A delay in vastus medialis-obliquus activation in relation to vastus lateralis is a contributing factor in patellofemoral pain.

**Objective:** To study the vastus medialis obliquus (VMO)/vastus lateralis (VL) electromyographic (EMG) activity in functional weight bearing and its contribution to patellofemoral pain (PFP).

**Design:** Prospective cohort study.

**Participants/Methods:** 92 entry-level cadets into the Belgian Royal Military Academy underwent EMG recordings of the VMO, VL, and tibialis anterior in a standing rock back maneuver over a 10-repetition protocol. None of the cadets had a history of knee pain, and all demonstrated a normal knee examination prior to embarking on a rigorous 6-week basic military training, which consisted of running, drilling, shooting, tactical exercises, and hiking while carrying 20- to 30-kg backpacks. The cadets were then followed up for the onset of PFP in 2 of the following activities: jumping, squatting, using the stairs, or running. To be included in the patellofemoral-injured group, subjects must have also demonstrated a pain score of 3 on a 10-point scale on 2 of the following 4 clinical examinations: pain on patella compression in knee extension, retro-patellar discomfort to palpation, pain with resisted knee extension, and isometric quadriceps contraction with suprapatellar resistance. All cadets underwent similar EMG testing at the completion of their 6-week training program.

**Results:** Of the original 92 cadets, 13 developed other injuries and were not included in the final study group of 79. Of these 79 cadets, 32% developed PFP as defined above. These 26 cadets who developed PFP demonstrated a significant delay in VMO/VL EMG activity with training (1.67 milliseconds prior to training, 17.73 milliseconds after training). The remaining cadets without PFP demonstrated little change in VMO/VL activity (-4.86 milliseconds before and -1.69 milliseconds after training). Additionally, cadets who developed PFP demonstrated greater VMO/VL delay prior to training than cadets who did not. The relative risk of developing PFP could be calculated. The relative risk was 1.15 with a delayed onset of 5 seconds, 1.30 for a delay of 10 seconds, 1.62 for 20 seconds, and 2.07 for 35 seconds.

**Conclusions:** Delayed-onset VMO/VL EMG activity is a risk factor for developing PFP.

**Reviewer’s Comments:** This excellent study identifies delayed-onset VMO/VL EMG activity not only as an observation in PFP but also as a risk factor for developing PFP in previously healthy patients. The next step after identifying patients at risk is employing a treatment intervention to correct the abnormalities and reduce the risk of developing symptoms. Rather than screening all patients, one could employ a training strategy to improve the VMO/VL EMG activity and reduce training injuries. (Reviewer-John H. Wilckens, MD).

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Keywords: Patellofemoral Pain

Print Tag: Refer to original journal article
Osteochondritis dissecans treated prior to skeletal maturity carries an increased prognosis of healing.

**Background:** Osteochondritis continues to perplex surgeons. Clearly, if diagnosed early, osteochondritis dissecans (OCD) lesions identified before skeletal maturity have the best prognosis of healing, even with nonoperative treatment. Adult (after skeletal maturity) OCD usually represents a failed juvenile OCD that presented or was diagnosed late; it tends to be more unstable and is less amenable to nonoperative treatment. Symptomatic lesions approaching skeletal maturity should also be considered for early surgical intervention.

**Objective:** To review the surgical treatment options of OCD.

**Design:** Literature review. **Reparative Techniques - Drilling:** Drilling antegrade of the lesion encourages lesion healing by establishing vascular channels. Retrograde drilling, although technically more difficult and requiring a drill-targeting system such as an anterior cruciate ligament guide, eliminates puncturing the articular surface of the lesion. Drilling is best done on stable lesions that have failed conservative treatment and are approaching skeletal maturity, with 80% good or excellent results in adolescents. **Internal Fixation:** This technique is used for higher-grade lesions that are unstable or for flaps and loose fragments. It is important to debride the fibrous tissue from both sides of the lesion and drill the base to establish a blood supply. The internal fixation device can be metal or an absorbable composite. It is important to recess the fixation to prevent damage to the juxtaposed articular surface. Although bioabsorbable fixation obviates the need for a second surgery to remove the fixation, a second look allows one to visualize healing and to be sure the fixation is not prominent secondary to fragment settling. **Restorative Techniques:** Once the fragment is irreplaceable, several strategies can be used to stimulate a hyaline-like cartilage replacement. Microfracture and abrasion chondroplasty are designed to stimulate subchondral flow of pluripotent marrow stem cells. This technique is best in smaller lesion (<2 to 3 cm²) and requires 6 weeks of non-weight bearing. Osteochondral autograft and allograft transplantation brings a composite bone and cartilage plug to the OCD lesion. Autografts are limited by donor site morbidity. Allografts are best suited for large and deep lesions. **Autologous Chondrocyte Implantation:** This requires host cartilage harvesting and culturing, with a second operation to implant the cultured chondrocytes under a periosteal patch. This can be used for large and multiple lesions. At 4-year follow-up, the success rate is 76%.

**Conclusions:** While many techniques exist for treating OCD lesions, a timely diagnosis with appropriate treatment before skeletal maturity ensures the best prognosis.

**Reviewer's Comments:** This is a very balanced review article from an experienced cartilage center. The authors provide a simple algorithm for the treatment of OCD. Re-establishing the joint surface, maximizing the healing environment, and using rigid-enough fixation to allow early range of motion is essential to all treatment strategies. (Reviewer-John H. Wilckens, MD).
Immobilizing Shoulder Dislocation--How Long?

How Long Should Acute Anterior Dislocations of the Shoulder Be Immobilized in External Rotation?

Scheibel M, Kuke A, et al:


A 3-week immobilization of the shoulder in 30° of external rotation after a primary anterior dislocation shows similar glenoid-labrum coaptation as shoulders similarly immobilized 5 weeks.

**Objective:** To determine if immobilization for 3 or 5 weeks in 30° of external rotation results in better Bankart lesion coaptation.

**Design:** Cohort study.

**Participants/Methods:** 22 patients met the study criteria, which included a primary traumatic anterior dislocation with a Hill-Sachs lesion, without associated rotator cuff injury, fracture, or neurologic injury. In the initial group, 11 patients (9 men, 2 women) with an average age of 37.4 years (range, 23 to 54 years) were immobilized in an ultra-sling in 30° of external rotation for 3 weeks. The second group of 11 patients (9 men, 2 women) underwent similar immobilization for 5 weeks. Their average age was 29.7 years (range, 19 to 43 years). MRI with a shoulder coil was performed within 3 days of injury and at 3 and 5 weeks after initiation of treatment. The shoulder was scanned in internal rotation, neutral rotation, 30° of external rotation, and maximum external rotation at 3 time periods. Anterior joint effusion and displacement and separation of the anterior-inferior labrum from the glenoid were measured at each position at each time frame.

**Results:** With external rotation, particularly full external rotation, the anterior joint effusion was less (as was the separation and displacement of the Bankart lesion) than with neutral and internal rotation. This occurred in both groups at all time periods, at 3 days, and after 3 and 5 weeks. Between 3 days and 3 weeks, measurements in internal and neutral rotation decreased, whereas no significant difference was noted in 30° and maximum external rotation. Between 3 and 5 weeks, both groups demonstrated decreased measurements in internal, neutral, and 30° and maximum external rotation.

