Guidelines for Neck Injuries and Return to Football

Cervical Spine Injuries and the Return to Football.

Torg JS:

Sports Health 2009; 1 (September/October): 376-383

A football player must be pain free, be neurologically intact, have full range of motion of the neck, and have full strength before being considered for return to collision activity.

Objective: To determine contraindications, relative contraindications, and no contraindications of traumatic and developmental cervical conditions for return to collision activity such as football.
Design: Systematic review.
Methods: The author analyzed data from >1200 neck injuries recorded in the National Football Head and Neck Registry. He also reviewed the literature with the specific purpose of categorizing return to play criteria for traumatic and developmental cervical spine conditions. "No contraindication" recommendation was rendered when no recognized risk factors were identified by the literature or the author's extensive personal experience. "Relative contraindication" was rendered when the literature found that the risk was not completely substantiated. "Absolute contraindication" was defined when risk factors were documented.
Results: Nerve root brachial plexus injury, commonly called "burner" or "stinger," can be caused by a stretch injury of the brachial plexus in a younger player. Acute cervical sprain presents as painful neck motion without radicular complaints with normal x-rays and exam, while usually self-limiting. Persistent limitation of motion should be further evaluated with flexion and extension views and MRI. Cervical cord neuropraxia is characterized by transient quadriplegia. Motion and sensory symptoms may persist for 2 days. Traumatic injuries of C1 and C2 are absolute contraindications for return to football. Healed type I and II odontoid fractures, nondisplaced Jefferson fractures, and lateral mass fractures of C2 represent relative contraindications, provided that the patient has pain-free full range of motion (ROM). Ligamentous injuries of the mid- and lower-cervical spine with >3.5 mm displacement and >11° of rotation are absolute contraindications, whereas injuries with <3.5 mm displacement and <11° of rotation are relative contraindications. Healed asymptomatic stable body fractures represent no contraindication. Healed stable posterior ring fractures carry a relative contraindication. Acute body fractures with a sagittal component, body and ring fractures, fractures with canal compromise, fractures with facet incongruity, and any healed fracture with pain, limited motion, or neurologic component are absolute contraindications for return to play. Healed disc herniations, treated conservatively or operatively, represent no contraindication as long as they are asymptomatic. Symptomatic disc herniation is an absolute contraindication. C1 fusions and 4-level or more fusions are absolute contraindications to return to football. Congenital conditions are absolute contraindications. Type II Klippel-Feil syndrome of 1 or 2 spaces at C3 or below and spina bifida occulta have no contraindication for return to play if patients are asymptomatic without degenerative changes.
Conclusions: Any cervical spine injury with persistent pain, limited ROM, or neurologic injury is contraindicated for return to playing football.
Reviewer's Comments: This concise article provides information not previously presented together. It is very organized with excellent figures and algorithms to walk one through each cervical condition. Torg has dedicated his professional career to elucidating the mechanisms, prevention, and treatment of spinal cord injuries in athletes. This is an absolute read for any physician treating collision and contact athletes. (Reviewer-John H. Wilckens, MD).

Keywords: Neck Injuries

Print Tag: Refer to original journal article

Does Timing of Knee Ligament Surgery Affect Academics?

The Effects of Timing of Pediatric Knee Ligament Surgery on Short-Term Academic Performance in School-Aged Athletes.

Trentacosta NE, Vitale MA, Ahmad CS:

Am J Sports Med 2009; 37 (September): 1684-1691

School-aged athletes' academic performance is affected by the timing of knee ligament surgery.

Objective: To determine the effects of timing of ligament reconstruction of the knee on academic performance in school-aged athletes.
Design: Cohort study.
Methods: Over a 6-year period, the authors identified 63 patients aged ≤18 years who underwent anterior cruciate ligament (ACL) or medial patellofemoral ligament (MPFL) reconstruction. Exclusion criteria included being home schooled or being in college at the time of surgery. Sixty-two patients were available for International Knee Documentation Committee (IKDC), Lysholm, and Kujala knee scores in addition to a 54-item questionnaire about post-reconstruction quality of life. These 62 patients were divided into 3 groups according to the timing of their reconstruction in regard to their school schedule. Group A patients had knee surgery during the school year. Group B patients had surgery during a school holiday (3-day weekend or longer). Finally, group C patients had their surgery during summer break.
Results: The demographics between the 3 groups were very similar. Similarly, the IKDC Score, Lysholm knee scale and Kujala questionnaire did not reveal any differences between groups. In group A, the mean time from initial visit to reconstruction was 12.1 weeks. Only 3.8% returned to school immediately, and overall, patients missed 13.5 days of school. More than one-third failed an exam, and 10% enrolled in summer school. In group B, the delay to surgery was 9.9 weeks, and 36.4% returned to school immediately; overall, patients missed 9.7 days of school, with none failing an exam or enrolling in summer school. In group C, the delay to surgery was 10.6 weeks. More than 87% of these patients returned to school immediately, with an average loss of 3.2 days of school; again, none failed an exam or enrolled in summer school. Home schooling in the postoperative period did not seem to improve the results over patients having materials brought from school. No patients had to repeat a grade. A delay in surgery did seem to correlate with a reduced clinical outcome.
Conclusions: Knee ligament reconstruction during the school year can have a significant impact on a student's academic performance.
Reviewer's Comments: This is a very practical article. Interestingly, the group that had surgery during school had a slightly longer delay to surgery. This is interesting information that the authors could explain better. The article clearly reflects that significant knee surgery during the school year has academic consequences. This article provides very helpful data for the surgeon to share with the patient and parents. Delaying surgery to a 3-day weekend or holiday seems the best strategy for someone sustaining a significant knee injury during the school year. That delay of 10 weeks would not significantly affect clinical outcome or academic performance. (Reviewer-John H. Wilckens, MD).

