappa to test absolute agreement.

## Results

There were 124 cases analyzed from four institutions with all cases being anatomic TSAs. Matching within one size, exact component matching, and kappa values below.

## Conclusions

There were 124 cases analyzed from four institutions with all cases being anatomic TSAs. Matching within one size, exact component matching, and kappa values below.

## Sunday, September 1st

Scientific Session - Arthroplasty-Miscellaneous

12:15 - 13:30

Ballroom

12:15 - 12:23

### **15 Deltpectoral Vs Deltoid Split Approach For Proximal Humerus Fracture Fixation With Locking Plate: A Prospective RAndomized Study (HURA Study)**

**Dominique M Rouleau**<sup>1</sup>, Frédéric Balg<sup>2</sup>, Benoit Benoit<sup>1</sup>, Stéphane Leduc<sup>1</sup>, Michel Malo<sup>1</sup>, François Vézina<sup>2</sup>, G.-Yves Laflamme<sup>1</sup>

1. CIUSSS NIM, Montreal, Canada
2. CIUSSS Sherbrooke, Sherbrooke, Canada

#### **Aim**

The purpose of the present study (NCT-00612391) was to compare outcomes for the deltoid split (DS) approach and the classic deltopectoral (DP) approach in terms of function, quality of life, and complications in a prospective randomized multicenter study using consort guidelines.

#### **Background**

There are two options when choosing the surgical approach for locking plate fixation to treat proximal humerus fractures (PHF). The deltoid split (DS) approach, developed according to minimally invasive surgery principles, and the classic deltopectoral (DP) approach, believed to increase the risk of avascular necrosis and making access to the greater tuberosity more difficult.

#### **Methods**

From 2007 to 2016, all patients, from two University Trauma Centers, meeting the inclusion criteria (PHF Neer II/III, isolated injury, skeletal maturity, speaking French or English, available for follow-up (FU), ability to fill questionnaires) were invited to participate. Exclusion criteria were: Pre-existing pathology to the limb, patient-refusing or too ill to undergo surgery, patient needing another type of treatment (nail, arthroplasty), axillary nerve impairment, open fracture. After consent, patients were randomized to one of the two treatments using the dark envelope method. Pre-injury status was documented by questionnaires (SF12, Q-DASH, Constant score). Range of motion was assessed. Patients were followed at 2-6 weeks, 3-6-12-18-24 months. Power calculation was done with primary outcome: Q-DASH.

#### **Results**

A total of 83 patients were randomized; 44 to the DS and 39 to the DP approach with a mean age of 62 y.o. (+- 14) and 77% were females. Groups were equivalent in terms of age, gender, BMI, severity of fracture and pre-injury scores, Neer II (53%) and Neer III (47%). Minimum FU was 12 months, mean was 26 months. All clinical outcome measures were in favor of the deltopectoral approach. Primary outcome measure, Q-DASH, was better statistically and clinically in the DP group (12 vs 26,  $p=0,003$ ). Patients with DP had less pain and better quality of life scores than with DS (VAS 1/10 vs 2/10  $p=0,019$  and SF12M 56 vs 51,  $p=0,049$ , respectively). Constant-Murley score was higher in the DP group (73 vs 60,  $p=0,014$ ). However, active external rotation was better with the DS approach ( $45^\circ$  vs  $35^\circ$ ). There were more complications in DS patients, with four screw cut-outs vs zero, four avascular necrosis vs one, and five reoperations vs two. Calcar screws were used for a majority of DP fixations (57%) vs a minority of DS (27%) ( $p=0,012$ ).

#### **Conclusions**

The primary hypothesis on the superiority of the deltoid split incision was rebutted. The added difficulty involved with the use of calcar screws and intramuscular dissection for the DS approach could be partly responsible for this difference. The DP approach should be used during Neer II and III PHF fixation.

