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What’s New in Shoulder and Elbow Surgery?

Aaron M. Chamberlain, MD, Surena Namdari, MD, and Jay D. Keener, MD

This update is a review of the most impactful studies related to advances in shoulder and elbow surgery from March 2014 to March 2015. Included are basic science and clinical studies primarily from The Journal of Bone & Joint Surgery, the Journal of Shoulder and Elbow Surgery, and The American Journal of Sports Medicine. Specific emphasis has been placed on higher-quality research (Level-I and II studies) and particularly relevant Level-III and IV studies. The level of evidence is provided (when known).

Shoulder

Rotator Cuff

Clinical Presentation

The correlation between rotator cuff tears and pain severity has recently been critically examined. The MOON (Multicenter Orthopaedic Outcomes Network) Shoulder Group published three cross-sectional studies that investigated the correlation of shoulder pain and function to the chronicity and severity of cuff disease. In one of the studies, a cohort of 393 subjects with an atraumatic, symptomatic full-thickness rotator cuff tear treated with physical therapy was evaluated. Multivariable modeling identified increased comorbidities, lower education level, and race as the only significant factors associated with pain on presentation, while no measure of rotator cuff tear severity (tear size, retraction, and rotator cuff muscle atrophy) correlated with pain (Level III). In a similar study of 450 subjects, the authors investigated the relationship between symptom duration and the severity of rotator cuff tears. In another analysis of 434 patients with an atraumatic rotator cuff tear evaluated the correlation between activity level and rotator cuff severity. Interestingly, shoulder activity was not associated with the severity of the rotator cuff tear but was negatively associated with age and female sex and positively associated with occupation (Level III). These studies, collectively, demonstrate the highly variable nature of the clinical presentation of rotator cuff tears, highlighting the fact that tear severity does not correlate with the duration or severity of shoulder pain.

Natural History

In a prospective evaluation of asymptomatic degenerative rotator cuff tears, Keener et al. reported risks associated with disease progression over time. Two hundred and twenty-four subjects were followed annually for a median of 5.1 years and assessed by shoulder ultrasonography, clinical examination, and shoulder outcome scores. Tear progression was seen in 49% and the development of shoulder pain was seen in 46% of the cohort. The onset of pain was associated with a decline in shoulder function. The risk of tear enlargement and muscle degeneration was greater in full-thickness tears. Shoulder pain development and supraspinatus muscle degeneration were associated with tear enlargement. This prospective evaluation of asymptomatic rotator cuff tears provides a unique perspective on the natural history of rotator cuff disease and is useful for informed decision-making and patient counseling when considering management options for rotator cuff tears (Level II).
Surgical Results

The preferred initial management of degenerative rotator cuff tears remains uncertain. A recent prospective randomized trial by Moosmayer et al. compared physical therapy and primary tendon repair surgery. Approximately 25% of the patients initially allocated to physical therapy underwent secondary tendon repair because of persistent pain. An intention-to-treat analysis showed significantly better functional results in the surgical group on the basis of Constant scores, American Shoulder and Elbow Surgeons (ASES) scores, and patient satisfaction; however, these differences were below minimal clinically important differences. In the physical therapy treatment group, increasing tear size and progressively inferior outcomes were seen in one-third of the patients. The authors concluded that their data supported a primary trial of physical therapy for most patients. The treatment effect of surgery was thought not to be profound enough to justify surgical management of painful degenerative cuff tears on initial presentation (Level I).

The appropriate indication for the performance of a distal clavicle resection in the setting of rotator cuff repair continues to be a clinically relevant question. Park et al. conducted a prospective randomized trial comparing the clinical outcomes of patients with a rotator cuff tear and symptomatic acromioclavicular joint arthritis, diagnosed by findings of tenderness, radiographic arthritis, and positive localized injection. Twenty-six of the patients underwent rotator cuff repair and distal clavicle resection, and thirty-two of the patients underwent rotator cuff repair alone. At a minimum of two years postoperatively, no differences in functional or pain scores were seen between the groups. This study underscores the need to carefully consider the necessity of distal clavicle resection concomitant with rotator cuff repair (Level I).