**Conclusions:** Immobilization of the shoulder in 30° of external rotation for 5 weeks showed no significant improvement in MRI displacement over shoulders similarly immobilized for 3 weeks.

**Reviewer's Comments:** This study provides provocative information showing the superior coaptation of the Bankart lesion in acute anterior shoulder dislocations immobilized in external rotation. External rotation tightens the anterior structures (reducing the Bankart lesion) and pushes the effusion posteriorly. The authors demonstrate this graphically by MRI. While maximum external rotation provided the best reduction, it is hardly practical. Immobilization for 3 weeks had similar results to those immobilized 5 weeks. Overall, these study group patients were relatively older than most other patient groups with anterior shoulder dislocation. Three weeks of immobilization at age >25 years may be adequate, but is it adequate for patients <25 years of age? The optimum amount of external rotation for immobilization still needs to be determined. Clearly, the use of a traditional sling is the worst. (Reviewer-John H. Wilckens, MD).

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Keywords: Shoulder Dislocation, Immobilization, External Rotation

Print Tag: Refer to original journal article
Objective: To compare the clinical results of debridement versus repair of type II superior labral anterior posterior (SLAP) tears in patients undergoing arthroscopic rotator cuff tear repair.

Design: Cohort study.

Methods: A prospective group of patients >45 years of age with a rotator cuff tear and a type II SLAP tear formed the study group. All pathology was confirmed by arthroscopic evaluation. Patients who had received cortisone injections to the shoulder or who had adhesive capsulitis or other associated shoulder pathology were disqualified. At the time of surgery, this group was randomized to either a SLAP debridement or SLAP repair along with concomitant arthroscopic supraspinatus rotator cuff repair. Outcome measures included Tegner scores, UCLA scores, and clinical examination. All patients underwent the same standard postoperative rehabilitation protocol.

Results: 24 patients were randomized into each group, debridement versus repair. Each group had similar demographic data as related to age and injured shoulder dominance, and had very similar preoperative Tegner and UCLA scores. Four patients from the debridement group and 6 patients from the repair group were lost to latest follow-up at 2 years. All patients undergoing rotator cuff repair and SLAP surgery had improved function over preoperative assessment. Patients undergoing SLAP debridement had significantly better functional scores (5.5 vs 3.8), pain relief (9.6 vs 7.7), and overall UCLA score (34 vs 31) than did patients with their SLAP repaired. At latest follow-up, the SLAP debridement group had significantly improved internal rotation and external rotation than did the repair group.

Conclusions: SLAP debridement yielded better clinical results than SLAP repair in older patients undergoing concomitant arthroscopic rotator cuff repair.

Reviewer's Comments: This is a well-written study with valuable clinical information. Type II SLAP tears are not infrequently encountered during rotator cuff repair. If the patient is aged >45 years, SLAP debridement provides better function, range of motion, and pain relief. Biceps tenotomy may have similar results to debridement but does create a cosmetic "Popeye sign" in addition to some weakness. Does not treating the SLAP tear during rotator cuff surgery have any consequence? While arthroscopic debridement appears to have no downside, a significant number of rotator cuff tears are still repaired via traditional open techniques, and a type II SLAP tear may not be recognized by preoperative MRI assessment. Finally, is there any indication to fix type II SLAP tears in any patient >45 years of age? (Reviewer-John H. Wilckens, MD).

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Keywords: Rotator Cuff Tears, SLAP Tears

Print Tag: Refer to original journal article
Inflammatory Markers Elevated in Periprosthetic Fractures

Inflammatory Laboratory Markers in Periprosthetic Hip Fractures.
J Arthroplasty 2009; 24 (August): 722-727

Patients with periprosthetic femur fractures may have elevated inflammatory markers, including ESR and CRP.

Background: Periprosthetic fractures around a hip arthroplasty are an increasingly common problem considering the prevalence of hip arthroplasty. The possibility of a deep prosthetic joint infection should be considered when a patient with a prosthetic joint presents with acute onset of pain. One common method of assessing the likelihood of a concurrent deep prosthetic joint infection is by measuring inflammatory laboratory values, such as the white blood cell (WBC) count, erythrocyte sedimentation rate (ESR), and C-reactive protein (CRP). These laboratory tests are not necessarily specific for prosthetic joint infection.

Objective: To determine the prevalence of increased inflammatory laboratory values in patients with periprosthetic fractures, and to correlate these results with intraoperative findings and culture results.

Methods: Periprosthetic hip fracture data from a single institutional database was gathered to determine the prevalence of increased serologic inflammatory markers in the setting of periprosthetic hip fractures and the positive predictive value of these increased values in predicting deep joint infection in the setting of periprosthetic fracture. The authors identified 204 patients who had received surgical treatment of a periprosthetic hip arthroplasty fracture. They categorized femoral fractures according to the Vancouver classification. For each patient, WBC with differential analysis, ESR, and CRP were obtained.

Results: True infection was diagnosed in 21 cases (11%) of the 204 fractures. Aspiration was performed in 41 cases. Results were positive in 2 (4.8%) of the 41 cases (surgical cultures were also positive for these 2 patients). CRP level was elevated in 83% of these patients, 50% had an elevated ESR, and 23% had an elevated WBC count. For the noninfected patients, 43% had an elevated CRP level, 30% had an elevated ESR, and 15% had an elevated WBC count. In 29 cases (14%), patients with periprosthetic hip fractures without joint infection had another inflammatory process that may explain the increase of these laboratory values. The most common finding in these patients was urinary tract infection (41%) and rheumatoid arthritis (24%). In patients tested with all 3 markers (CRP, ESR, and WBC) and in whom all 3 markers were positive, the specificity was 94%.

Conclusions: Increased inflammatory laboratory values in patients with periprosthetic fractures are not an indication for additional testing such as hip aspiration or WBC scan unless clinically indicated.

Reviewer's Comments: This interesting study can provide surgeons some guidance as to the management of periprosthetic hip fractures. Often the clinical picture is cloudy with elevations in both the ESR and CRP. This study can give us some confidence to take the patient to surgery without further unnecessary and often expensive testing, which inevitably delays appropriate care. (Reviewer-Kris J. Alden, MD, PhD).

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Keywords: Periprosthetic Hip Fracture, Inflammatory Markers

Print Tag: Refer to original journal article
Uncontrolled diabetes mellitus increases the risk of perioperative complications following elective joint arthroplasty.

**Background:** Arthritis and diabetes mellitus affect approximately 46 million and 20 million people in the United States, respectively, and it is estimated that 52% of patients with diabetes mellitus have some form of arthritis. As the prevalence of diabetes mellitus increases, the number of diabetic patients who undergo total hip and knee arthroplasty should increase accordingly. In general, it is believed that patients with diabetes are at increased risk for adverse events following arthroplasty.

**Objective:** To determine if preoperative glycemic control affects the prevalence of perioperative complications following lower extremity joint arthroplasty.