12:23 - 12:31

## **27 Effect Of Critical Shoulder Angle, Glenoid Lateralization And Humeral Inclination On Range Of Motion In Reverse Shoulder Arthroplasty.**

Alexandre Lädermann<sup>1</sup>, Eileen Tay<sup>2</sup>, Philippe Collin<sup>3</sup>, **Joe Chih-Hao Chiu**<sup>4</sup>, Caecilia Charbonnier<sup>5</sup>

1. La Tour Hospital, Meyrin, Switzerland
2. Ng Teng Fong General Hospital, Singapore, Singapore
3. Ng Centre Hospitalier Privé Saint-Grégoire (Vivalto Santé) Fong General Hospital, Saint-Grégoire, France
4. Chang Gung Memorial Hospital, Taoyuang City, Taiwan
5. Artanim Foundation, Meyrin, Switzerland

### **Aim**

The purpose was to evaluate the effects of lateralization of the center of rotation (COR) and neck shaft angle (NSA) on shoulder ROM after RSA in patients with different scapular morphologies.

### **Background**

No study considered the impact of acromial morphology on shoulder range of motion (ROM).

### **Methods**

3D-computer models were constructed from computed tomography (CT) scans of 12 patients with critical shoulder angle (CSA) of 25°, 30°, 35° and 40°. For each model, shoulder ROM was evaluated at a NSA of 135° and 145° and lateralization of 0mm, 5mm and 10mm for 7 standardized motions: glenohumeral abduction, adduction, forward flexion, extension, internal rotation with the elbow at 90° of abduction, as well as external rotation with the arm at 10° and 90° of abduction.

### **Results**

In all models, CSA did not seem to influence ROM, but greater lateralization achieved greater ROM for all motions in all configurations. Internal and external rotation at 90° of abduction were impossible in most configurations, except in models with 25° CSA.

### **Conclusions**

Post-operative ROM following RSA depends on multiple patient and surgical factors. This study based on computer simulation suggests that there is no influence of CSA on ROM after RSA, while lateralization increases ROM in all configurations. Furthermore, increasing subacromial space is important to grant sufficient rotation at 90° of abduction. In summary, increased lateralization of the center of rotation and increased subacromial space improve range of motion in all CSA configurations.

12:31 - 12:39

## 24 Neck Shaft Angle After Reverse Shoulder Arthroplasty

Alexandre Lädermann<sup>1</sup>, Grégory James Cunningham<sup>2</sup>, **Philippe Collin**<sup>3</sup>

1. La Tour Hospital, Meyrin, Switzerland
2. Hirslanden La Colline, Geneva, Switzerland
3. Centre Hospitalier Privé Saint-Grégoire (Vivalto Santé), Saint-Grégoire, France

### Aim

The aim of this study was to evaluate differences between expected and postoperative neck shaft angle (NSA) in reverse shoulder arthroplasty (RSA).

### Background

Implant size and geometry, together with the humeral cut level and entry point, can all influence humeral stem alignment in RSA. It has been reported that lower NSA can reduce scapular notching, heterotopic ossification, and pain, while improving range of motion, notably in adduction. Short uncemented and convertible stems are gaining popularity as they preserve bone stock and facilitate revision surgery, though they remain more difficult to align than long stems that serve as intramedullary guides.

### Methods

The authors retrospectively reviewed immediate postoperative radiographs of a consecutive series of 159 patients, comprising 57 men (36%) and 102 women (64%), who underwent RSA with a short uncemented convertible stem with constant NSA of 145°. The parameters measured included NSA, defined as the angle between the diaphyseal axis and the perpendicular to the reversed tray, and canal fill ratio (CFR), calculated by dividing the mediolateral width of the stem by that of the inner bone cortex, both measured perpendicular to the diaphyseal axis 1 cm below the medial calcar-prosthesis junction. The inter-observer agreement was excellent for both NSA and CFR (intraclass correlation coefficients of 0.85 and 0.81, respectively).

### Results

The postoperative NSA was  $149^\circ \pm 7.9^\circ$  (range,  $133.5^\circ$ – $176.5^\circ$ ) and CFR was  $57.7\% \pm 8.2\%$  (range,  $38.6\%$ – $74.0\%$ ). The mean postoperative NSA was greater than expected by  $4.0^\circ \pm 7.9^\circ$  (range,  $-11.5^\circ$ – $31.5^\circ$ ), exceeding 5° of valgus in 71 shoulders (45%) and exceeding 5° varus in 15 shoulders (9%). Univariable linear regression revealed that absolute deviation between expected and postoperative NSA (misalignment) decreased significantly with CFR (beta, -13.1;  $p=0.023$ ).