Keywords: Knee Ligament Surgery, Academics

Print Tag: Refer to original journal article

Baseball Bat-Related Injuries--Wood vs Non-Wood Bats

A Comparison of Injury and Game Characteristics Between Non-Wood and Wood Baseball Bats.

Laudner KG, Sipes RC:

Athletic Training Sports Health Care 2009; 1 (May): 222-226

The use of non-wood bats does not contribute to an increased number of injuries by the batted ball in high school baseball players.

Background: Since the 1970s, more baseball teams are using non-wood bats. These new non-wood bats have led to higher ball exit speeds and greater injuries from batted balls. Batted ball injuries are the most common cause of catastrophic injuries in pitchers. More recently, the National Federation of State High School Associations sought to control the characteristics of non-wood bats to make them perform more like wood bats and become ball exit speed ratio (BESR) certified.
Objective: To identify the difference in game characteristics and injury rate in high school baseball between wood and non-wood bats.
Design: Prospective comparison study.
Methods: For the 2007 season, 32 high school varsity baseball teams agreed to use non-wood bats for all non-conference games and wood bats for all conference games. Game statistics recorded were total number of at-bats, hits, runs scored, and game duration, in addition to injuries (all types and batted ball related).
Results: 11 of the 32 teams reported statistics for both wood and non-wood bats; 143 games used wood bats, and 144 games used non-wood bats. There were 5 injuries in the non-wood bat games and 1 in the wood bat games. The number of batted ball-related injuries was 2 in the non-wood bat games (incidence, 0.014) and 1 in the wood bat game (incidence, 0.007); this did not reach statistical significance. All the batted ball-related injuries were minor with no lost playing time. Similar numbers of bats were used per game: non-wood bat games averaged 8.8 hits per game and 7.1 runs scored compared to 6.5 hits and 4.5 runs scored in wood bat games. Non-wood bat games were, on average, 12 minutes longer. Wood bats broke, on average, every 35.5 times at bat.
Conclusions: BESR non-wood bats did not produce significantly more injuries than wood bats.
Reviewer's Comments: This is a very practical study to help better understand the bat controversy. The incidence of a batted ball injury was twice as high in the non-wood bats but did not reach statistical significance because of the small sample size. The increased number of hits and runs scored suggests that ball exit speed is still a little higher with non-wood bats compared to wood. This was a varsity high school baseball population. As batters become bigger and more skilled at the college and adult level, the injury rates may change. It would be informative to repeat this at the college level. To add to the controversy, there is a growing shortage of ash wood for bats. In professional baseball, players are beginning to use maple bats with a demonstrable increase in broken bats and player and fan injury from flying bat pieces. This is currently being studied. (Reviewer-John H. Wilckens, MD).

Keywords: Baseball Bat-Related Injuries

Print Tag: Refer to original journal article

Clavicle Fractures--Open Reduction vs Nonoperative Treatment

Acute Operative Stabilization Versus Nonoperative Management of Clavicle Fractures.

Judd DB, Pallis MP, et al:

Am J Orthop 2009; 38 (July): 341-345

Open reduction internal fixation of midshaft clavicle fractures offers no functional advantage over midshaft fractures treated nonoperatively.

Objective: To determine if pin fixation offers any advantages over nonoperative treatment of clavicle fractures.
Design: Randomized, prospective study.
Methods/Participants: Over a 2-year period, the authors enrolled 57 patients with clavicle shaft fractures into the study. Exclusion criteria included open fractures, fractures of the proximal or distal clavicle, and fractures associated with neurologic injury. Patients randomized to the nonoperative group were treated in a sling for comfort, followed by physical therapy once the fracture had healed for range of motion, strength training, and return to full unrestricted activities. The operative group was treated with a Hagie pin secured with a nut on the rod exiting the posterolateral corner. The pin was removed once the fracture healed, and the patients began physical therapy. Patients were evaluated at presentation 3 weeks, 6 weeks, 3 months, 6 months, and 1 year after injury. Fractures were also classified into side and dominance, comminution, angulation, and >2 cm of shortening.
Results: 28 patients were randomized to the nonoperative group, and 29 to the operative group. Groups were very similar demographically. For the nonoperative group, the mean shortening was 12 mm with 12.7°of angulation. In the operative group, the mean shortening was 13.4 mm with 7.7°of angulation. Only at 3 weeks did the operative group have a statistically higher functional score than the nonoperative group. At 6 months, both groups had very similar scores. At 1 year, the nonoperative group had a slightly higher functional score. For fractures >2 cm shortened, the operative group had better functional score at 3 months but had similar scores at 1-year follow-up. While operative treatment demonstrated better anatomic reduction at 6 and 12 months, there was no functional improvement of score with anatomic reduction, operative or nonoperative. The nonoperative group had 2 complications (8%), which included a nonunion and refracture at 6 months. The operative group had 12 complications (41%), 9 due to irritating prominent pins resulting in superficial pin tract infections; most cases resolved with pin removal. Open complications included nonunion, delayed union, broken Hagie pin, and transient radial nerve palsy from the interscalene block; 1 refracture occurred.
Conclusions: Hagie pin fixation offered no clear advantage of functional recovery after clavicle shaft fractures over those treated nonoperatively.
Reviewer's Comments: This is a good article with useful data. The study group is a young, high level of function, military group. At 1 year, there was no difference in functional outcome. It would have been informative to know what the mean time to full military duty was for both groups. Other enlightening information would have been mean cost of treatment of each group. The nonoperative group did undergo physical therapy. Anatomic reduction provided no functional advantage over nonanatomic reduction at 1 year. (Reviewer-John H. Wilckens, MD).

