

MAOA BREAK-OUT SESSION #4
SHOULDER
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39. Outcomes Following Shoulder Arthroplasty in a Community Setting

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Much has been written regarding the outcomes following shoulder arthroplasty. However, these studies are almost exclusively reported on a diverse group of patients presenting to a tertiary care center for management of a painful shoulder. The objective of the present study is to investigate the outcome of shoulder arthroplasty in a community based setting.

Through a cooperative venture between the two medical facilities in this county, medical information of residents has been studied and validated as a model of a closed community setting for epidemiological purposes. Between 1977-2002, 99 residents (113 shoulders) underwent primary shoulder arthroplasty, with 67 total shoulder arthroplasties (TSA) and 46 hemiarthroplasties (HHR). Most common indications were osteoarthritis (OA) for TSA (48/67) and acute fracture for HHR (27/46). One hundred five shoulders with \geq two year follow-up or until revision surgery were included in the clinical analysis. Eight patients (eight shoulders) were excluded from clinical analysis due to death less than two years from surgery.

Neer ratings were excellent (HHR: n=5, 14%; TSA=28, 45%), satisfactory (HHR=14, 40%; TSA=29, 47%), unsatisfactory (HHR=16, 46%; TSA=5, 8%). Ten-year survival was 96%; with one TSA revised for instability and one for loosening. Mean postoperative active forward elevation was significantly different between TSA (133°) and HHR (111°), $p=0.01$; as was postoperative ER (TSA=58°, HHR=38°; $p<0.001$).

These data demonstrate expected outcomes following shoulder arthroplasty in a community-based setting, and may be used to predict the outcome in the typical patient. A high rate of satisfactory or excellent results following TSA for OA was seen. Less satisfactory results were seen with HHR, most likely related to the use of this procedure for trauma. This information will assist the community surgeon in counseling patients and weighing the risks and benefits of shoulder arthroplasty in the typical patient.

40. What Constitutes an Unstable Biceps Anchor? The Effect of Zone-Specific Superior Labral Detachment on Anchor Stability

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BACKGROUND: Lesions of the superior labrum anterior posterior (SLAP lesions) are a known cause of shoulder pain and dysfunction. Diagnostic arthroscopy is ultimately the tool utilized to assess and treat SLAP tears. Vertical lift-off of the labrum, displacement into the joint, and “posterior peel-back” are parameters used to assess for biceps anchor instability. The current literature provides no scientific guidelines for the evaluation of superior glenolabral separation as it relates to biceps anchor stability.

PURPOSE: This study aimed to elucidate the degree of biceps anchor instability that occurs when specific zones of the superior labrum are detached from the glenoid.

METHODS: Fourteen fresh frozen cadaveric shoulder specimens with grossly intact labrums were obtained. Labral detachment was performed sharply in three different zones: superior, anterior-superior, and posterior-superior. These three labral detachment zones were created in various combinations. Biceps anchor instability was then assessed by measuring its displacement from the glenoid with 2.5 pounds of traction placed on the biceps tendon. Traction was applied in three different fashions: vertically, laterally into the joint, and using a combination of posterior/superior/lateral to simulate the “posterior peel-back” test.

RESULTS: The greatest degree of instability occurred with the sectioning of all three zones followed by the sectioning of two adjacent zones. Combined anterior-superior/superior lesions generally demonstrated more displacement than combined posterior-superior/superior lesions. Superior traction created the least displacement in all combinations, while lateral traction created maximal displacement in posterior-superior/superior lesions. In the setting of anterior-superior/superior lesions, maximal displacement was observed using the “peelback” simulation.

CLINICAL SIGNIFICANCE: These findings have important implications relating to the clinician’s arthroscopic assessment of SLAP tears, as well as the determination of need for stabilization. This information is particularly useful when treating SLAP tears in certain laborers and athletes, whose activities may cause specific biceps anchor displacement patterns.

41. Strain and Force Changes within the Rotator Cuff After a Simulated Tear Using a Dynamic Model

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PURPOSE: To assess supraspinatous tendon forces in the intact state, after a defect and after repair in a simulated abduction model.