### Conclusions

While short uncemented stems offer several advantages in RSA, they remain challenging to align within the humerus, particularly if undersized. Misalignment of 5° or more was observed in more than half this series, and surgeons should reduce such alignment errors that may compromise clinical and radiographic outcomes.

12:39 - 12:47

## 118 Robotic Biomechanical Evaluation Of Reverse Shoulder Implants

Jan Herregodts, Stijn Herregodts, Mathijs Verhaeghe, **Alexander Van Tongel**, Lieven De Wilde

University Ghent, Ghent, Belgium

### Aim

To investigate the impact of the implant design and the glenosphere size on the ROM and on the lowering and medialisation of the humerus with respect to the scapula in neutral position.

### Background

Since its introduction, more than thirty brands of reversed shoulder prosthesis are available of the reverse polarity. All brands seems to behave well, resulting into the same functional outcome. However, in spite of positive clinical results, the range of motion (ROM) after implantation is not always satisfactory.

### Methods

Six implant systems (Delta Xtend® centred epiphysis and eccentric epiphysis (Depuy syntheses), Comprehensive® (Biomet), Ascend Flex® (Tornier), Trabecular® (Zimmer), RSP® (DJO), Equinox® (Exatech)) were implanted on a Sawbone® according to the manufacturer guidelines. All six implant systems were evaluated using a smaller and a larger glenosphere. The lowering and medialisation of the humerus with respect to the scapula after implantation of the implant was determined in neutral position (0° elevation and 0° internal rotation in scapular plane). The ROM was determined by the minimal and maximal elevation in the scapular and in 90° humeral plane, as by the maximal internal and external rotation at 30° and 60° elevation (glenoid plane) until bony contact.

### Results

With all implant systems the humerus was significantly lowered with respect to the scapula ( $p < 0.05$ , mean: 38.8mm, SD: 4.4, range: 30.9; 43.6mm). With larger glenospheres, this lowering was significantly higher compared to smaller glenospheres ( $r = 0.94$ ,  $p < 0.05$ , mean: 2.1mm, SD: 1.6). The humerus shifted medial ( $p < 0.05$ , mean: 7.1mm, SD: 6.2) with a range of -1.5mm to 17.2 mm. The medialisation is positively correlated with the size of the glenosphere ( $r = 0.98$ ,  $p < 0.05$ , mean: 1.2mm, SD: 1.3).

The total range of elevation depends on the orientation of the humerus in the vertical plane. The total range of elevation in the scapular plane ranges between 59.2° and 100.4°, whereas it ranges between 18.3° and 54.8° in the 90° humeral plane. The starting point, defined as the minimal elevation varies between 4.9° and 35° in the scapular plane, whereas it varies between 21.4° and 35.6° in the 90° humeral plane.

The implantation of a large glenosphere resulted in a significant ( $p < 0.05$ ) enhancement of the total range of elevation and a reduction of the minimal elevation in both scapular and 90° humeral plane.

### Conclusions

There exists a wide variation in the measured parameters (position humerus, ROM) between the six most frequent implanted prosthesis. A larger glenosphere results in a better ROM in all different brands. These significant differences in ROM can be clinically important as it can result in impingement and restricted functionality of the humeroscapular joint.

12:47 - 12:55

## **104 Low Survival Rates Of Stemmed Hemiarthroplasty And Reverse Arthroplasty After Treatment For Proximal Humerus Fracture Sequelae. A Register-Based Study From The Nordic Arthroplasty Register Association.**

Ditte Unbehaun<sup>1</sup>, Sigrid Rasmussen<sup>1</sup>, Randi hole<sup>2</sup>, Anne Marie Fenstad<sup>2</sup>, **Björn Salomonsson**<sup>3</sup>, Yilmaz Demir<sup>3</sup>, Steen Lund Jensen<sup>4</sup>, Stig Brorson<sup>5</sup>, Ville Äärimala<sup>6</sup>, Inger Mechlenburg<sup>7</sup>, Jeppe Vejlgaard Rasmussen<sup>8</sup>

1. Department of Public Health, Aarhus University, Aarhus, Denmark
2. Haukeland University Hospital, Bergen, Norway
3. Karolinska Institutet, Danderyd Hospital, Stockholm, Sweden
4. Aalborg University Hospital, Aalborg, Denmark
5. Zealand University Hospital, Koge, Denmark
6. , Turku University and University Hospital, Turku, Finland
7. 7Department of Clinical Medicine, Aarhus University, Aarhus, Denmark
8. Herlev University Hospital, Copenhagen, Denmark

### **Aim**

To report cumulative survival rates and reasons for revision after arthroplasty for proximal humerus fracture sequelae (PHFS).