Keywords: Clavicle Fractures, Pin Fixation, Nonoperative Treatment

Print Tag: Refer to original journal article

How Effective Is Arthroscopic Revision of Failed Open Shoulder Stabilization?

The Role of Arthroscopy in Revision of Failed Open Anterior Stabilization of the Shoulder.

Boileau P, Richou J, et al:

Arthroscopy 2009; 25 (October): 1075-1084

Arthroscopic revision Bankart repair of a failed open anterior stabilization can yield acceptable results.

Background: The typical treatment for recurrences after open stabilization has been revision open surgery with either a bone block (eg, Laterjet-Bristow procedure) or soft-tissue procedure (eg, capsular shift).
Objective: To evaluate the results of arthroscopic treatment of failed open shoulder stabilization.
Design: Retrospective therapeutic case series (Level of Evidence, IV).
Methods: Patients who underwent an arthroscopic Bankart repair between 1996 and 2004 after a failed open shoulder stabilization were included in the study. Preoperatively, patients were assessed clinically and radiographically with x-ray and CT arthrography. Patients underwent arthroscopic revision stabilization in the beach chair position with suture anchors. An inferior capsular plication or a rotator interval closure was performed as necessary. Patients were followed up for a mean of 43 months. Patients were evaluated with the visual analog scale score, University of California, Los Angeles (UCLA) score, Rowe score, and Walch-Duplay score.
Results: 22 patients (17 men, 5 women) underwent arthroscopic revision. Sixteen patients had undergone a single previous procedure, 5 had undergone 2 previous procedures, and 1 had undergone 3 procedures. The most recent procedure was a bony procedure in 16 cases, an open Bankart repair in 3 cases, and an open capsular shift in 3 cases. Preoperatively, all patients had a positive apprehension sign. Radiographically, 13 of 16 patients (81%) who had undergone bone block had signs of technical errors or complications on x-ray. At surgery, all patients underwent a labral reattachment with Mitek Panalok anchors. Twelve patients (54%) underwent additional inferior capsular plication, and 4 (8%) underwent rotator interval closure. Half of the patients who had undergone previous bone block procedure had their screws removed. Two additional patients underwent SLAP resection, 1 patient underwent rotator cuff repair, and 1 underwent a biceps tenotomy. Seventeen patients (89%) were very satisfied or satisfied with the results of their surgery at final follow-up. There were marked statistically significant increases in the Walch-Duplay, Rowe, and University of California-Los Angeles scores. Sixteen patients (85%) had a good or excellent result by the Walch-Duplay score, and 13 (67%) had a good or excellent result according to the Rowe score. There was an average loss of 15° in external rotation at final follow-up. At final follow-up, 1 patient had a recurrent subluxation. Two patients exhibited anterior apprehension but were satisfied with the outcome of the surgery.
Conclusions: Arthroscopic revision of failed open anterior shoulder stabilization can yield acceptable results.
Reviewer's Comments: This article shows that arthroscopic shoulder stabilization with suture anchors can be a good revision procedure for failed open stabilizations. One does not have to dissect anteriorly. However, one must be cognizant of scarring near the axillary nerve when performing a capsular plication. The small number of patients and retrospective nature of the study are weaknesses. (Reviewer-Nathaniel P. Cohen, MD).

Keywords: Shoulder Instability, Arthroscopy

Print Tag: Refer to original journal article

Does Computer Navigation Improve Results of ACL Reconstruction?

Anterior Cruciate Ligament Reconstruction With and Without Computer Navigation: A Clinical and Magnetic Resonance Imaging Evaluation 2 Years After Surgery.

Endele D, Jung C, et al:

Arthroscopy 2009; 25 (October): 1067-1074

In this study, there was no significant difference between computer-assisted navigation and traditional ACL reconstruction in both clinical results and tunnel placement.

Background: Tunnel placement has been shown to be a critical determinant of a successful outcome in anterior cruciate ligament (ACL) reconstructions. Computer navigation can help create a more accurate tunnel.
Objective: To assess the difference in tunnel placement between standard and computer-assisted navigation for ACL reconstructions.
Design: Prospective, randomized, single-blind study (Level of Evidence, I).
Participants/Methods: 40 patients undergoing ACL reconstruction by 3 surgeons experienced in the procedure were randomized to either standard ACL reconstruction or computer-navigated reconstruction. Patients all underwent ACL reconstruction with bone-patellar tendon-bone autograft. Each graft was press fit into the femoral tunnel, and tibial fixation was performed with a distal post screw. Patients were randomized to have their tunnels drilled by hand or with a computer navigation system. The goal was to achieve a femoral tunnel that was at the 10:30 position for the right knee and the 1:30 position for the left knee. All patients underwent the same postoperative rehabilitation protocol. Patients were followed up with x-ray to assess tunnel position. They were also assessed with an MRI at a mean follow-up of 24 months to examine tunnel position, graft impingement, and graft appearance. Patients were followed up for a mean of 24 months with Lachman and anterior drawer tests, IKDC, Lysholm score, and Tegner score.
Results: A power analysis showed that the total sample size needed to detect significant differences was 56 patients. Twenty-four male and 16 female patients with a mean age of 34 years (range, 18 to 54 years) were included in the study. No significant differences were found in tunnel placement between the 2 groups, although a slightly smaller range was noted in the navigated group. There also appeared to be better remodeling of the grafts in the navigation group. There were 2 cases of moderate notch impingement in the manual group and none in the navigated group. Otherwise, no significant difference was found in notch impingement between the 2 groups. There were also no significant differences between groups with respect to the IKDC, Lysholm, and Tegner scores.
Conclusions: In this study, no significant difference was noted between computer-assisted navigation and traditional ACL reconstruction in both clinical results and tunnel placement.
Reviewer's Comments: This study does not show a difference between computer-aided navigation and traditional ACL reconstruction. However, there are several caveats to this conclusion. The most obvious is that the sample size was too small based on the authors' power analysis. Moreover, the 3 surgeons were very experienced in ACL reconstruction. Perhaps a difference could have been seen if a low-volume ACL surgeon had been performing the procedures. It would have been interesting to see the difference in operative time between the 2 techniques. (Reviewer-Nathaniel P. Cohen, MD).