**Methods:** From 1988 to 2005, the Nationwide Inpatient Sample recorded >1 million patients who underwent joint replacement surgery. This study compared patients with uncontrolled diabetes mellitus (3973), those with controlled diabetes mellitus (105,485), and those without diabetes mellitus (920,555) with regard to common surgical and systemic complications, mortality, and hospital course alterations. Additional stratification compared the effects of glucose control among patients with type I and type II diabetes. Glycemic control was determined by physician assessments on the basis of the American Diabetes Association guidelines with the use of a combination of patient self-monitoring of blood glucose levels, hemoglobin A1c level, and related comorbidities.

**Results:** Compared to patients with controlled diabetes mellitus, patients with uncontrolled diabetes mellitus had a significantly increased odds of stroke (OR, 3.42), urinary tract infection (OR, 1.97), ileus (OR, 2.47), postoperative hemorrhage (OR, 1.99), transfusion (OR, 1.19), wound infection (OR, 2.28), and death (OR, 3.23). Patients with uncontrolled diabetes mellitus had a significantly increased length of stay (almost a full day) compared to patients with controlled diabetes ($P<0.0001$). All patients with diabetes had significantly increased inflation-adjusted postoperative charges compared to nondiabetic patients ($P<0.0001$).

**Conclusions:** Regardless of diabetes type, patients with uncontrolled diabetes mellitus exhibited a significantly increased risk of surgical and systemic complications, higher mortality, and increased length of stay during the index hospitalization following lower extremity total joint arthroplasty.

**Reviewer's Comments:** This interesting and well-done study confirms much of the anecdotal data in the orthopaedic community. Diabetic patients, in general, are sicker and have many of the systemic comorbidities that lend to the increased complication rates observed in this study. It is nice to have concrete data to share with our internal medicine colleagues to promote stricter glycemic control and promote overall well-being. (Reviewer-Kris J. Alden, MD, PhD).

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Keywords: Joint Replacement, Diabetes, Glycemic Control

Print Tag: Refer to original journal article
Can NBA Players Rebound After ACL Reconstruction?

Performance Outcomes of Anterior Cruciate Ligament Reconstruction in the National Basketball Association.

Busfield BT, Kharrazi FD, et al:

Arthroscopy 2009; 25 (August): 825-830

According to this study, 78% of NBA athletes undergoing ACL reconstruction were able to return to the NBA. Of these, 44% had a decrease in their performance.

Background: There are very few data on outcomes after anterior cruciate ligament (ACL) reconstruction in elite basketball players.

Objective: To assess the rate of return to play to the National Basketball Association (NBA) following ACL reconstruction, and to assess the influence on performance. The authors hypothesized that there would be a high rate of return to the NBA following reconstruction, and that the players who returned would have worse performance.

Design: Therapeutic case series (Level of Evidence, IV).

Methods: The NBA Trainers Association database was used to assess ACL injuries between 1994 and 2006. The authors also used the player efficiency rating (PER) of each subject to assess performance. The PER evaluates a variety of performance parameters and is calculated by adding positive measures and subtracting negative measures. It is a well-established measure of basketball performance. Injured players were compared with a control group of noninjured players who had similar demographics.

Results: A total of 31 players (of 1144 in the database) sustained 32 ACL injuries; 4 players were excluded for a variety of reasons. Of the 27 athletes evaluated, 21 (78%) returned to the NBA, while 6 (22%) did not. Of the 19 players who had an isolated ACL rupture, 16 (84%) returned. Of the 8 players with additional pathology, 5 (62%) returned. The players who returned to the NBA did so at an average of 325 days (range, 204 to 466 days) and played for an average of 4 seasons. Overall, there was a nonsignificant decline in the PER in the cohort from preinjury to post-ACL reconstruction. No difference was found in the PER between the injured players and the control group. Twelve players (44%) had a decline of >1 point in the PER, while the rest had either an improvement or minimal loss.

Conclusions: 78% of NBA athletes undergoing ACL reconstruction were able to return to the NBA. Of these, 44% had a decrease in their performance.

Reviewer's Comments: This article highlights the fact that >20% of elite basketball players did not return to the NBA. This corresponds to a study of National Football League (NFL) athletes cited by the authors, in which 21% of NFL athletes did not return. This is higher than I would have expected, given the predictable results seen in the literature. I was also struck by the relatively long time to return to competitive sports, nearly 1 year in this cohort. (Reviewer-Nathaniel P. Cohen, MD).

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Keywords: Anterior Cruciate Ligament, Basketball

Print Tag: Refer to original journal article
Can Microfracture Treat Chondral Lesions of Shoulder?

Outcomes of Full-Thickness Articular Cartilage Injuries of the Shoulder Treated With Microfracture.

Millett PJ, Huffard BH, et al:

Arthroscopy 2009; 25 (August): 856-863

Microfracture can provide improvements in pain and function for cartilage lesions of the glenohumeral joint.

Objective: To determine if "microfracture provides pain relief and relieves shoulder function in patients with chondral defects of the glenohumeral joint."

Methods: Patients were selected if they had undergone microfracture of the shoulder and had a minimum of 2 years of follow-up; 30 patients (31 shoulders) were evaluated by questionnaire. Patients underwent a variety of procedures in addition to the microfracture. The authors performed microfracture on grade IV articular cartilage lesions, unstable lesions with intact subchondral bone, and focal degenerative lesions. They did not microfracture partial-thickness lesions or Hill-Sachs lesions. The authors' technique is similar to that of previously described microfracture for the knee. Patients' preoperative and postoperative American Shoulder and Elbow Surgeons (ASES) scores were calculated, as were satisfaction, return to pre-injury level of sports, and ability to use the arm overhead without pain.

Results: 25 men and 5 women (average age, 45.5 years) formed the study group. Patients were followed up for an average of 45 months. Six patients had microfracture of both the glenoid and humeral head, 12 underwent microfracture of the humeral head alone, and 13 underwent microfracture of the glenoid alone. Six shoulders (19%) progressed to further surgery; these patients' scores were not included in the final follow-up scores. Three patients underwent total shoulder replacements; these were classified as true failures according to the authors. At final follow-up, patients had an improvement in the ASES score, as well as the ability to perform work, sports, activities of daily living, and painless overhead activity. Prior surgery and treatment of >2 other concomitant procedures were associated with a worse outcome. Lesion size and ASES scores were negatively correlated. The largest improvement in ASES score was seen with humeral head microfracture alone (25). Glenoid microfracture alone was associated with a 17-point improvement in ASES score, while glenoid and humeral head microfracture was associated with an improvement of 19 points.

Conclusions: Microfracture provided improvements in pain and function in >80% of patients in this study. Humeral head microfracture had the best improvement in ASES scores. Size of the lesion was negatively correlated with ASES score.

Reviewer's Comments: This article seems to show that a majority of patients with chondral lesions may benefit from this treatment. However, the retrospective nature of the study and the combination of pathologies treated lessen the strength of the conclusions. Nevertheless, this may be a good first-line treatment for isolated chondral lesions or those seen incidentally at surgery. (Reviewer-Nathaniel P. Cohen, MD).

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Keywords: Articular Cartilage, Glenohumeral Joint

Print Tag: Refer to original journal article
In single-level posterolateral lumbar fusion, rhBMP-2 combined with carrier produces better clinical results than iliac crest autograft.

**Background:** Recombinant human bone morphogenetic protein-2 (rhBMP-2) has previously been shown to improve bony fusion in many situations. It has proven to be superior to autograft in anterior lumbar interbody fusion. It has also been shown to be effective for posterolateral lumbar fusion, but has not been previously compared to the gold-standard method of iliac crest autograft.