Another recent prospective randomized trial compared the potential benefits of platelet-rich plasma (PRP) on structural and clinical outcomes following surgical cuff repair. Tears of <3 cm that were repaired with an arthroscopic single-row technique were included. At a minimum of twenty-four months of follow-up, no difference in functional outcomes, as measured by the UCLA (University of California, Los Angeles) score and the Constant score, were noted between those who received PRP in conjunction with a cuff repair and those who did not. Additionally, no difference in the rate or quality of postoperative tendon healing was seen between the groups (Level I). These findings are consistent with those of previous higher-quality studies examining the effect of PRP on healing after rotator cuff repair.

Calcific Tendinitis

A recent prospective randomized trial assessed two distinct treatments for calcific tendinitis of the shoulder: fluoroscopically guided needling in combination with subacromial corticosteroid injection was compared with extracorporeal shock wave therapy (ESWT). The mean duration of follow-up was twenty-three months. Subjects in the ultrasound needling group had better functional scores than did those in the ESWT group. Furthermore, the decrease in size of the calcium deposit was greater in the ultrasound needling group. Both treatments, however, provided significant improvement in pain and function compared with baseline assessment (Level I).

Basics Science

Choo et al. evaluated muscle biopsies obtained from patients with various stages of rotator cuff disease to examine gene expression in human rotator cuff musculature. They found that gene expression in rotator cuff muscles varied according to tendon injury severity. Patients with bursitis and tendinopathy appeared to retain some intrinsic capacity to heal. In contrast, patients with massive rotator cuff tears had downregulation of all genes except those inhibiting myogenesis, indicating minimal intrinsic healing properties.

Lamplot et al. examined the effects of PRP and BMP (bone morphogenetic protein)-13 on rotator cuff healing in a rat model. BMP-13 was found to upregulate Type-III collagen expression compared with PRP and controls. The tendon repairs augmented with BMP-13 had increased mechanical stress to failure as well. Histologic analysis corroborated the mechanical results seen in this study. The authors concluded that further investigation into the role of BMP-13 as a potential augmentation to rotator cuff healing is warranted.

Shoulder Instability

Soft-Tissue Repairs

Research is ongoing regarding the optimal surgical method of managing recurrent traumatic anterior shoulder instability. Mohtadi et al. conducted a prospective randomized trial of 196 patients, comparing open and arthroscopic stabilization procedures. This study excluded patients with substantial glenoid bone loss or fracture. Outcome measures included WOSI (Western Ontario Shoulder Instability Index) and ASES scores at two years postoperatively. No significant difference in final WOSI and ASES scores was noted, and range of motion did not differ between the groups. A higher rate of recurrent instability was seen in the arthroscopic repair group (23% versus 11%), and a higher rate of complications was found in the open repair group. Risk factors for recurrence were male sex, an age of less than twenty-five years, and the presence of a Hill–Sachs lesion (Level I).

The optimal position of immobilization of the shoulder after primary anterior dislocation is controversial, as some studies have suggested a benefit of immobilization in external rotation, while others have suggested no benefit. Heidari et al. compared the effectiveness of immobilization in abduction (15°) and external rotation (10°) versus adduction and internal rotation after primary anterior shoulder dislocation in a randomized controlled trial of 102 patients. After three weeks of immobilization, patients underwent a standardized rehabilitation program. While compliance with immobilization was
lower in the abduction and external-rotation group, after twenty-four months of follow-up, only 3.9% in this group had recurrent instability compared with 33.3% in the adduction and internal-rotation group.

**Osseous Augmentation**

The Latarjet procedure has proven to be clinically effective in the management of anterior shoulder instability; however, the potential for intraoperative nerve injury is relatively high. Delaney et al. demonstrated that 76% of the subjects in their study had measurable electromyographic nerve alert episodes during surgery\(^1\). The most common nerves involved included the axillary and musculocutaneous nerves. Nerve alerts typically happen during glenoid exposure or during graft placement. The duration of the higher-risk stage of the procedure and the total operative time were predictive of a postoperative nerve deficit, which was seen in 21% of the subjects. All nerve deficits were temporary and improved over a period of one to six months (Level IV).