### **Background**

Proximal humerus fractures (PHF) may result in sequelae indicating arthroplasty.

### **Methods**

Data was derived from the Nordic Arthroplasty Register Association. The Kaplan-Meier method was used to illustrate survival rates. Cox regression model was used to calculate hazard ratios. Type of arthroplasty, age, gender and period of surgery were included in the model. Revision was defined as removal or exchange of any component or the addition of a glenoid component.

### **Results**

30,190 primary arthroplasties were reported from 2004 to 2016, of which 3,245 were for PHFS. The 12-year cumulative survival rates were 0.85 for stemmed hemiarthroplasty (SHA) and 0.86 for reverse shoulder arthroplasty (RSA) ( $p=0.12$ ) with a mean time to revision of 30 months (SD 29) and 13 months (SD21) ( $p<0.001$ ). The most common reason for revision was luxation and instability for RSA and "other reasons" (including glenoid wear) for SHA. Men, compared to women (HR: 1.4, 95%CI: 1.1; 1.8,  $p=0.003$ ), and younger patients compared to older (HR: 1.6, 95% CI: 1.3; 2.0,  $p<0.001$ ) had an increased risk of revision.

### **Conclusions**

Shoulder arthroplasty for PHFS was associated with lower survival rates, compared to previously published results of shoulder arthroplasty for acute PHF. The low arthroplasty survival rates for especially men and young patients are worrying.

12:55 - 13:03

## **21 Cutibacterium Acnes (Propionibacterium Acnes) Is Observed As An Intraarticular And Intracellular Commensal Of The Human Shoulder Joint Detected In First-Time Surgery.**

**Robert Hudek**<sup>1</sup>, Alexander Brobeil<sup>2</sup>, Holger Brüggemann<sup>3</sup>, Frank Sommer<sup>4</sup>, Stefan Gattenlöhner<sup>2</sup>, Frank Gohlke<sup>1</sup>

1. Rhön Klinikum AG, Shoulder & Elbow Surgery, Bad Neustadt, Germany
2. Institut für Pathologie, Giessen, Germany
3. Department of Biomedicine, Medical and Molecular Bacteriology, Aarhus, Denmark
4. Institut für Medizinische Mikrobiologie und Hygiene, Marburg, Germany

### **Aim**

We aimed to detect *Cutibacterium acnes* with histologic methods from intra-articular shoulder tissue specimen and to analyse whether it can be found intracellularly when taken from patients having first time shoulder surgery.

### **Background**

*Cutibacterium acnes* is a mysterious member of the shoulder microbiome. It has been multiply associated with chronic postoperative complications and low-grade infections in orthopedic surgery. Still, it is unclear whether it should be either linked to skin contamination or to true deep infections. Some authors hypothesized *C. acnes* to be a commensal of deep, intraarticular tissues and linked it to osteoarthritis. Further, *C. acnes* is reported to persist in macrophages as a niche for its survival and spread.

### **Methods**

In 23 consecutive, otherwise healthy patients (17 m, 6 f; 58y), who had first time shoulder surgery and no previous shoulder injections, specimen were taken from intraarticular tissue during arthroscopic (n=11) and open (n=12) surgery. The samples were microbiologically cultivated and histologically processed using immunohistochemical staining with *C. acnes* specific antibodies, CD163 macrophage and  $\beta$ -actin markers to identify the position of *C. acnes* within the cell cytoskeleton. Positional analyses was conducted with a 3D confocal laser microscopy scanner at a maximal resolution of 310nm.

### **Results**

In 10 patients (43%) *C. acnes* growth was observed in microbiological culture (7 subcutaneous, 7 deep). *C. acnes* was detected in all tissue samples at histological analysis. In 5 tissue samples (22%, all arthroscopic), *C. acnes* was detected intracellularly in stroma cells and in macrophages.