**Objective:** To compare rhBMP-2 combined with compression-resistant carrier to iliac crest autograft in posterolateral fusion of a single lumbar level with pedicle screws and rods instrumentation.

**Design:** Prospective, randomized, controlled multicenter study (Level of Evidence, I).

**Participants/Methods:** 463 patients needing a single-level posterolateral lumbar fusion with instrumentation were randomized into 2 equal groups. The first group received rhBMP-2 in compression-resistant matrix of collagen and hydroxyapatite (AMPLIFY rhBMP-2 Matrix, Medtronic Sofamor Danek). The second group received iliac crest autograft harvested through a separate fascial incision. Inclusion criteria were failure of nonoperative care for at least 6 months and evidence of instability and/or spondylosis in the lumbar spine at a single level between L2 and S1. Patients with more than grade 1 spondylolisthesis, history of arthrodesis, preoperative Oswestry Disability Index (ODI) <30, or any factors that could compromise success of fusion were excluded. All patients were seen and clinical data collected preoperatively and at 6 weeks and 3, 6, 12, and 24 months' postoperatively. Statistical analysis was performed on an as-treated basis.

**Results:** The rhBMP-2 group had shorter operative time by an average of 24 minutes, lower blood loss by approximately 100 mL, and no difference in intraoperative complications or length of stay. There were significant improvements in ODI, SF-36, and back and leg pain scores in both cohorts without a significant difference between groups. Sixty percent of patients with the iliac crest autograft had persistent donor site pain at 24 months. Radiographic evidence of fusion was present in significantly more patients in the rhBMP-2 group than in the iliac crest autograft group (96% and 89%, respectively). The latter cohort also had a significantly higher reoperation rate.

**Conclusions:** The use of rhBMP-2 in compression-resistant matrix instead of iliac crest autograft in single-level posterolateral lumbar fusion leads to similar clinical outcomes with higher rates of fusion at 2 years. This is a good option that spares the patient donor site morbidity.

**Reviewer's Comments:** This was a very well-designed study. The authors succeeded at demonstrating clinical efficacy of rhBMP-2 in posterolateral fusion. The reader should keep in mind, however, that the study was sponsored by Medtronic. The additional costs of using their product were not mentioned, and the results apply only to single-level surgery. Despite these limitations, this is another study demonstrating the clinical efficacy of rhBMP-2, sparing patients the donor site morbidity. (Reviewer-Vladimir Sinkov, MD).

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**Keywords:** rhBMP-2, Iliac Crest Autograft, Posterolateral Lumbar Fusion
The use of bone morphogenetic protein was approved for use in anterior lumbar surgery in the United States in 2002. Since then, its use has spread to other indications.

**Objective:** To characterize the use of bone morphogenetic proteins (BMPs) and their complications in spinal fusion surgery over the past 5 years.

**Methods:** The authors, who are neurosurgeons in Boston, used the National Inpatient Sample (NIS) database to evaluate trends in BMP use over a 5-year period from 2002 to 2006. The NIS is a random sample of community hospitals, which represents about 20% of discharges in the United States. Demographic information was collected and used to study factors associated with its use as well as complications. Nearly 330,000 fusion procedures were evaluated during this period. Patient characteristics were the dependent variable.

**Results:** BMP use increased steadily during the years studied, going from <1% during the year it was introduced (2002) to nearly 25% of U.S. spinal fusions by the time of this trial. The use of BMP was slightly but significantly higher in revision cases and in women. Its use was lower in teaching hospitals. It was also associated with minor geographic variation in use. The utilization was higher in the western region of the country. The use of BMP was highest in lumbosacral fusions. The risk of complications was highest in the cervical region. The FDA reported some cases of neck swelling and respiratory complications in cervical cases beginning in 2006, the last year of the catchment period. Although the overall incidence of wound complications was higher in the lumbosacral spine, the risk of incisional swelling was more significantly increased by the addition of BMP in the cervical spine.

**Conclusions:** BMP use has increased significantly in the 5 years since it was introduced, and is now used in >20% of spinal fusions. The authors stress that even though charges may have been higher with BMP, charges do not equal reimbursement. The risk of neck swelling and dysphagia is significantly greater in cases using BMP, and procedures should be developed to monitor for this.

**Reviewer’s Comments:** The press will certainly focus on the rapid adoption of BMP for spinal fusion. However, it is clearly a unique product that surgeons and patients had been hoping for in the decades since the era of Marshall Urist. The demand was there from the start, so to speak. I believe there is no “right size” number for the ideal rate of BMP usage. If we can save patients the morbidity of a graft harvest and increase their fusion rate, it may be cost effective. A longer-term study is needed to look at the entire number of episodes of care, so that the need for reoperation can be tracked. The widespread use may stem from the desire of the surgeon to produce the best outcome. (Reviewer-Paul D. Sponseller, MS, MD).

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Keywords: Spinal Fusion, Bone Morphogenetic Proteins

Print Tag: Refer to original journal article
Surgical site infections are a topic of increasing importance and interest as more implants are used and as payment for caring for this complication is threatened.

**Objective:** To determine if the use of local gentamicin is superior to systemic cefazolin, and whether local cefazolin has the same effect as systemic cefazolin or local gentamicin.

**Design:** Bench study.

**Methods:** A previously used infection model employing an implant was used. A lateral approach to the femur of mature rats was performed, and a cerclage of 30-gauge wire was performed to simulate an implant. The rats were inoculated with *Staphylococcus aureus*, and the incision was closed. Six different treatment groups were used: no antibiotics, systemic cefazolin, local gentamicin, local cefazolin, systemic cefazolin plus local gentamicin, and systemic cefazolin plus local cefazolin. The systemic antibiotics were given by IM injection at doses calculated to resemble human prophylactic doses. The local antibiotics were injected into the surgical site after the wound had been closed. The animals were sacrificed 48 hours later, and colony counts of staphylococcus were analyzed for each group.

**Results:** All animals survived to the follow-up period. All but 1 of the rats with local gentamicin and systemic cefazolin had no colonies of staph growing. The local gentamicin decreased the infection rate by over 5 orders of magnitude compared with no treatment, and by 2 orders of magnitude compared with systemic cephalosporin. The use of local gentamicin decreased the infection rate by 4 orders of magnitude compared to systemic cefazolin. No statistically significant difference was found between the local and systemic cefazolin group.

**Conclusions:** The authors report that studies have shown that both local gentamicin and cefazolin have had cytotoxic effects locally above certain concentrations. The dose of these antibiotics used locally in this study was calculated to be below this threshold, based on the volume of the wound. Further reassuring, the authors state, is the rapid drop in local antibiotic concentration of >100-fold over 24 hours when injected locally. The authors state that this usage will need to be evaluated in humans.

**Reviewer's Comments:** This was a clinically relevant study. Many surgeons use antibiotics as an irrigant, but this is diluted and little is left at wound closure. Investigators from the AI duPont institute have already shown that local antibiotics in bone graft can lower the high infection rates seen in Cerebral Palsy scoliosis surgery. The antibiotic used here had no carrier. Injecting antibiotic into a surgical wound closed in a single layer does not replicate the layered nature of human surgical wounds. Delivery methods may need to be developed if this avenue proves useful. It will also need to be shown that osseous objectives of surgery are not affected by local antibiotics, so dosage estimation will be important. (Reviewer-Paul D. Sponseller, MS, MD).