Dumont et al. recently reported clinical results of the arthroscopic Latarjet procedure\(^4\). Sixty-four of eighty-nine shoulders were followed for a mean duration of seventy-six months. There were no reported dislocations and one recurrent subluxation event. The mean WOSI score was 91%. Overall, 16% of the patients had a complication necessitating reoperation (Level IV).

A recent long-term follow-up of the Latarjet procedure was reported by Mizuno et al.\(^5\). Sixty-eight subjects had a mean of twenty years of postoperative follow-up. The rate of recurrence was 6%, and 20% of subjects had developed radiographic arthritis by the time of final follow-up. In most cases, the arthritis was early-stage; however, stage-3 arthritis was seen in 9% of subjects. The study results demonstrate that the open Latarjet procedure is highly effective, producing durable results with mild to moderate arthritis in approximately one-quarter of patients over the long term (Level IV).

When recurrent instability is associated with glenoid bone loss, Bristow and Latarjet procedures can be used to address bone deficiencies. The Bristow procedure transfers only the coracoid tip, whereas the Latarjet procedure transfers the entire horizontal pillar of the coracoid process. Using a custom shoulder simulator and cadaveric specimens, Giles et al. tested shoulders in the intact state, following Bristow and Latarjet reconstructions after a capsulolabral injury (0% glenoid defect), and after the creation of 15% and 30% glenoid bone defects\(^6\). No significant differences in joint stability were noted for the 0% glenoid defect in any joint position. However, substantially greater joint stabilization occurred following the Latarjet procedure for the 15% and 30% glenoid bone loss conditions, in adduction with neutral rotation, adduction with external rotation, and abduction with external rotation.

**Proximal Humeral Fractures**

Rangan et al. published results from the ProPHER (Proximal Fracture of the Humerus Evaluation by Randomization) trial critically examining the role of surgery for the treatment of displaced proximal humeral fractures\(^7\). This was a prospective randomized trial consisting of 250 patients with displaced surgical neck fractures. Subjects were randomized to surgical or conservative treatment, and outcomes were reported at a minimum of two years of follow-up. Randomization produced groups with similar demographics, including age (mean, sixty-five to sixty-six years). Surgical treatment included locking-plate fixation in over 80% of the subjects but also included hemiarthroplasty, intramedullary nailing, suture repair, and other techniques. This multicenter trial, which involved over thirty centers and over sixty treating surgeons, demonstrated no statistically or clinically significant difference in outcomes as assessed by the Oxford Shoulder Score. Interestingly, secondary analysis also failed to show benefit of surgical fixation in fractures with tuberosity involvement. Complications were slightly greater in the surgical fixation group. The authors concluded that their results do not support the rising trend of surgical management for proximal humeral fractures (Level I).

Another recent prospective randomized trial compared reverse shoulder arthroplasty with hemiarthroplasty for acute proximal humeral fractures\(^8\). At a mean follow-up of more than two years, patients who had undergone reverse shoulder arthroplasty had better functional scores, better active elevation, and fewer complications than the hemiarthroplasty group. Failure of tuberosity healing was a frequent complication (30%) in the hemiarthroplasty group and negatively affected the clinical outcome. For the reverse shoulder arthroplasty group, tuberosity healing was more predictable, and functional outcome was irrespective of healing of the tuberosities (Level I).

**Shoulder Arthroplasty**

Schairer et al. examined hospital readmission rates after primary shoulder arthroplasty\(^9\). Data from seven states were tabulated over a six-year period to determine the ninety-day readmission rate and associated risk factors. The overall readmission rate was 7.3%, with the highest rate found in the reverse shoulder arthroplasty group. Medical complications contributed to 82% of the readmissions. Infection and dislocation were the most common surgical complications resulting in readmission. Patients with Medicaid insurance had more than a 50% greater risk of readmission compared with patients with Medicare. Procedures performed in medium and high-volume hospitals were associated with a lower risk of readmission compared with those in low-volume centers (Level III).