### **Conclusions**

*C. acnes* can be detected intracellularly in macrophages and within stroma cells of intraarticular tissues of patients who never experienced a previous penetration of their shoulder joint. These data indicate *C. acnes* to be a commensal of the human shoulder joint where it persists within macrophages and stroma cells.

13:03 - 13:11

## **71 Immediate Mobilisation Following Reverse Total Shoulder Arthroplasty: A New Rehabilitation Protocol**

Paolo Consigliere, Jonathon Lee, **Ernest Fawzy**, Laura Mariani, Luis Natera, Caroline Witney-Lagen, Juan Bruguera, Giuseppe Sforza, Ofer Levy

Reading Shoulder Unit, Reading, United Kingdom

### **Aim**

Analyzing the outcome and complications comparing three different groups which followed different postoperative rehabilitation protocols following reverse shoulder arthroplasty (rTSA); evaluate if immediate mobilisation can be considered as a safe and reliable option

### **Background**

Use of reverse total shoulder arthroplasty (rTSA) has increased exponentially in recent years. Few articles outlining a structured and validated rehabilitation protocol exist. Slow conservative rehabilitation, with prolonged immobilisation and delayed exercises, has been used in the past

### **Methods**

Between 2005 and 2016, 352 shoulders (337 patients) underwent a primary rTSA. Patients were divided in 3-groups depending on the rehabilitation protocol undertaken (6weeks, 3weeks immobilisation and immediate mobilisation respectively for group-1, 2 and 3). Antero-superior approach was used and a "double row" equivalent intraosseous technique was used to reattach the deltoid to the acromion. Constant Score (CS), Subjective Shoulder Value (SSV), Satisfaction were used and patients prospectively assessed both clinically and radiographically preoperatively, at 3weeks, 3months, 6months, 1-year and yearly postoperatively

### **Results**

Mean age at surgery was 76 years (range 40 - 93). At 1year follow-up Constant Score (CS) improved from 15.5 (adjusted 24) to 63.2 (adjusted 91,4) in group-1 (n=113), from 22.1 (adjusted 30.9) to 63,3 (adjusted 98.7) in group-2 (n=126) and from 23,4 (adjusted 31,4) to 65 (adjusted 1000) in group-3 (n=113). Pain improved from 11,8/15 preoperatively to 2.5/15 postoperatively in group-1, from 11,2/15 to 2/15 in group 2 and from 11,3/15 to 2,5/15 in group-3. Mean range of movement (ROM) improved to 142°flexion and 131°abduction in group-1, 152°flexion and 144°abduction in group-2 and 157°flexion and 154°abduction in group-3. The SSV improved form 1,2 to 8,5 in group-1, from 1,3 to 8,5 in group-2, from 1,2 to 8,4 in group-3. No statistical significance differences were observed in CS, SSV and ROM in group-3 compared to group-1 and 2

### **Conclusions**

Despite no statistical significance differences in the three groups, immediate mobilisation after rTSA was seen to be safe, allowing quicker recovery and reducing prolonged immobilisation discomfort. The complications weren't observed to be increased in this group. A strong repair of the deltoid is mandatory to reach this purpose

13:11 - 13:19

## **45 Survivorship Of Autologous Bone Graft At A Minimum Of Two Years For Glenoid Bone Loss In Primary And Revision Shoulder Arthroplasty: A CT And Clinical Review.**

**Jagwant Singh**, K Neelakandan, M Walton, Puneet Monga, S Bale, I Trail

Wrightington Hospital, Wigan, United Kingdom

### **Aim**

Severe glenoid bone loss remains a challenge in patients requiring shoulder arthroplasty and may necessitate glenoid bone grafting. The purpose of this study was to assess the integrity of the bone graft at two years in our series of primary and revision shoulder replacements where glenoid bone loss was managed using a structural autograft (humeral head or iliac crest bone graft) and correlate the findings with the clinical outcomes.

### **Background**

The long term fate of these structural bone grafts is unknown. Substantial resorption and subsidence certainly remain a concern.

Multiple studies have used radiographs to assess bone graft resorption, base plate stability and loosening and expressed the need for a quantitative assessment of graft integration and resorption.