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Keywords: Surgical Site Infection, Prophylaxis, Antibiotics

Print Tag: Refer to original journal article
Multiple hereditary exostoses are one of the most common disorders seen in orthopaedic offices by upper and lower extremity and tumor and pediatric specialists.

**Objective:** To determine the prevalence and significance of exostoses within the spinal canal.

**Participants/Methods:** All patients with multiple hereditary exostoses seen at the Shriner's Hospital in Salt Lake City, Utah, over a 2-year period were asked to enroll in the study. Participants were between 4 and 19 years of age. Patients were asked to undergo a spinal MRI, or if they were not able to be sedated, they were asked to undergo a CT scan. These were correlated with plain radiographs when available. Neurologic evaluation was correlated as well. Lesions were rated as encroaching, nonencroaching, or absent. Encroaching meant that the lesion extended into the spinal canal.

**Results:** 44 patients (mean age, 12 years) were studied. Males predominated (26 males to 18 females), and 68% had an osteochondroma arising from some of the spinal elements. Twelve patients (27%) had a lesion of the spinal column that encroached into the spinal canal. Eight arose from the laminae and 4 arose from the vertebral body. The cervical spine was the most common area involved. Two patients had multiple lesions encroaching into the spinal canal. Of the 12 patients, 5 had plain radiographs that did not suggest any lesion in the area. Males were significantly more likely than females to have encroaching spinal lesions. Six of the patients underwent surgical excision of the lesions.

**Conclusions:** The authors point out, that from a review of the literature, others have reported sudden neurologic compromise from multiple hereditary exostoses (MHE). They report that EXT1 mutations produce the most significant clinical phenotype of MHE. However, they were not able to predict spinal encroachment from other physical features and did not do genotypes. They mention that neurologic compromise can occur acutely with little or no prior clinical clues, based upon the 3 patients they encountered. Spinal encroachment could occur as early as age 5 years. However, MRI is the best study for demonstrating the lesions, and this is not easy for all patients in the early years, and, therefore, it may require general anesthesia.

**Reviewer's Comments:** This is a thought-provoking article because of the commonness of the MHE condition and the seriousness of the findings they report. I have not encountered any neurologic compromise in 23 years of practice. The surgery to remove the lesions is not without risk, either. I was in the audience when this paper was first presented. Many in the audience felt that it did not equate with their experience, either. However, the argument raised by these authors is persuasive because of the dramatic images and the seriousness of the sequelae. I think it would be best to take their advice and image patients with MHE at least once during their growing years until further multicenter studies either confirm or refute the findings. (Reviewer-Paul D. Sponseller, MS, MD).

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Keywords: Multiple Hereditary Exostoses, Spine

Print Tag: Refer to original journal article
While stronger than braided polyester sutures, newer sutures containing ultra-high molecular weight polyethylene have a greater tendency to slip.

**Background:** There is concern over frequent slipping of arthroscopic knots tied with newer high-strength sutures.

**Objective:** To compare the biomechanical performance during cyclic loading and destructive testing of several different sutures by evaluating knot security and load to failure strength using different arthroscopic knots.

**Methods:** 8 different No. 2 sutures (Ethibond [Ethicon, Somerville, NJ], Orthocord [DePuy-Mitek, Norwood, MA], ForceFiber [Stryker Endoscopy, San Jose, CA], Hi-Fi [ConMed Linvatec, Largo, FL], FiberWire [Arthrex, Naples, FL], Ultrabraid [Smith & Nephew, Andover, MA], MagnumWire [ArthroCare, Sunnyvale, CA], and MaxBraid PE [Arthrotek, Warsaw, IN]) were arthroscopically tied into standardized loops using 6 different knots (Weston, Tennessee slider, SMC, San Diego knot, Duncan, SMC, and Revo) 10 times each. Each sliding knot was backed up by 4 reversed half-hitches over reversed posts. The suture loops, which were pretensioned to 10N, were cycled between 10N and 45N for 1,000 cycles and loaded to failure. The authors record the failure load for each suture, each knot, and slippage trend during cyclic loading. Elongation of the construct by ≥3 mm after the initial preload length was identified was considered failure.

**Results:** Mean knot failure loads ranged from 150N to 280N. The Revo and SMC knots were stronger than the Tennessee slider and San Diego knots, which were stronger than the Weston knot, which was stronger than the Duncan loop (P <0.05). This pattern also coincided with the loads at which these knots slipped. Duncan loops (97.5%) and Weston knots (86.3%) slipped more than other knots (P <0.001), while the SMC and Revo knots slipped the least. Statistically significant differences were found between suture types with Ethibond showing a significantly lower load to failure than all other suture materials (P <0.05). Compared with all of the other suture types, FiberWire showed statistically higher failure loads (P <0.05). The remaining high-strength suture materials clustered in between with overlap between the groups and no significant differences were revealed. Ethibond sutures were the least likely to slip.

**Conclusions:** While stronger than braided polyester sutures, newer sutures that contain ultra-high molecular weight polyethylene have a greater tendency to slip. The Duncan loop and Weston knot were more likely to slip than all other knots tested, and caution should be exercised when tying them with these high-strength sutures. The Revo, Tennessee slider, San Diego, and SMC knots were the least likely to slip.

**Reviewer's Comments:** As the authors note, the limitations of this study were that the loads were applied to isolated knotted sutures without anchors or attachment to bone or tendon. The weakest point of the in vivo construct is the tendon-suture interface. In addition, this study does not determine how strong a suture needs to be in order to be "strong enough." (Reviewer-Adam J. Farber, MD).

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Keywords: Arthroscopic Knots, High Strength Sutures, Biomechanics

Print Tag: Refer to original journal article
Does Increasing Severity of Ankle Fx Increase Risk of Chondral Injury?

Arthroscopically Detected Intra-Articular Lesions Associated With Acute Ankle Fractures.

Leontaritis N, Hinojosa L, Panchbhavi VK:


We need prospective studies with more detailed analysis of the intra-articular chondral lesions associated with ankle fracture before prognostic relevance and strategies of treatment can be established.

**Background:** Intra-articular chondral lesions are frequently found in association with acute ankle fractures. The frequency or severity of chondral injury has not been correlated with the severity of ankle fracture.

**Objective:** To determine if the severity of an acute ankle fracture, as classified with the Lauge-Hansen criteria, correlates with the severity of arthroscopically detected intra-articular chondral lesions.

**Participants/Methods:** The authors conducted a retrospective review of the medical records pertaining to 283 ankle fractures. All patients included in the study underwent ankle arthroscopy prior to being treated with open reduction and internal fixation. Each patient was assigned a Lauge-Hansen classification on the basis of preoperative radiographs and/or the operative report and arthroscopy photographs.