In an attempt to determine the influence of surgeon and hospital case volume on perioperative blood loss, operative time, and length of hospital stay for patients undergoing shoulder arthroplasty, Singh et al. utilized prospective data from a multicenter registry of 1176 primary shoulder arthroplasties\(^10\). The authors reported that higher surgeon and hospital case volumes led to improved perioperative metrics with all shoulder arthroplasty procedures. Interestingly, surgeon...
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Scapular notching after reverse arthroplasty has traditionally been a common complication with uncertain clinical ramifications. With innovations in reverse implant design and improvements in surgical technique, the occurrence of notching has decreased. Poon et al. performed a randomized controlled trial comparing the results of concentric and eccentric glenospheres in reverse shoulder arthroplasty. The surgical technique for both groups involved the placement of the glenoid baseplate flush with the inferior glenoid rim. No differences were seen in notching rates or clinical outcomes between concentric and eccentric glenospheres at a minimum follow-up of two years. The authors demonstrated that eccentric glenospheres provide a surgical option for reducing the risk of notching in cases in which inferior placement of the glenoid baseplate is not possible (Level I).

Arthroplasty Infections

The diagnosis of indolent infections after shoulder arthroplasty remains elusive. Much research has been garnered in this area recently. Grosso et al. investigated the potential value of interleukin (IL)-6 serum levels in predicting indolent periprosthetic shoulder infections. IL-6 was studied in sixty-nine patients undergoing revision shoulder arthroplasty. Serum IL-6 levels were found to have poor sensitivity and accuracy with respect to the diagnosis of definite or probable infections (Level III). Conversely, Frangiamore et al. studied the sensitivity and specificity of synovial fluid IL-6 as a predictor of periprosthetic shoulder infection. Synovial fluid IL-6 had a sensitivity of 87%, a specificity of 90%, a positive likelihood ratio of 8.45, and a negative likelihood ratio of 0.15. Furthermore, they found that intraoperative synovial fluid IL-6 values correlated well with preoperative IL-6 synovial fluid values and frozen-section histologic findings. Synovial fluid IL-6 provides a potentially promising new marker to improve the accuracy of diagnosing periprosthetic shoulder infection (Level III).

Dilisio et al. performed a retrospective review to examine the role of arthroscopic tissue culture for diagnosing indolent periprosthetic shoulder infection with Propionibacterium acnes. The results of arthroscopic biopsy were much more accurate (100% sensitivity, specificity, and accuracy) than those of fluoroscopically guided fluid aspiration (17% sensitivity, 100% sensitivity, 100% positive predictive value, and 58% negative predictive value), when compared with results of intraoperative culture, the gold standard. Although it showed the potential value of arthroscopic tissue culture, this study was limited by the small number of subjects and the potential for selection bias (Level I).

Clavicular Fractures

Clavicular fracture management has been critically examined in recent Level-I studies. Melean et al. performed a prospective randomized trial comparing conservative and surgical management of displaced midshaft clavicular fractures in the Workers’ Compensation population. Seventy-six patients...
Adhesive Capsulitis

While adhesive capsulitis is a diagnosis that is often successfully treated nonoperatively, those that fail conservative management are candidates for arthroscopic capsular release or manipulation under anesthesia. The extent of the capsular release necessary to achieve successful results is unknown. Kim et al. performed a randomized controlled trial with thirty-seven patients who underwent standard arthroscopic capsular release and thirty-eight patients in whom the capsular release was extended to the posterior capsule. Preoperative demographic data, symptom duration, and range of motion were similar between the groups. At a mean follow-up of eighteen months, there were no differences in postoperative outcomes between the groups. No statistical differences were found between the groups in terms of subjective, patient-specific clinical outcome scores or postoperative range of motion. This study suggests that routine adjunctive posterior capsular release is not a necessary component of an arthroscopic capsular release in treating primary adhesive capsulitis.

Sung et al. evaluated serum lipid levels in patients with primary adhesive capsulitis of the shoulder. Comparing 300 patients with frozen shoulder with 900 patient controls who were age and sex-matched, they found significant differences in the prevalence of elevated serum lipids. They concluded that hypercholesterolemia and inflammatory lipoproteinemia have a significant association with primary frozen shoulder. Additional research is needed to evaluate if the nonoptimal serum lipid level is a cause, a related co-factor, or the result of primary adhesive capsulitis.