Keywords: Computer Navigation, ACL Reconstruction

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Is a Corticosteroid Helpful Following Total Knee Arthroplasty?

Effect of Periarticular Corticosteroid Injections During Total Knee Arthroplasty: A Double-Blind Randomized Trial.

Christensen CP, Jacobs CA, Jennings HR:

J Bone Joint Surg Am 2009; 91 (November): 2550-2555

The periarticular injection of a corticosteroid following total knee arthroplasty did not improve pain relief, motion, or function in the early postoperative period.

Background: Multimodal pain pathways have improved patient satisfaction following joint replacement. The use of periarticular injections during total knee arthroplasty has significantly decreased pain and improved patient satisfaction. Expansion of these pain regimens to include corticosteroids has been a subject of interest in the orthopaedic community. However, it remains unclear if the addition of the corticosteroid to a periarticular injection is necessary or associated with an increased risk of infection.
Objective: To determine if pain, narcotic use, clinical outcomes, or complications differed between patients who receive a corticosteroid and those who do not in the early postoperative period. The authors hypothesized that the group receiving the corticosteroid would have an improved outcome and enhanced range of motion in the early postoperative period without an increased risk of complications.
Participants/Methods: Patients were randomized into 1 of 2 groups. One group received a periarticular injection, consisting of bupivacaine, morphine, epinephrine, clonidine, and cefuroxime. The second group received the same periarticular injection with the addition of a corticosteroid (40 mg of methylprednisolone acetate). Seventy-six patients (23 men and 53 women with a mean age of 65.5 ± 11.0 years and a mean body-mass index of 34.0 ± 7.3 kg/m2) participated in the study. Thirty-seven patients were assigned to the no-steroid group and 39 to the steroid group.
Results: The hospital stay was significantly shorter for patients in the steroid group (2.6 days vs 3.5 days in the no-steroid group; P =0.01). No significant group differences in terms of pain, narcotic consumption, outcome scores, or motion were identified. There were 3 complications in the steroid group: 2 patients required a manipulation under anesthesia, and the knee joint became infected in another patient, leading to numerous complications and ultimately death.
Reviewer's Comments: This interesting study can give surgeons some guidance for local infiltration of pain medications following joint replacement. It certainly appears that the addition of steroid to the local pain medications offered no benefit, and may have led to an infection in 1 patient. Although I would not advocate avoiding steroid injections in patients undergoing knee replacement, it does not seem to provide any significant benefit and may be associated with poorer outcomes. (Reviewer-Kris J. Alden, MD).

Keywords: Pain Management, Multimodal Pain Management, Knee Arthroplasty

Print Tag: Refer to original journal article

Lumbar Fusion Method Doesn't Affect Outcomes in DS

Degenerative Spondylolisthesis: Does Fusion Method Influence Outcome? Four-Year Results of the Spine Patient Outcomes Research Trial.

Abdu WA, Lurie JD, et al:

Spine 2009; 34 (October 1): 2351-2360

Evaluation of SPORT trial patients who underwent lumbar fusion for degenerative spondylolisthesis did not show significant differences in outcomes at 4 years based on the method of fusion used.

Background: Lumbar fusion is a commonly performed procedure for degenerative spondylolisthesis (DS). Instrumented fusion improves the rates of fusion. Little data exist on which method of fusion is most effective in improving pain and functional outcomes.
Objective: To compare patient outcomes with 3 methods of fusion used in the multicenter Spine Patient Outcomes Research Trial (SPORT) at 4 years of follow-up.
Design: Clinical trial, subgroup analysis.
Methods: Data on combined patient population from the observational and randomized cohorts with degenerative spondylolisthesis from the SPORT trial who underwent lumbar decompression and fusion were analyzed. Patients were followed for 4 years. Fusion procedures included posterolateral in situ fusion (PLF), instrumented posterolateral fusion with pedicle screws (PPS), and combined PPS and interbody instrumented fusion (360°). Outcome measures included the SF-36, the Oswestry Disability Index (ODI), and the presence of fusion.
Results: 380 patients had enough data for analysis; 21% had PLF, 56% had PPS, and 17% had 360° fusion. Six percent of patients had decompression only and were excluded. Baseline characteristic differences of the 360° group were statistically significant, with patients being younger, having lower SF-36 mental component scores, having a greater likelihood to be employed, and being less likely to have osteoporosis, severe stenosis, or central stenosis. The PLF group had the lowest operative time and blood loss, and the PPS group had the highest blood loss and dural tear rate (12%). At 4 years, the reoperation rate and age-adjusted mortality were similar in the 3 groups. Improvement in SF-36 and ODI scores was seen in all 3 groups at 4 years, but did not differ significantly among the groups. The fusion rate was lower in the PLF group (67%) and similar between the PPS and 360° groups (85% and 87%, respectively).
Conclusions: The authors findings were similar to previous reports in that the method of fusion did not significantly affect the outcomes. This trial was not designed to evaluate differences between types of fusion. The choice of the method of fusion and the method of evaluating for presence of fusion was left up to the treating surgeons. The authors acknowledged that a randomized controlled study with long-term follow-up is needed to definitively state which fusion method would benefit most patients with DS.
Reviewer's Comments: This report represents the largest known cohort of patients with DS treated by different methods of fusion. The findings of this study, however, are difficult to generalize and apply to practice due to the lack of control for multiple variables. Comparable positive outcomes between the groups mostly suggest that the participating surgeons were successful in selecting appropriate fusion methods for their patients. The data from this study can be considered when deciding whether to instrument or perform interbody fusion in a patient needing lumbar arthrodesis for DS. (Reviewer-Vladimir Sinkov, MD).