### **Methods**

Ethical approval was sought and the study has a portfolio study status by the NIHR (17/YH/0318). We contacted patients who had primary and revision shoulder arthroplasty with Lima Axioma TT metal back glenoid with autologous bone graft and were more than two years since their operation. All eligible patients underwent CT evaluation, clinical review and functional scoring. Early failures of composite fixation were excluded (2 patients).

### **Results**

40 patients (42 shoulders) were reviewed. Mean age 65 yrs. (range 35-83 yrs.), 22 females and 18 males. The average follow up period was 40 months (range 24 - 59 months). Primary arthroplasty was performed in 22 shoulders whereas 20 had revision arthroplasty. 25 had reverse shoulder arthroplasties (RSR) and 17 had anatomical shoulder replacements (ASR). Two of the ASR sustained a cuff failure and were revised to an RSR. 23 shoulders had graft taken from the humeral head and 19 had iliac crest bone graft, reflecting the numbers of revisions. Satisfactory bone graft incorporation (>50 %) was seen in 39 shoulders and only 3 patients had <50 % graft incorporation. Average forward elevation improved from 50 degrees (pre-op) to 100 degrees (range 35-150). The mean improvement in average Oxford Shoulder Score was 15 (Pre-op- 15, Post op 30) and the mean improvement in Constant Score improvement was 35 (Pre-op 12, post-op 47). Mean postoperative ASES was 62 (range 30-85).

### **Conclusions**

The use of trabecular metal in conjunction with autologous bone graft provides a reliable method of addressing glenoid bone defects in primary and revision shoulder arthroplasty. The graft has been shown to integrate well and remain largely unchanged over a two-year period.

13:19 - 13:27

### **33 Revision Of Failed Shoulder Arthroplasty: Epidemiology, Etiology And Surgical Options**

**Marc-Olivier Gauci**<sup>1</sup>, Maxime Cavalier<sup>1</sup>, Jean-François Gonzalez<sup>1</sup>, Nicolas Holzer<sup>2</sup>, Toby Baring<sup>3</sup>, Gilles Walch<sup>4</sup>, Pascal Boileau<sup>1</sup>

1. IULS, CHU de Nice, Nice, France
2. HUG, Geneva, Switzerland
3. Hospital of St John & St Elizabeth, London, United Kingdom
4. Clinique Mermoz, GDS-Ramsay, Lyon, France

#### **Aim**

To analyze the epidemiology, etiologies and revision options from two tertiary centers.

#### **Background**

Despite the increase in the number of revisions of failed shoulder arthroplasty there remains a paucity of information about them.

#### **Methods**

From 1993 to 2013, 542 failed arthroplasties were revised in 540 patients (65% of women) by two experienced shoulder surgeons: 224 hemiarthroplasties (HAs=41%), 237 anatomical total shoulder arthroplasties (TSAs=44%) and 81 reverse shoulder arthroplasties (RSAs=15%). Data about patients, primary pathology, intraoperative data, and re-intervention procedures were analyzed. Patients were followed clinically and radiographically with an average follow up of 8.7 years (range 1 to 20).

#### **Results**

The revision rate for primary arthroplasty was 12.7% for HAs, 6.7% for TSAs, 3.9% for RSAs. HAs were revised earlier ( $33\pm 40$  months) than RSAs ( $47\pm 150$  months) and TSAs ( $69\pm 61$  months). Although reasons for reintervention were often multiple, glenoid failure was a major cause of reintervention: glenoid erosion in failed HAs (29%) or glenoid loosening in failed TSAs (37%) and RSAs (24%). Prosthetic instability was another major cause of reintervention: 32% in RSAs, 20% in TSA, and 13% in HAs. Humeral implant loosening led to revision in 10% of RSAs and 6% of HAs and 6% of TSAs. Overall, 21% of patients required multiple reinterventions, mainly for instability (26%) and/or infection (25%). The final implant selection was RSA in 48%, specifically when associated cuff insufficiency, instability and/or bone loss. Final prosthesis re-implantation was possible in 90% of cases, with the remaining 10% treated with resection arthroplasty or a spacer.

#### **Conclusions**

Glenoid failure (erosion, loosening) and instability are the two most common causes of revision. Soft-tissue insufficiency and/or low-grade infection results in multiple revisions. Surgeons must recognise all complications so they can be addressed at the first revision surgery and avoid further re-interventions. Overall, RSA was the most common final revision implant.