Elbow Arthroplasty

The influence of obesity on elbow arthroplasty outcomes was investigated by Baghdadi et al. From a study period that spanned twenty years, there were 564 nonobese patients and 159 obese patients who underwent total elbow arthroplasty. The ten-year survival rate for total elbow arthroplasty free from revision for any reason was significantly greater among nonobese patients (86%) than among obese patients (70%). Despite the poor implant longevity among obese patients, their rates of perioperative mortality and complications were comparable with those of nonobese patients.

Distal Biceps Rupture

Watson et al. performed a systematic review of articles related to the surgical management of acute distal biceps ruptures. Twenty-two studies with a total of 494 patients were examined for complications following various surgical techniques. The complication rate did not vary between single and double-incision techniques; however, the bone-tunnel and cortical-button fixation methods had fewer complications than did suture-anchor and intrasosseous-screw techniques. The most common complication involved injury to the lateral antebrachial cutaneous nerve.

Arthroscopy

Wada et al. performed a randomized trial comparing regional analgesia with local anesthetic injections in patients undergoing elbow arthroscopy. No differences in pain level, oral analgesic use, or patient satisfaction were seen at three time points within the first forty-eight hours after surgery. The authors concluded that pain after elbow arthroscopy could be well controlled with local anesthetic and oral analgesics.

Upcoming Events

The ASES will hold its annual open meeting on Saturday, March 5, 2016, in Orlando, Florida. The 13th International Congress of Shoulder and Elbow Surgery (ICSES) will be held in Jeju, South Korea, on May 18-20, 2016. This meeting will bring together an international panel of shoulder and elbow experts to discuss recent advances in shoulder and elbow surgery.

Evidence-Based Orthopaedics

The editorial staff of The Journal reviewed a large number of recently published research studies related to the musculoskeletal system that received a higher Level of Evidence grade. In addition to articles published previously in this journal or cited already in the Update, twenty-six other articles with a higher Level of Evidence grade were identified that were relevant to shoulder and elbow surgery. A list of those titles is appended to this review after the standard bibliography.
have provided a brief commentary about each of the articles to help guide your further reading, in an evidence-based fashion, in this subspecialty area.

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26. van der Meijden OA, Houwert RM, Huismans M, Wiljdicks FJ, Dijkstraan MG, Meylearts EA, Hammacher ER, Verhofstadt MH, Verleidenk J. Operative treatment...
Evidence-Based Articles Related to Shoulder and Elbow Surgery


This systematic review looked at randomized and quasi-randomized trials regarding various methods of fixation for olecranon fractures. Six studies met the inclusion criteria. The overall quality of the studies was limited by bias, making definitive recommendations difficult. The majority of the studies showed no difference in outcomes between fixation methods; one study favored plate fixation over tension-band wiring. The removal of hardware was a common later procedure, more often seen with plate fixation.


This systematic review examined the benefit of elbow aspirations for the treatment of acute radial head fractures in adults. All injuries were treated conservatively. The evidence for the outcomes was judged as very low quality. The authors concluded that there was insufficient evidence to determine the effectiveness of elbow aspiration for acute radial head fractures.


This meta-analysis compared nonsurgical treatment with observation or placebo for the treatment of lateral epicondylitis of the elbow. Only trials of good or excellent quality were examined, creating pooled data from twenty-two quality studies. Various nonsurgical treatments were analyzed. Nonoperative treatment was not favored over no treatment as assessed by overall improvement, the need for escape treatment, elbow function scores, and grip strength at mid to long-term follow-up.


This systematic review compared surgical versus conservative treatment for primary anterior shoulder dislocations. Thirty-one studies (2813 shoulders) were included. Pooled results from comparative studies showed that the rate of recurrence was significantly lower in the surgical group than in the conservative group (odds ratio [OR] = 12.71; 95% confidence interval [CI] = 4.88 to 33.10). Immobilization in external rotation resulted in a lower rate of recurrence than immobilization in internal rotation (OR = 2.28; 95% CI = 1.34 to 3.87).