MATERIALS AND METHODS: Eight fresh frozen cadaveric shoulders free of a rotator cuff tear were used. Each specimen consisted of the scapula, humeral head, proximal humeral shaft, and the intact rotator cuff tendons. Specimens were tested on a biaxial hydraulic machine. The supraspinatus tendon was secured to three straps. A force transducer was attached to each strap and to a fixed load cell. Eight pounds connected to the humeral shaft simulated arm weight. During testing, 0-180 N was applied to the supraspinatus tendon. After 300 cycles, a defect was created in the supraspinatus tendon. The glenohumeral joint was cycled 100 times. The defect was repaired with two metal anchors and cycled 500 times or until failure. Central load force was divided by total force and averaged over 100 cycles. Peripheral force was represented by the sum of the anterior and posterior transducers. Regression analysis was used to analyze load distribution. Paired t-tests were used. Significance was determined at $p=0.05$ level.

RESULTS: In the intact tendon, load distribution was relatively equally divided. After a defect, 33% of tendon load was absorbed centrally ($p=0.01$). After repair, central tendon forces were 57% and peripheral forces 43%. After cyclic loading, central load was transferred peripherally. With continued cyclic loading, the peripheral and central loads remained unchanged. Ten of the 16 sutures didn't fail through 500 cycles.

DISCUSSION: Our results indicate that supraspinatus load is shifted peripherally after a tear. After repair, load is transferred back centrally and, with cycling, is transferred peripherally until an equilibrium is reached. This phenomenon of load transfer supports the rotator cable concept which depicts the rotator cuff tendon similar to a bridge cable.

42. The Acromiohumeral Interval is Affected by Arm Position with Plain Radiography in Healthy Young Volunteers without Shoulder Symptoms

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INTRODUCTION: The acromiohumeral interval (AHI), the distance between the acromion and humerus, is occupied by the rotator cuff and may be altered by rotator cuff disease. Although some feel AHI measurements are only accurate when made with three-dimensional MRI, others reference the interval with plain radiographs. The purpose of this study was to evaluate whether arm and x-ray beam positional changes affect the AHI as measured on plain radiographs.

METHODS: Controlling for shoulder and x-ray beam height as well as body position, 30 right shoulders of right hand dominant males (without kyphosis, shoulder symptoms, or previous shoulder surgery) underwent four anteroposterior plain radiographic views in defined positions: (1) true AP with neutral rotation, (2) true AP with 45° abduction and neutral rotation, (3) AP with internal rotation, and (4) true AP with neutral rotation and 10° of x-ray beam caudal tilt. Three independent, blinded observers were asked to measure the AHI for all 120 x-rays with the same goniometer.

RESULTS: Controlling for observer effect, there was a significant difference between AHI measurements on different views ($p < 0.01$). All pair-wise differences were statistically significant after adjusting for multiple comparisons (view #1 versus view #2, #2 versus #3, and #1 versus #3 with all p -values < 0.01). There was also a significant difference between AHI measurements when comparing view #1 with view #4 ($p < 0.01$).

DISCUSSION AND CONCLUSION: Even in normal healthy young shoulders, small changes in arm position and x-ray beam orientation affect the acromiohumeral interval as measured on plain radiographs.

43. Are Multiple Corticosteroid Injections Beneficial in Subacromial Impingement Syndrome?

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INTRODUCTION: Our objective was to assess the benefit of a second corticosteroid injection for subacromial impingement syndrome after return of symptoms following a single injection

MATERIALS AND METHODS: The charts of 20 patients with a clinical diagnosis of subacromial impingement syndrome without full thickness rotator cuff tears, labral tears, and acromioclavicular or glenohumeral pathology were reviewed. Diagnosis was based on clinical examination, plain radiographs, MRI scans, and positive impingement tests. All of the patients had received at least two corticosteroid injections. Patients who had not returned to clinic were contacted regarding their shoulder symptoms. The mean time from the second injection to follow-up was 11.2 months.

RESULTS: Five of 20 patients (25%) had lasting pain relief following the second injection, six patients (30%) underwent a subacromial decompression, and nine patients (45%) had return of symptoms significant enough to prompt them to seek or consider seeking further care for their shoulder.

CONCLUSION: Return of symptoms following a single corticosteroid injection should prompt the surgeon to consider more aggressive treatment options as a second injection is associated with only a 25% success rate for pain relief in subacromial impingement syndrome.