Keywords: Degenerative Spondylolisthesis, Lumbar Fusion

Print Tag: Refer to original journal article

NSAIDS May Affect Skeletal Healing

Nonsteroidal Anti-inflammatory Drugs in Orthopaedics.

Abdul-Hadi O, Parvizi J, et al:

J Bone Joint Surg Am 2009; 91 (August): 2020-2027

NSAIDS have been widely used in orthopaedic surgery for their analgesic, antipyretic, and anti-inflammatory effects

Background: The authors state that there is a lot of information and some degree of confusion about the specific adverse events when nonsteroidal anti-inflammatory drugs (NSAIDs) are used.
Objective: To review the topic in this Instructional Course lecture (ICL) and answer the questions.
Results: Nonsteroidal anti-inflammatory drugs (NSAIDS) have been widely used in orthopaedic surgery for their analgesic, antipyretic, and anti-inflammatory effects. They exert most of their effects by inhibiting the synthesis of prostaglandins, which are autocrine mediators of inflammation. NSAIDs interfere with the conversion of arachidonic acid to prostaglandin precursors, by blocking the action of cyclo-oxygenase (COX). There are 2 forms of this enzyme, COX-1 and COX-2. The COX-2 form has less inhibitory effect on gastrointestinal function and is more specific for musculoskeletal tissues. For this reason, it was selectively targeted by the COX-2 inhibitors. They are also antipyretic and have effects on angiogenesis. Because prostaglandin E2 increases bone formation and bone mass, it stands to reason that inhibition of this molecule may have an adverse effect on skeletal healing and remodelling. This has been shown and is time- and dose-dependent in the laboratory. There have been many articles on the effects of selective and nonselective NSAIDs. The consensus seems to be that the NSAIDs may have a clinically significant effect on fracture vascularity and fracture healing that the selective COX-2 agents have to a lesser degree. The authors of this ICL state that NSAIDs, especially nonselective ones, should be avoided after problem fractures. There is significant evidence to suggest that nonspecific NSAIDs can inhibit spinal fusion. The clinical effects of this depend upon the underlying situation and the risk of pseudarthrosis. There is less evidence of an adverse effect with COX-2 inhibitors. There is also evidence that NSAIDs effect integration of ingrowth prostheses. Both COX-1 and COX-2 inhibitors have this effect. COX-2 can decrease ingrowth if given early in the postoperative period. In addition, they may also decrease osteolysis. COX-2 inhibitors may significantly decrease aseptic loosening. The effects of NSAIDs on soft tissue injury and repair are less well understood. The authors speculate that it is possible that NSAIDs may improve soft tissue healing. They also speculate that the mechanisms for this include improving the microcirculation. In addition, NSAIDs may also improve ligament and tendon healing by decreasing inflammation.
Reviewer's Comments: In summary, this article explores multiple ways in which NSAIDs may affect skeletal healing. The authors feel that COX-2 inhibitors may be preferred and have a lower rate of adverse events. They also point out that part of the desire to use these agents comes in the spirit of decreasing narcotic use. (Reviewer-Paul D. Sponseller, MS, MD).

Keywords: NSAIDs, Uses, Adverse Effects, Orthopaedic Surgery

Print Tag: Refer to original journal article

AHL Doesn't Always Pass Through Midportion of Capitellum

Relationship of the Anterior Humeral Line to the Capitellar Ossific Nucleus: Variability With Age.

Herman MJ, Boardman MJ, et al:

J Bone Joint Surg Am 2009; 91 (September): 2188-2193

If the AHL does not pass through the midportion of the capitellum, one should rely on clinical examination and possibly obtain a comparison lateral radiograph of the opposite side to judge whether or not there may be an injury.