In this randomized controlled trial, corticosteroid injection was compared with physical therapy (six treatment sessions) for the treatment of subacromial impingement syndrome. Patients in both groups demonstrated a 50% improvement in Shoulder Pain and Disability Index scores at one year, with no difference between the groups. The patients treated with physical therapy required significantly fewer future visits to their primary care provider related to their shoulder pain. Those treated with an injection were more likely to need additional injections on subsequent follow-up (38% versus 20%).


This systematic review compared the radiographic and clinical survivorship of all-polyethylene versus metal-backed glenoid components. Analysis included data on 1571 metal-backed glenoids with a mean follow-up of 5.8 years and 3035 all-polyethylene glenoids with a mean follow-up of 7.3 years. The all-polyethylene glenoids had a higher rate of radiolucencies (42.5% versus 34.9%; p < 0.0026) and radiographic loosening (21.1% versus 16.8%; p < 0.0005) than metal-backed glenoids. The rate of revision of metal-backed glenoids was much higher than that of polyethylene glenoids (14.0% versus 3.8%; p < 0.0001).


This was a Level-I meta-analysis that examined the efficacy of platelet concentrates on arthroscopic rotator cuff repairs. Seven studies reporting the clinical and structural results of 417 patients were included. The authors found no benefit of platelet concentrates on tendon healing or functional results.


This prospective randomized trial compared the effectiveness of a single-injection interscalene block (SISB), a continuous interscalene catheter (CISB), or general anesthetic (GA) alone after arthroscopic rotator cuff repair surgery. Pain relief and adverse reactions in the first week were compared. Subjects who received a regional anesthetic were discharged from the facility faster after surgery than the GA group. The mean pain scores and narcotic use were lower and the duration of sleep was better for the CISB group than the SISB and GA groups up to postoperative day 3.


This systematic review examined the results of arthroscopic stabilization for posterior instability. Six retrospective studies involving 387 patients were reviewed. The mean duration of follow-up was forty-four months. The mean rate of recurrence was 5.4%, and the mean rate of return to sports was 92.5%.


This was a randomized controlled trial that examined the rate of recurrence and disease-specific quality of life for subjects immobilized in either internal or external rotation following primary anterior shoulder dislocation. Sixty subjects, excluding those with large bone lesions, were randomized to...
immobilization in internal rotation with use of a sling or in adduction and external rotation with use of a brace. Blinded assessments were performed at twelve months. There was no difference between the groups in the rate of recurrent instability (37% of subjects in the external-rotation group and 40% in the internal-rotation group; p = 0.41) or in WOSI scores (p = 0.74).


This study was both a systematic review and a meta-analysis of Level-I studies comparing the result of arthroscopic single and double-row rotator cuff repair. There was no significant difference in the preoperative to postoperative change in ASES, UCLA, or Constant scores between repair types. There was a significantly greater risk of postoperative tendon retear in the single-row group compared with the double-row group (25.9% versus 14.2%; p = 0.001).


This study examined the results of arthroscopic rotator cuff repair with concomitant capsular release compared with arthroscopic repair after six months of rehabilitation for shoulders presenting with a cuff tear and shoulder stiffness. No differences were seen between groups in the degree of improvement of shoulder range of motion or in ASES, Simple Shoulder Test, and Constant scores at a mean follow-up of twenty-one months. Additionally, no difference was noted in postoperative repair integrity as assessed by ultrasound or magnetic resonance imaging performed between six and twelve months after surgery.


This meta-analysis examined the effectiveness of low and high-energy extracorporeal shock wave therapy (ESWT) for the treatment of calcific tendinitis of the rotator cuff. Five randomized controlled trials were included. All studies showed better Constant scores for the high-energy ESWT at three and six months following treatment. High-energy ESWT also resulted in more complete resorption of the calcific deposit at three months following treatment.


This prospective randomized trial compared early pain relief following arthroscopic rotator cuff repair in subjects treated with a suprascapular nerve block (SSNB) alone or in combination with an axillary nerve block (ANB). Subjects receiving both an SSNB and an ANB had lower pain scores for all time points within the first twenty-four hours after surgery and a lower chance of rebound pain than those who received an SSNB alone.