44. Long-Term Results of Humeral Head Replacement for Osteoarthritis

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BACKGROUND: While there has been some renewed interest in the use of hemiarthroplasty for osteoarthritis of the shoulder, there is little information available concerning the long-term results of this procedure. Therefore, the purpose of this study was to determine the results, risk factors for an unsatisfactory outcome, and rates of failure for the treatment of osteoarthritis of the shoulder with hemiarthroplasty.

METHODS: Between 1978 and 1997, 60 humeral head replacements were performed at our institution for the primary diagnosis of osteoarthritis. Fifty-one humeral head replacements in 49 patients performed for the diagnosis of osteoarthritis with complete preoperative evaluation, operative records, and minimum five-year follow-up (mean 11.3 years) or follow-up until revision were included in the study. Seven patients died with less than five-year follow-up and one patient (two shoulders) was lost to follow-up. All 60 shoulders were included in the survival analysis.

RESULTS: There was significant long-term pain relief, improvement in active abduction, and external rotation ($p < .0001$) with humeral head replacement. According to a modified Neer result rating, there were 10 excellent (20%), 20 satisfactory (39%), and 21 unsatisfactory results (41%). Ten of 51 shoulders (20%) underwent revision surgery, 9 of 10 for painful glenoid arthritis. Complete radiographs were available in 39 patients with a mean follow-up of 10.7 years. Humeral periprosthetic lucency was found in 13 of 39 (33%) and glenoid erosion was present in 37 of 39 (95%): 24 mild, 5 moderate and 8 severe.

CONCLUSIONS: The data from this study suggest that substantial clinical improvement can occur after humeral head replacement for osteoarthritis, but there is a high rate of unsatisfactory results and revision surgery. Careful consideration should be made as to whether this is the optimal procedure for primary osteoarthritis of the shoulder.

45. Treatment of Posterior SLAP and Labral Tears

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Posterior labral and SLAP Lesions comprise a large percentage of labral pathology. Most attention has been paid to anterior Bankart lesions and SLAP tears. The posterior labrum constitutes 50% of the labrum and Type II SLAP A, B, and C have two categories with a posterior component. Nord and Ryu introduced SLAP VIII, IX, and X which all have posterior components. Simple deduction suggests that a majority of labral tears may be posterior tears, yet little has been published in the literature on this area.

METHODS: A retrospective review of 200 consecutive SLAP lesions performed by the senior author (KDN) was performed. Each was categorized using the classification system by Snyder with modifications by Maffet and Nord. SLAP tears were divided into ten types and Type IIA, B, C. The SLAPs with a posterior component were reviewed.

RESULTS: 129 of the 200 SLAP lesions contained a posterior labral component. Repair techniques involve anchor insertion through the posterolateral portal (Port of Wilmington), the Lateral Accessory Posterior Portal (LAP), and the Low Posterolateral portal. Suture retrieval through the labrum was performed utilizing the straight Penetrator (Arthrex, Inc.) through the High Posteromedial portal, the Medial Accessory Posterior Portal (MAP), and the Low Posteromedial portal. The anatomy of each portal is reviewed.

DISCUSSION AND CONCLUSION: 2/3 of SLAP tears include a posterior component. In addition, isolated posterior Bankart tears or posterior instability occurs. Additional portals or instruments are necessary for repair of these posterior labral tears. Techniques for repairing these posterior labral lesions are demonstrated.

46. Rotator Cuff Repair in Patients with Rheumatoid Arthritis

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BACKGROUND: Currently, there is no information available regarding the results of rotator cuff repair in patients with rheumatoid arthritis. Therefore, we reviewed our experience to determine the results, the risk factors for an unsatisfactory outcome, and the rates of failure.

MATERIALS AND METHODS: A retrospective review of all patients with rheumatoid arthritis who underwent repair of a rotator cuff tear from 1988 to 2002 was performed. There were 23 shoulders in 21 patients. The median follow-up for the 20 shoulders that did not require revision surgery was 9.7 years. Nine shoulders had partial thickness tears and 14 had full thickness tears. Shoulders were assessed for pain, functional outcomes, and overall satisfaction.