Objective: To determine the variation of the anterior humeral line (AHL) with age in normal children.
Design: Cross-sectional diagnostic study.
Participants/Methods: Three authors with various levels of training analyzed the position of the AHL with age in normal children. Images were chosen from radiographs chosen to rule out fracture, but that proved to be clinically and radiographically normal. Only images in which the 2 supracondylar ridges were superimposed were chosen. Sixty children <4 years old and 60 children >4 years of age were studied. Each radiograph was measured twice. The AHL was drawn and a perpendicular constructed having the anterior-to-posterior width of the capitellum. This line was divided into thirds. The position of the capitellum with respect to the AHL was studied. Intra- and inter-rater reliability was also studied.
Results: The AHL passed through the midportion of the capitellum in approximately 66% of the children >4 years of age, but in only 50% of the children <4 years old. The line passed through the posterior third in about the same percentage of both age groups (16% and 17%, respectively). The reliability of this measurement was only fair, and was worse for the orthopaedic surgeon than the younger trainees.
Conclusions: The AHL does not always pass through the midportion of the capitellum. This is especially true of younger children. This may be because the ossification center is not "centered" in younger children, or it may be due to a change in the actual anatomy of the lower humerus.
Reviewer's Comments: This was a practical and useful study. It may be more useful in young children in whom a physeal injury may otherwise be invisible. The corollary seems to be that if the AHL does not pass through the midportion of the capitellum, one should rely on clinical examination and possibly obtain a comparison lateral radiograph of the opposite side to judge whether or not there may be an injury. The AHL is often used to judge the adequacy of reduction of supracondylar humeral fractures on the lateral view. Statements in the literature have alluded to an opinion that if the AHL passes through or anterior to the anterior one-third of the capitellum, the fracture is in extension. However, this statement has not been substantiated, and nor has the variation in this parameter with age been explored. (Reviewer-Paul D. Sponseller, MS, MD).

Keywords: Anterior Humeral Line, Capitellar Ossific Nucleus, Age

Print Tag: Refer to original journal article

Complexity of Pediatric Musculoskeletal Infection Has Increased

Pediatric Musculoskeletal infection: Trends and Antibiotic Recommendations.

Copley LAB:

J Am Acad Orthop Surg 2009; 17 (October): 618-625

Children are much more predisposed to spontaneous musculoskeletal infection than are adults.

Background: In prior eras, infections were characterized as septic arthritis, osteomyelitis or soft tissue infection, or both. Now, the evolution of *Staphylococcus aureus* is more virulent and invasive, which has changed the pathophysiology of the disorder. The incidence of methicillin-resistant *Staphylococcus aureus* (MRSA) has increased, and the infections more often involve different tissue planes. **Summary:** The authors rank the types of infections by severity, depending upon how many different tissue planes are involved. The most extreme are those involving osteomyelitis, septic arthritis, and pyomyositis or abscess. This categorization scheme decreases continuously in severity, including just osteomyelitis, isolated septic arthritis, or pyomyositis or abscess. The associated complications, number of surgeries needed, and length of hospitalization also descended along this continuum. Most notably, the risk of deep venous thrombosis is >25% in cases where osteomyelitis and septic arthritis occur together. Septic pulmonary emboli have also been reported. The initial laboratory work should include a complete blood count, C-reactive protein assay, erythrocyte sedimentation rate, and blood cultures. Also, more comprehensive imaging is called for. MRI should be obtained if there is any question about which tissues are involved; such as in a patient whose examination suggests more than a septic hip or a septic knee. The author suggests that one way to allow this without undue waits is to have a daily slot or 2 in the schedule for musculoskeletal emergencies. Given the changing sensitivities of organisms, tissue should be obtained for culture rather treating empirically as in years past. *Kingella kingae* should be suspected in patients between 6 months and 4 years of age. This organism is harder to grow, and should be cultured and sent in aerobic blood culture bottles. Bone aspirate material should also be sent on blood and chocolate agar. Children with group-A beta hemolytic strep should be watched carefully for necrotizing fasciitis. Lyme titers should be obtained in endemic areas to include this in the differential diagnosis. Antistreptolysin –O titers may help to identify those with post-streptococcal reactive arthritis.

Reviewer's Comments: Surgical drainage is indicated when there is significant abscess formation or septic arthritis of the hip. The author states that he has had good results with percutaneous lavage of knees and ankles in the emergency room using approximately 2 liters of saline. Children are still much more predisposed to spontaneous musculoskeletal infection than are adults. The features of musculoskeletal infection are changing. I recommend this article to all who take call in a general emergency department. (Reviewer-Paul D. Sponseller, MS, MD).

Keywords: Musculoskeletal Infections, Pediatrics, Trends, Antibiotics

Print Tag: Refer to original journal article

Casting vs Bracing Treatment for Infantile Scoliosis

Derotational Casting for Progressive Infantile Scoliosis.

Sanders JO, D'Astous J, et al:

J Pediatric Orthop 2009; 29 (September): 581-587

Infantile scoliosis may be idiopathic or secondary to genetic or neuromuscular disorders; it has a greater mortality rate than juvenile scoliosis.

Objective: To study the results of the Cotrel derotation technique and identify factors predictive of success.
Participants/Methods: Over a 5-year period, 55 patients with infantile scoliosis were studied. All had at least 1 year of follow-up after casting. Casting was begun based upon a progressive Cobb angle >25° or a rib vertebral angle difference (RVAD) of >20°. Double curves were more likely to be casted at a younger age. They were subclassified as idiopathic, syndromic, or neurological etiologies. MRI was performed before or during the cast period.
Results: The mean age at cast initiation was 2.2 years, ranging up to 5 years. Precast curve averaged 52° and ranged up to 100° in this series. The mean precast RVAD was 32°. Seventeen of the 55 patients were able to be corrected to curves under 10° degrees. Factors predictive of success were idiopathic diagnosis, younger age, and curve under 60°. Smaller amounts of rotation and lower RVAD also predicted success. Those with full correction were a mean of 1.1 years at initiation of casting, while those whose casts were started after 18 months rarely achieved complete resolution. Correction of the curves usually took over 1 year of casting. There were no complications in this series.
Conclusions: Serial cast application seems to have a role in treatment of infantile scoliosis. If treatment is started before the curve reaches 60° and before the age of 2 years, there seems to be a significant chance of correction of the curve. The results are better than those for bracing, presumably because of the more consistent application of corrective force. The results are less predictable for patients whose curves are not idiopathic.
Reviewer's Comments: This is an article worth reading by all of those who treat pediatric scoliosis. It seems analogous to Ponseti cast treatment, but it is becoming more popular among pediatric orthopaedists. The fact that some curves resolve completely without the need for any surgery is a major advantage for those fortunate patients. Of course, some of those small or early curves resolve completely without treatment. The challenge is to identify patients who truly need treatment and the subset of those who will be well controlled with cast application. Infantile scoliosis may be either idiopathic or secondary to genetic or neuromuscular disorders, and it has a greater mortality rate than juvenile scoliosis. Surgical treatment with growing rods or the vertical expandable prosthetic titanium rib is an option, but it can cause stiffness and requires a lot of effort. Recently, it has been suggested that cast treatment of early onset scoliosis may have improved results compared to bracing. (Reviewer-Paul D. Sponseller, MS, MD).