**Results:** Of the 283 patients, 84 (44 females and 40 males) met our inclusion criteria. Fifteen percent of the fractures were pronation-external rotation type I, 1% were pronation-external rotation type II, 20% were pronation-external rotation type IV, 1% were supination-adduction fractures, 5% were supination-external rotation type I, 11% were supination-external rotation type II, and 46% were supination-external rotation type IV. Chondral lesions were found in 61 of 84 ankle fractures (73%); 61% had lesions involving the talar dome, 6% had lesions involving the tibial plafond, and 12% had lesions of the articular surface of the medial and/or lateral malleolus. Of 17 fractures graded as pronation-external rotation or supination-external rotation type I according to the Lauge-Hansen classification, 15 were associated with 1 or no chondral lesion and 2 were associated with ≥2 chondral lesions. Of 10 fractures graded as pronation-external rotation or supination-external rotation type II, 9 were associated with 1 or no chondral lesion and 1 was associated with ≥2 chondral lesions. Of 56 fractures graded as pronation-external rotation or supination-external rotation type IV, 27 were associated with 1 or no chondral lesion and 29 with ≥2 chondral lesions. Type-IV fractures were associated with the highest frequency of loose bodies and the highest frequency of chondral lesions in the anterior, posterior, lateral, and medial aspects of the talar dome. Type-IV pronation-external rotation and supination-external rotation ankle fractures were more likely to be associated with ≥2 chondral lesions than type-I fractures (OR, 8.1; 95% CI, 1.7 to 81.5; \( P =0.0044 \)) or type-II fractures (OR, 9.7; 95% CI, 1.1 to 81.5; \( P =0.0172 \)).

**Conclusions:** This retrospective study demonstrated that the number of intra-articular chondral lesions associated with the more severe ankle fracture patterns (pronation-external rotation and supination-external rotation type IV fractures) was greater than the number associated with the less severe ankle fracture patterns.

**Reviewer's Comments:** This study is limited by its retrospective nature. Prospective studies with more detailed analysis of the intra-articular chondral lesions associated with ankle fractures are necessary before treatment strategies and prognostic relevance can be established. (Reviewer-Adam J. Farber, MD).

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Keywords: Ankle Fracture, Ankle Arthroscopy, Chondral injury

Print Tag: Refer to original journal article
Adjunctive Hyaluronic Acid Holds Promise in Tx of Chondral Injuries

The Efficacy of Intra-Articular Hyaluronan Injection After the Microfracture Technique for the Treatment of Articular Cartilage Lesions.

Strauss E, Schachter A, et al:


In the rabbit chondral defect model, analysis of specimens in which microfracture is augmented with intra-articular hyaluronic acid shows a positive effect on the repair tissue in the defect without having an adverse effect on the surrounding cartilage.

**Background:** Recent animal studies have demonstrated chondroprotective and anti-inflammatory properties of hyaluronic acid viscosupplementation.

**Objective:** To evaluate the impact of hyaluronic acid viscosupplementation on the quality of repair tissue after microfracture in a rabbit chondral defect model.

**Design:** Controlled laboratory study.

**Methods:** A 3.0-mm full-thickness cartilage defect was created in the center of the medial femoral condyle in 36 rabbits. The defects were then treated with surgical microfracture. Eighteen rabbits formed the 3-month cohort and the other 18 formed the 6-month cohort. Within each cohort, 6 rabbits were randomly assigned to receive 3 weekly injections of hyaluronic acid (group A), 5 weekly injections (group B), or control injections of saline (group C). At 3 and 6 months postmicrofracture, the animals were sacrificed and the operative knee harvested. Repair tissue was assessed grossly, using a modified component of the International Cartilage Repair Society (ICRS) Cartilage Repair Assessment scoring scale, and histologically, using the modified O'Driscoll histological cartilage scoring system. The overall appearance of the repair tissue, cell shape, the extent of defect filling, and the integration with the defect edges were noted. Comparisons were made with respect to gross and histologic findings between treatment groups at each time point and between time points.

**Results:** At 3 months, gross and histologic evaluation of the repair tissue showed that the 3-injection group had significantly better fill of the defects and more normal appearing, hyaline-like tissue than did the controls (mean ICRS score of 1.92 vs 1.26; P <0.05 and mean modified O'Driscoll score of 10.3 vs 7.6; P <0.02). The greatest difference in appearance between the groups was the significant reduction in fissures in the repair surface. Use of 5-weekly injections did not show the specimens to be significantly improved when compared with controls. By 6 months, the histologic scores and the mean gross appearance among the 3-specimen cohorts were not significantly different. However, when the entire operative knee was examined, there was a significantly greater extent of degenerative changes (synovial inflammation and osteophyte formation) in the control group than in both hyaluronic acid treatment groups (P <0.05).

**Conclusions:** Using 3 weekly injections of intra-articular hyaluronic acid to supplement the microfracture technique had a positive effect on the repair tissue that formed within the chondral defect at the 3-month follow-up time point, but this improvement did not last to the 6-month follow-up. In addition, hyaluronic acid supplementation had a possible chondroprotective and anti-inflammatory effect, which limited development of degenerative changes within the knee joint.

**Reviewer’s Comments:** It is unclear why the 5-injection group had worse results than the 3-injection group. Furthermore, the lack of durability of the results is a concern. Nevertheless, the adjunctive use of hyaluronic acid appears to hold promise in the treatment of chondral injuries and warrants further investigation.

(Reviewer-Adam J. Farber, MD).

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Keywords: Articular Cartilage Lesions, Intra-Articular Hyaluronic Acid Injections

Print Tag: Refer to original journal article
Viable Tx Alternative for Patients With Failed Anterior Shoulder Reconstructions

Background: Recurrent instability after surgical stabilization of the shoulder is uncommon. Although results of open revision stabilization procedures have been reported, few studies have evaluated the outcome of arthroscopic revision surgery.

Objective: To analyze the results of arthroscopic revision anterior shoulder reconstruction at 1 institution.

Design: Case series.

Participants/Methods: 16 patients (13 men and 3 women; mean age at surgery, 30 years; range, 17 to 55 years) who underwent arthroscopic revision anterior shoulder reconstruction at 1 institution between 1997 and 2002 were included in this study. There was a mean of 1.2 prior surgeries per shoulder, including 10 open procedures and 10 arthroscopic procedures. All patients underwent anterior reconstruction of the shoulder using suture anchors and nonabsorbable sutures. A mean of 3.0 anchors (range, 2 to 4 anchors) per shoulder were used. In most patients (n=13), posterior capsular plication was also performed, and in 1 patient, closure of the rotator interval was performed. Patient satisfaction, the Simple Shoulder Test, and the Rowe scale were used to measure outcome. In addition, a physical examination with measurement of shoulder range of motion and the apprehension test was performed at final follow-up.

Results: Mean final follow-up was 38 months (range, 24 to 67 months). One patient (6%) dislocated his shoulder 4 months after arthroscopic revision anterior shoulder reconstruction during an altercation and subsequently underwent a Bristow procedure. Of the remaining cases, none of the shoulders had recurrence of dislocation or subluxation. All 15 of these patients were satisfied with their revision surgeries. Among this group, the Simple Shoulder Test responses improved from 8.3 "yes" responses to 11.3 after arthroscopic revision anterior shoulder reconstruction (P <0.05). Using the Rowe scale, there were 9 excellent, 4 good, and 3 fair results. Mean Rowe score at follow-up was 83.8 (range, 55 to 100). The mean side-to-side difference in external rotation was -1.5° when measured with the arm in neutral position and -7.3° when measured with the arm at 90° of abduction.