RESULTS: Patients with both partial and full thickness rotator cuff tears had significantly improved overall pain ($p < 0.05$) and satisfaction ($p < 0.05$). Patients undergoing repair of partial thickness tears had improved active elevation from 148° to 164° ($p = 0.03$), while elevation did not improve in patients who underwent repair of full thickness tears. Six of 14 patients with full thickness tears had unsatisfactory results, while only 2 of 9 patients with partial thickness tears had unsatisfactory results.

CONCLUSION: Rotator cuff repair in patients with rheumatoid arthritis can be challenging. However, durable pain relief and patient satisfaction can occur. Functional gains should not be expected in patients with full thickness rotator cuff tears. Repair of the rotator cuff in patients with rheumatoid arthritis can be undertaken when nonoperative measures for pain relief have failed.

47. Latissimus Dorsi Transfer as Salvage for Failed Debridement and Repair of Massive Rotator Cuff Tears

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INTRODUCTION: Often, massive rotator cuff tears cannot be primarily repaired despite mobilization and releases. The surgeon has the option of tear debridement or soft tissue transfer. The purpose of the current study was to review patients who underwent latissimus dorsi transfer for an irreparable posterior-superior rotator cuff tear.

METHODS: Eight patients who had undergone a failed arthroscopic or mini-open debridement and repair of a massive rotator cuff tear underwent latissimus dorsi transfer with ipsilateral fascia lata augmentation. Prior to transfer, all patients completed six weeks of PT. MRI confirmed a massive re-tear of the rotator cuff in all patients. No preoperative computed tomography scans were obtained. Preoperative evaluation included shoulder ROM, Constant and Murley Score, VAS pain scale, Short Shoulder Form, and SF-12. Bivariate analyses were performed. Significance was set at $p < 0.05$.

RESULTS: The average age was 63 years. There were four females and three males. Average follow-up was 31 months (range 12-58 months). At the most recent follow-up, average forward flexion and abduction improved from 49° and 53° preoperative to 76° and 67° postoperative ($p=0.04$ and $p=0.13$). Average VAS pain improved from 9.1 to 3.6. Average Constant and Murley score improved from 22 to 44. The UCLA score averaged 19. Age, sex, side of tear, size of tear, surgical history, and other co-morbidities did not correlate with outcome.

DISCUSSION: The results of the current study are in agreement with previous reports of latissimus dorsi transfer for irreparable rotator cuff tears. In the setting of a painful, massive, irreparable rotator cuff tear after previous debridement and attempted repair, latissimus transfer is an acceptable option to restore function and eliminate pain.

48. Rotator Cuff Repair Utilizing the Anterolateral Portal – The 3D Repair

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INTRODUCTION: Rotator cuff repair involves visualizing the subacromial space while passing sutures. By only viewing the bursal surface during repair, the cuff is evaluated in only 2-dimensions. Some tears can be handled this way, but delaminated tears have a 3-dimensional component. Viewing only the bursal surface can cause failure to incorporate the articular side. If a repair only captures the bursal portion, a partial articular surface tear avulsion (PASTA) lesion is produced. A technique is presented where the 3-dimensional anatomy of the cuff is addressed by visualizing suture passage from the glenohumeral and subacromial space.

METHODS: Two cadaveric shoulders and ten instrument passes on 10 and 15 mm delaminated tears of the supraspinatus were performed. Measurements were made using an Absolute Digimatic Caliper (Mitutoya, Kawasaki, Japan). Comparisons were made between ExpressSew (Surgical Solutions), Viper, and Penetrator (Arthrex, Naples, FL).

RESULTS: When a 10 mm delaminated tear is not identified, jawed instruments such as ExpressSew and Viper captured both tear layers 20% and 10% of the time. With 15 mm delaminated tear the capture rates decreased to 0%. The Penetrator captured both layers 80% (10 mm tear) and 60% (15 mm tear). All instruments captured both layers 100% for both 10 and 15 mm tears when delamination is identified and the articular side retracted.

DISCUSSION AND CONCLUSION: Anterolateral portal allows direct suture passage through delaminated tears. Visualization in the glenohumeral joint confirms the articular side is captured. This portal is commonly used for anchor placement. Cadaveric studies show this portal is far from neurovascular structures. The same incision can be used for anchor placement and suture passing.

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