Keywords: Progressive Infantile Scoliosis, Cotrel Derotation

Print Tag: Refer to original journal article

ChloraPrep More Effective Than DuraPrep

Efficacy of Surgical Preparation Solutions in Shoulder Surgery.

Saltzman MD, Nuber GW, et al:

J Bone Joint Surg Am 2009; 91 (August): 1949-1953

ChloraPrep is more effective than DuraPrep and povidone-iodine at eliminating bacteria from the shoulder region.

Background: Preoperative skin-preparation solutions may decrease the risk of infection following surgery in the shoulder region. The efficacy of different solutions at eradicating normal skin flora present in the shoulder and axillary region is unknown.
Objective: To examine the native bacteria present on the skin around the shoulder and to assess the efficacy of 3 commonly used surgical skin-preparation solutions at eliminating bacteria from the shoulder.
Design: Prospective, randomized study.
Participants/Methods: 150 consecutive patients (84 men and 66 women; ages 17 to 79 years) undergoing shoulder surgery at 1 institution were included in the study. No specific home cleansing protocol was undertaken prior to surgery. Preoperative antibiotics were administered to all patients. Prior to the skin incision, each shoulder was prepared in the routine sterile fashion with 1 of 3 randomly selected solutions: ChloraPrep (2% chlorhexidine gluconate and 70% isopropyl alcohol), DuraPrep (0.7% iodophor and 74% isopropyl alcohol), or povidone-iodine scrub and paint (0.75% iodine scrub and 1.0% iodine paint). Fifty patients were included in each of the 3 groups. In an attempt to characterize the native bacterial flora around the shoulder, aerobic and anaerobic cultures were obtained prior to skin preparation for the first 20 patients; aerobic and anaerobic skin cultures were obtained following skin preparation for all patients. Cultures were monitored for 7 days.
Results: Coagulase-negative Staphylococcus and *Propionibacterium acnes* were the most commonly isolated organisms prior to skin preparation. After the skin preparation was performed, the rate of positive cultures was 31% in the povidone-iodine group, 19% in the DuraPrep group, and 7% in the ChloraPrep group. The positive culture rate in the ChloraPrep group was lower than that in the povidone-iodine group (P <0.0001) and the DuraPrep group (P =0.01). The positive culture rate in the DuraPrep group was lower than that in the povidone-iodine group (P =0.05). Both ChloraPrep and DuraPrep were more effective than povidone-iodine in eliminating coagulase-negative Staphylococcus (P <0.001 for both). There were no significant differences between any of the 3 skin preparation solutions tested in the efficacy of eliminating *P. acnes*. No superficial or deep infections occurred in any of the patients in this study.
Conclusions: "ChloraPrep is more effective than DuraPrep and povidone-iodine at eliminating bacteria from the shoulder region."
Reviewer's Comments: This study suggests that one should be cautious about using povidone-iodine skin prep solutions prior to shoulder surgery. Since *P. acnes* infections are the most common form of postoperative shoulder infections, it would be useful to identify a skin prep solution that has superior efficacy in eliminating P. acnes. (Reviewer-Adam J. Farber, MD).

Keywords: Shoulder Surgical Preparation Sterile

Print Tag: Refer to original journal article

Risk Factors for Progression of Rotator Cuff Tears

Outcome of Nonoperative Treatment of Symptomatic Rotator Cuff Tears Monitored by Magnetic Resonance Imaging.

Maman E, Harris C, et al:

J Bone Joint Surg Am 2009; 91 (August): 1898-1906

Risk factors for progression of tear size in the nonoperative treatment of rotator cuff tears include: increased duration of follow-up; the presence of a full-thickness tear; patient age >60 years; and the presence of fatty atrophy on MRI.