Conclusions: In this series, 94% of shoulders were stable after arthroscopic revision anterior shoulder reconstruction, and there were a high number of good and excellent outcomes. Results suggest arthroscopic revision anterior shoulder reconstruction using suture anchors is a viable treatment alternative for patients with failed anterior shoulder reconstructions.

Reviewer's Comments: This study is limited by its retrospective nature, lack of a comparison group, and by the heterogeneity of the study population. Further prospective comparative studies are needed to confirm these findings. (Reviewer-Adam J. Farber, MD).

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Keywords: Shoulder, Anterior Instability, Revision, Arthroscopy, Reconstruction

Print Tag: Refer to original journal article
When treating primary adhesive capsulitis, there is no difference in terms of speed of reduction in pain or improvement in function between patients treated with MUA and patients treated with steroid injection and distension.

**Background:** The management of adhesive capsulitis is controversial. A variety of treatment modalities have been advocated, including manipulation under anesthesia (MUA) and distension of the shoulder joint (brisement) with or without steroid injections. No studies reported thus far have been prospective, randomized, or controlled.

**Objective:** To present a prospective randomized study comparing the outcome at a 2-year follow-up period of 2 groups of patients treated either by MUA or by intra-articular shoulder injections using steroids with distension.

**Design:** Randomized controlled trial.

**Participants/Methods:** The study cohort was comprised of 53 consecutive patients, aged 40 to 75 years, who presented with primary frozen shoulder; diabetic patients were excluded. Patients were prospectively randomized into 2 treatment groups: MUA (15 women and 13 men; median age, 56.5 years) or injection (20 women and 5 men; median age, 57.0 years). The MUA group received treatment with manipulation under general anesthesia followed by physiotherapy. The injection group was treated by distension with local anaesthetic and a steroid followed by physiotherapy. Patients in the injection group received 3 injection treatments with a steroid and distension at 6-week intervals in the outpatient clinic. The injection, consisting of 40 mg of triamcinolone (in 1 mL), 5 mL of 2% lignocaine, 10 mL of 0.25% bupivacaine and 5 mL of air, was given by the posterior route. All patients were reviewed at 2, 6, and 12 weeks, and then at 6, 9, 12, 18, and 24 months. Assessments at each outpatient visit included using the Constant-Murley Shoulder Function Assessment Score, a straight-line visual analog score (VAS) to assess pain levels, and the Short-Form 36-Item Health Survey questionnaire (SF-36), which was performed at the beginning and end of the 2-year follow-up.

**Results:** The median duration of symptoms before presentation in the MUA group was 19 weeks compared with 16 weeks in the injection group, suggesting that most patients were in the "freezing" stage of the disease. No statistical differences were found between the 2 groups of patients with regards to the rise in the Constant score, the decrease in the VAS score, or the time at which these events occurred. All components of the SF-36 scores improved for all patients during the course of the treatment. However, no statistically significant difference was found between the 2 groups with respect to the change in SF-36 scores. No systemic or local complications were noted from either treatment modality.

**Conclusions:** The authors recommend treatment using steroid injections with distension as an out-patient for the treatment of idiopathic "primary" frozen shoulder. This has the same clinical outcome as a MUA with less attendant risks.

**Reviewer's Comments:** This study is limited by the fact that diabetic patients were excluded and that range of motion data are not included. (Reviewer-Adam J. Farber, MD).

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**Keywords:** Shoulder, Adhesive Capsulitis; Manipulation/Intra-Articular Steroids, Reconstruction

**Print Tag:** Refer to original journal article
Arthroscopic conversion of a high-grade partial-thickness rotator cuff tear to a full-thickness tear followed by repair is a highly effective treatment option, and age is significantly related to the success of the repair.

Background: No studies have documented the healing rate following repair of high-grade partial-thickness rotator cuff tears.

Objective: To report the rate of healing of high-grade partial-thickness (>50%) rotator cuff tears in a cohort of patients treated with arthroscopic conversion to a full-thickness tear followed by surgical repair.

Design: Retrospective review.

Methods: 41 consecutive patients (21 males and 20 females; 42 shoulders; mean age, 53 years; range, 34 to 72 years) who had undergone arthroscopic conversion of a high-grade partial-thickness supraspinatus tendon rotator cuff tear to a full-thickness tear and subsequent repair were included in the study. The integrity of the rotator cuff repair was determined with ultrasound examination at a minimum of 6 months after the surgery. Clinical outcome measures were assessed with use of validated outcomes measures, and all patients were re-examined by an independent observer at a minimum of 24 months after the surgery.

Results: 37 shoulders had a repair with a horizontal mattress construct and a single suture anchor, and 5 shoulders had a double-row repair. Seventeen shoulders had a concomitant procedure in addition to the rotator cuff repair. The average duration of clinical follow-up was 39 months (range, 25 to 50 months). The average visual analog pain score improved from 6.65 points preoperatively to 2.7 points postoperatively (P <0.01). The mean American Shoulder and Elbow Surgeons (ASES) score improved from 46.1 points preoperatively to 82.1 points postoperatively (P<0.01). The rate of patient satisfaction with the outcome of surgery was 93%, and 93% of patients were able to return to their previous occupation. Among the 42 shoulders, 37 (88%) had an intact rotator cuff repair seen on ultrasound at an average of 11 months postoperatively. The remaining 5 patients had a full-thickness defect in the tendon. The average age of the patients with a recurrent defect was older (62.8 years) than the average age of patients with a healed repair (51.8 years; P =0.02). There were no postoperative infections or implant-related complications. A frozen shoulder developed in 2 patients postoperatively.

Conclusions: Arthroscopic repair of high-grade partial-thickness rotator cuff tears results in a high rate of tendon healing. Patient age is an important factor in tendon healing.

Reviewer's Comments: This study is limited by the retrospective nature, small sample size, short-term follow-up, lack of a control group, and heterogeneity in both the repair constructs and the concomitant procedures that were performed; nevertheless it provides useful data on the rate of healing of high-grade partial thickness rotator cuff tears treated with this approach. It remains to be seen whether other surgical strategies such as in situ or transtendon repair without complete conversion to a full-thickness tear would result in a better healing rate than the approach studied here. (Reviewer-Adam J. Farber, MD).

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Keywords: Partial-Thickness Rotator Cuff Repair; Ultrasound Healing

Print Tag: Refer to original journal article
Minimal Support for Ropivacaine Infusion Improving Outcome Post-RTC Surgery

Efficacy of Subacromial Ropivacaine Infusion for Rotator Cuff Surgery: A Randomized Trial.
Coghlan JA, Forbes A, et al:


The clinical benefit of a postoperative pain catheter does not appear to outweigh the cost and potential risk.

**Background:** Local anesthetic delivered directly to the operative site by slow infusion is a popular method for controlling postoperative pain associated with rotator cuff (RTC) repair.

**Objective:** To determine the effectiveness and safety of ropivacaine infusion following arthroscopic or mini-incision RTC surgery.