This multicenter randomized trial compared the results of electrothermal arthroscopic capsulorrhaphy (ETAC) with those of open inferior capsular shift (ICS) for the treatment of multidirectional instability or hyperlaxity with anteroinferior instability of the shoulder. Subjects with bone loss or labral tears were excluded. At two years postoperatively, there were no statistically or clinically significant differences between the groups in the WOSI, ASES, and Constant scores or in active range of motion. Recurrent instability was not statistically different (ETAC, two cases; ICS, four cases; p = 0.41).


A combined systematic review and meta-analysis was conducted to examine factors related to the repair integrity and clinical outcomes of patients who underwent surgery for rotator cuff repair. One hundred and eight articles from 1980 to 2012, with data for 8011 shoulders, met the inclusion criteria. Over the study period, the rate of tendon healing and clinical results did not improve. The weighted mean retear rate was 26.6% at a mean of 23.7 months after surgery. Retears were associated with more fatty infiltration, larger tear size, advanced age, and double-row repairs. Clinical improvement averaged 72% of the maximum possible improvement. Patient-reported outcomes generally improved regardless of the integrity of the repair. The inconsistent and incomplete published data limited the meta-analysis of factors affecting the outcome of rotator cuff repair.


This randomized trial (Level II) compared the short-term outcomes of arthroscopic rotator cuff repair performed with and without acromioplasty. Ninety-four of 114 initially enrolled subjects were available for review at two years following surgery. No differences in clinical outcome scores (ASES, UCLA, or Constant scores) were seen between groups or between subjects with different acromial features.


Three methods of treating symptomatic, nontraumatic tears of the supraspinatus tendon in patients older than fifty-five years of age were compared. A total of 180 shoulders (173 patients) with supraspinatus tendon tears were randomly allocated into one of three groups (each of sixty shoulders): physiotherapy (group 1), acromioplasty and physiotherapy (group 2), and rotator cuff repair, acromioplasty, and physiotherapy (group 3). One hundred and sixty-seven shoulders were available for follow-up at one year after treatment. There were no between-group differences in the mean Constant score at the time of final follow-up: 74.1 (standard deviation [SD], 14.2), 77.2 (SD, 13.0), and 77.9 (SD 12.1) in groups 1, 2, and 3, respectively (p = 0.34). The mean change in the Constant score was 17.0, 17.5, and 19.8, respectively (p = 0.34). The authors concluded that, at one year of follow-up, operative treatment is no better than conservative treatment with regard to nontraumatic supraspinatus tears, and that conservative treatment should be considered as the primary method of treatment for this condition.


This prospective randomized trial compared anatomic intramedullary nailing with minimally invasive plate osteosynthesis for the treatment of humeral shaft fractures. At one year postoperatively, no significant difference in shoulder function was seen between the minimally invasive plate osteosynthesis and locking intramedullary nailing according to the UCLA scale (31.4 versus 31.2 points; p = 0.98). There was also no difference in elbow function (Broberg and Morrey elbow score, 94.8 versus 94.1; p = 0.96). Complications
were similar between the groups. Fracture union was achieved in all but one patient (2.4%) in the intramedullary nailing group within one year after the surgical procedure.


This randomized controlled trial compared eccentric and concentric resistance exercises for the treatment of lateral epicondylitis. One hundred and twenty subjects with a minimum of three months of pain were recruited. The eccentric-exercise group had faster resolution of pain and lower pain scores lasting until twelve months of follow-up. The eccentric-exercise group also had greater strength increases. No difference in function or quality of life between the groups was seen.


This prospective randomized trial compared rehabilitation protocols involving two different periods of immobilization following arthroscopic rotator cuff repair. One hundred subjects were randomized to immobilization for four weeks compared with eight weeks. Single-row repairs were performed for full-thickness tears with a mean size of 2.3 x 20 cm. There were nine full-thickness retears (9%), and 89% of the patients rated their result as excellent or good. There were five full-thickness retears in the four-week group and four in the eight-week group (p = 0.73). At final follow-up, the two groups showed no differences in range of motion or clinical scores (ASES and Constant scores). The proportion showing stiffness was higher in the eight-week group (38% compared with 18%; p = 0.038).


The purpose of this study was to report complication and reoperation rates following nonarthroplasty fixation of shoulder fractures. Records from all inpatient hospital discharges and subsequent readmissions related to operative nonarthroplasty treatment of proximal humeral fractures were obtained for patients in California from 1994 through 2005. Procedures included open reduction and internal fixation (9254 patients), closed reduction and internal fixation (1903 patients), and internal fixation without reduction (302 patients). The short-term complications included mortality (401 patients, or 3.5%), which was associated with a higher Charlson Comorbidity Index (OR = 1.5; p < 0.001) and male sex (OR = 1.7; p < 0.001); and pulmonary embolism (sixty patients, or 0.5%), which was associated with male sex (OR = 2.2; p = 0.007) and patient age of seventy-five years or older (OR = 3.6; p = 0.001). Intermediate-term reoperations included conversion to hemiarthroplasty (174 patients, or 1.5%), which was associated with an age of fifty to sixty-four years (hazard ratio = 2.8; p = 0.007). Overall, an age of sixty-five years or older, male sex, residence in an area with an income in the lowest two quintiles, and the presence of preexisting comorbidities were associated with elevated risks of short-term complications but not of intermediate-term conversion to arthroplasty. The ninety-day revision rate was 5.3%.


A combined systematic review and meta-analysis was performed to determine the effects of early versus delayed passive range of motion (PROM) of the shoulder on outcomes following arthroscopic rotator cuff repair. Twenty-eight studies (1729 repairs) were included. The first analysis of Level-1 studies did not reveal a significant difference in retear rates for early (13.7%) versus delayed (10.5%) PROM (p = 0.36). The second analysis revealed that, for tears of >5 cm, the risk of retear was lower for early versus delayed PROM for transosseous plus single-row anchor repairs (18.7% versus 28.2%; p = 0.002). For tears of >5 cm, the risk of retear was greater for early versus delayed PROM for double-row anchor repairs (56.4% versus 20%; p = 0.002) and for all repair methods combined (52.2% versus 22.6%; p = 0.01). There were no significant associations for tears measuring <1 cm, 1 to 3 cm, and 3 to 5 cm. The authors concluded that evidence is lacking with regard to the optimal timing of PROM after cuff repair; however, the findings suggest that tear size may be influential.


A systematic review of previous meta-analyses examined the outcomes of arthroscopic and open stabilization surgery for anterior shoulder instability. Eight meta-analyses met the inclusion and exclusion criteria. Both studies published prior to 2007 concluded that open stabilization resulted in lower recurrence rates than arthroscopic stabilization, the three studies published in 2007 were discordant, and all three studies published after 2008 concluded that open and arthroscopic stabilization resulted in equivalent results. This systematic review of overlapping meta-analyses comparing arthroscopic and open shoulder stabilization suggests that, according to current best available evidence, there are no notable differences in failure rates.


This meta-analysis of prospective randomized trials compared the effect of early versus delayed motion on the outcomes of arthroscopic rotator cuff repair. No differences were seen in postoperative ASES scores or the rate of tendon healing between the groups. Early motion resulted in slightly better forward-elevation range of motion but no difference was demonstrated in external rotation between the groups.


The aim of this study was to compare the efficacy of local injections administered in the glenohumeral joint, the subacromial space, or both locations after arthroscopic rotator cuff repair. One hundred and twenty-one consecutive patients who had undergone arthroscopic rotator cuff repair were enrolled and randomly allocated to the three groups. In group 1, forty patients received a postoperative glenohumeral injection of bupivacaine and lidocaine. In group 2, forty-two patients received the same postoperative injection, administered in the subacromial space. In group 3, thirty-nine patients received the same amount of local anesthesia, half injected in the glenohumeral joint and half in the subacromial space. Scores measured by a visual analog scale for pain were not significantly different among the groups at any time point. In addition, the amount of supplementary analgesic administered was not significantly different among the groups.