**Design:** Randomized, blinded, placebo-controlled trial.

**Methods:** Patients planning to undergo arthroscopic subacromial decompression (SAD; n=88) or RTC repair (n=70) were included. All participants received 20 mL of 1% ropivacaine injected into the glenohumeral joint and subacromial space 15 minutes before placement of the arthroscope. All patients also received an intraoperative IV bolus of 40 mg of parecoxib. After the procedure was completed, an elastomeric pump, containing either 0.75% ropivacaine or a placebo of normal saline, set to run at 5 mL/hour was inserted in the subacromial space. Outcome assessors were blinded to the treatment allocation. Pain scores, analgesia, and duration of hospital stay were recorded. Pain was measured with a verbal 11-point analogue scale.

**Results:** Compared with placebo, continuous subacromial ropivacaine infusion resulted in a significant, but clinically unimportant, improvement in average pain in the first 12 hours following both SAD and RTC repair. No patient was lost to follow-up. The average pain level in the ropivacaine and placebo arms was 1.62 and 2.16, respectively, for the arthroscopic SAD group and 2.12 and 2.82, respectively, for the RTC repair group. There were no differences between treatment arms with regard to maximum pain at rest in the first 12 hours after surgery or average/maximum pain levels in the second 12 hours after surgery. There was no difference in the amount of accessory opioid use between the groups. The pain catheter was in place for a median of 17 hours.

**Conclusions:** There was minimal evidence to support the use of ropivacaine infusion for improving outcomes following RTC surgery in the setting of preemptive ropivacaine and intraoperative parecoxib.

**Reviewer's Comments:** I applaud the authors for their strong methodology. Their careful design contributed to this being the lead article in the *Journal of Bone and Joint Surgery American*. Some variables that could have been removed, however, were the time the catheter was in place postoperatively and the availability of an opioid, patient-controlled anesthetic. Issues they encountered with the catheters were variable flow rates and possible loss of anesthetic from wound drainage. (Reviewer-Carl H. Wierks, MD).

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Keywords: Rotator Cuff Repair, Pain Control, Subacromial Ropivacaine Infusion

Print Tag: Refer to original journal article
The tibial onlay technique eliminates problems with the "killer corner" associated with the transtibial technique.

**Background:** The results of posterior cruciate ligament (PCL) reconstruction are less reliable than those of the anterior cruciate ligament. **Anatomy:** The PCL can be functionally divided into 2 components—a larger anterolateral (AL) bundle and a smaller posteromedial bundle (PM). The AL bundle inserts anteriorly on the femur and laterally on the tibia. **Biomechanics:** The PCL is the primary restraint to posterior translation. The ultimate load of the AL bundle is more than twice that of the PM bundle. Thus, the AL bundle is the primary focus of single-bundle reconstruction. **Transtibial Reconstruction:** Variable results are reported with the transtibial technique. The 90° curve of the graft around the posterior edge of the proximal tibia, or "killer curve," creates increased tendon pressure and possibly causes graft elongation and failure. Aperture fixation or rounding the posterior edge of the tibial tunnel reduces graft damage. **Tibial Inlay Technique:** The tibial inlay technique secures the graft within a bone trough at the anatomic attachment of the PCL, avoiding the killer curve. Biomechanical studies comparing the inlay and tunnel techniques found less anteroposterior laxity and less graft-lengthening in the inlay group. In addition, 1 study documented evidence of mechanical degradation in the tunnel group, but not the inlay group. **Graft Bundle Options:** Conflicting data exist in regard to the superiority of double-bundle reconstruction. One biomechanical study, using a tibial tunnel technique demonstrated increased posterior laxity in the single-bundle group compared to the double-bundle group. Conversely, another biomechanical study using a tibial inlay technique showed no increased posterior laxity in either single- or double-bundle groups. **Femoral Tunnel Positioning:** The femoral tunnel position influences bundle tension and the ability of the graft to control posterior translation. The AL tunnel reconstruction location can reproduce normal PCL forces, but is associated with increased laxity from 0° to 45°. Central tunnel and PM tunnel positions generated high graft forces. An outside-in femoral drilling technique creates a smaller "critical corner" angle than an inside-out technique, which may result in less attenuation over time. **Graft Forces:** Traditional single-bundle reconstruction techniques replace the AL bundle tensioned with the knee at between 70° and 90° of flexion. In double-bundle reconstruction, differential tensioning of the AL bundle at 90° and the PM bundle at 0° has resulted in reciprocal in situ forces similar to those of the native PCL. **Conclusions:** Much has been learned about PCL anatomy and biomechanics, and this knowledge can be applied to well-designed clinic trials to determine optimum reconstruction techniques. **Reviewer's Comments:** This is an excellent review of PCL injuries. I recommend reading it to anyone who takes care of these injuries. (Reviewer-Carl H. Wierks, MD).

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Keywords: PCL, Tears, Surgical Reconstruction

Print Tag: Refer to original journal article
TSA is superior to hemiarthroplasty for glenohumeral osteoarthritis.

**Background:** In addition to severe proximal humerus fractures, indications for shoulder arthroplasty now include cuff tear arthropathy, primary osteoarthritis (OA), posttraumatic arthritis, inflammatory arthritis, osteonecrosis, pseudoparesis caused by severe rotator cuff deficiency, shoulder girdle tumors, and failed shoulder arthroplasty. Knowledge of the array of shoulder prostheses currently available and the indications for each, as well as the use of treatment algorithms, can lead to optimized patient outcomes. **Shoulder Prosthesis Options:** Hemiarthroplasty, total shoulder arthroplasty (TSA), and reverse total shoulder arthroplasty (RTSA) are the 3 main types of shoulder reconstruction that require prosthetic components. **Resurfacing Hemiarthroplasty:** Resurfacing humeral hemiarthroplasty is an attractive option for the young, active, or athletic patient in whom loosening or wear of a polyethylene glenoid component is a concern. It allows the surgeon to preserve the native version, offset, and head-shaft angle. **Hemiarthroplasty with an Extended-Coverage Head:** Hemiarthroplasty with an extended-coverage head may be considered for the patient with a deficient rotator cuff whose humeral head is contained by the coracoacromial arch. However, hemiarthroplasty is unlikely to restore motion and function in the patient with a decentered humeral head and frank anterosuperior instability. **TSA:** The primary indication for TSA is a painful shoulder caused by glenohumeral OA that is not successfully managed without surgery, in conjunction with loss of articular cartilage, incongruent osseous surfaces, and an intact rotator cuff. TSA is superior to hemiarthroplasty for conventional glenohumeral arthritis. **Resurfacing TSA:** Proximal humerus malunion is particularly challenging to manage. The absence of a stem makes a resurfacing prosthesis ideally suited for the patient with posttraumatic arthritis and humeral deformity. **TSA With Biologic Glenoid Resurfacing:** The young patient with disabling arthritis and the manual laborer whose job requires heavy lifting or overhead work are ideal candidates for TSA with a biologic glenoid resurfacing as an alternative to arthrodesis. **RTSA:** The use of a RTSA is reserved for patients with cuff tear arthropathy, pseudoparesis or a revision arthroplasty where the rotator cuff is deficient. Deltoid function must be preserved.

**Reviewer's Comments:** This is an excellent review article. The authors have provided nice treatment algorithms in figure format to guide the surgeon in this rapidly developing field. (Reviewer-Carl H. Wierks, MD).