Background: The natural history of symptomatic rotator cuff tears that undergo nonoperative treatment is relatively unknown.
Objective: To use magnetic resonance imaging (MRI) to assess long-term structural outcomes of rotator cuff tears treated nonoperatively.
Design: Retrospective review. **Participants/Design:** 59 shoulders in 54 patients (21 men and 33 women; mean age, 58.8 years; range, 38 to 84 years) with rotator cuff tears on MRI were included in this retrospective study.
Methods: All patients were initially managed nonoperatively. All patients underwent a subsequent MRI ≥6 months after the initial MRI. The MRI images were evaluated by experienced musculoskeletal radiologists in a blinded fashion. The extent of change in the rotator cuff tear was compared between groups by age, length of follow-up, the involved tendon, the type of tear (partial-thickness tear compared with full-thickness tear, and bursal side compared with glenohumeral side), the existence of an acromial spur, acromioclavicular joint arthritis, and muscle atrophy, or fatty infiltration.
Results: Baseline MRI scans demonstrated 33 full-thickness tears, 26 partial-thickness tears, and 4 combined full-thickness and partial-thickness tears. Approximately 98% of the tears involved the supraspinatus tendon. The follow-up period ranged from 7 to 58 months (mean, 20 months). Each shoulder had a mean of 2.95 MRI scans, acquired at a mean interval of 10.1 months. During the follow-up period, 59% of the tears remained the same size and 32% became larger. Risk factors for progression of tear size included: duration of follow-up >18 months; the presence of a full-thickness tear as opposed to a partial-thickness tear; the age of the patient; and the presence of fatty infiltration in the muscle substance of the rotator cuff on the initial MRI. Tear size increased in 48% of the patients followed for >18 months versus 19% of the patients followed <18 months (P <0.05). Tear size increased in 52% of the full-thickness tears versus 8% of the partial-thickness tears (P <0.05). Tear size increased in 54% of patients >60 years of age versus 17% of patients <60 years of age (P <0.05).
Conclusions: Risk factors for progression of tear size in the nonoperative treatment of rotator cuff tears include: increased duration of follow-up; the presence of a full-thickness tear; patient age >60 years; and the presence of fatty atrophy on MRI.
Reviewer's Comments: This study is limited by its retrospective nature. It does, however, underscore the importance of the full-thickness tear and the presence of fatty infiltration on the risk of progression of tear size. Future studies are needed to develop an evidenced-based treatment recommendation on when to consider surgery on minimally symptomatic tears so as to avoid tear progression and irreparable tears in the future. (Reviewer-Adam J. Farber, MD).

Keywords: Nonoperative Treatment , MRI, Tear Progression

Print Tag: Refer to original journal article

Transphyseal ACL Reconstruction in Skeletally Immature Patients

Transphyseal Anterior Cruciate Ligament Reconstruction in Patients With Open Physes.

Cohen M, Ferretti M, et al:

Arthroscopy 2009; 25 (August): 831-838

Transphyseal ACL reconstruction with hamstring autograft in skeletally immature patients leads to good clinical outcomes and no growth abnormalities if proper techniques are utilized.

Background: The established treatment for anterior cruciate ligament (ACL) injuries in skeletally immature patients is still controversial.
Objective: To evaluate the clinical outcomes in patients with open physes who underwent ACL reconstructions with a transphyseal technique and to investigate growth abnormalities related to the procedure.
Design: Retrospective case series.
Participants/Methods: 26 skeletally immature patients (11 males and 15 females; mean age, 13.3 years; range, 11 to 15 years) with open tibial and femoral physes (physis >2 mm) who underwent transphyseal ACL reconstruction between 2000 and 2006 were included in this study. Preoperatively, the Tanner stage was determined. Intraoperatively, a tibial tunnel was drilled through the tibial physis by use of a 5-mm drill and manually dilated up to 6, 7, or 8 mm. The femoral tunnel was drilled with a 5-mm drill and manually dilated similarly. For all cases, quadrupled hamstring autograft tissue was utilized for the graft. Graft passage was then performed with the graft-tunnel interface tight. Femoral fixation by use of the Transfix technique and tibial fixation with a Bioscrew and staple were performed in the metaphysis away from the physis. Outcomes included AP stability (as measured by a KT-1000), validated clinical outcomes scores (including the International Knee Documentation Committee [IKDC] score and Lysholm Knee Scoring Scale), and radiographic measurements of length and angular deformity (as observed in a long film and scanogram of the lower limbs after physeal closure).
Results: 5 patients were in Tanner stage I or II, 9 in Tanner stage III, and 12 in Tanner stage IV, and no patient was scored in Tanner stage V. The mean follow-up period was 45 months (range, 24 to 84 months). The length of the operated limb was increased compared with that of the contralateral limb. The total mean length difference was 1.2 mm (range, −7 to 7 mm), but this was not statistically significant ($P = 0.227$). The mean angular deviation difference between the lower limbs was 0.46° of less valgus. No growth abnormalities, such as length discrepancies and axis deviation, were clinically detected. The mean difference in KT-1000 measurement was 2.0 mm. The mean subjective IKDC score was 91.5, and the mean score on the modified Lysholm scale was 93.5.
Conclusions: Transphyseal ACL reconstruction in the skeletally immature patient can lead to good clinical outcomes and no growth abnormalities. Care should be taken to ensure that only a soft-tissue graft is in contact with the physis, that the tunnel diameter is fully filled by the graft, allowing no empty spaces, and that no bone or hardware contacts the physis.
Reviewer's Comments: This study is limited by its small sample size, retrospective nature, and the lack of a control group. Future controlled studies are needed to validate these findings. (Reviewer-Adam J. Farber, MD).

Keywords: Anterior Cruciate Ligament, Reconstruction, Knee, Skeletally Immature, Transphyseal

Print Tag: Refer to original journal article

Stiffness Following Arthroscopic Rotator Cuff Repair.

Incidence and Treatment of Postoperative Stiffness Following Arthroscopic Rotator Cuff Repair.

Huberty DP, Schoolfield JD, et al:

Arthroscopy 2009; 25 (August): 880-890

Following arthroscopic rotator cuff repair, patients <50 years of age, Workmen's Compensation patients, patients with adhesive capsulitis or calcific tendonitis, and patients undergoing concomitant labral repair are at increased risk for postoperative stiffness.

Objectives: (1) To determine the incidence of postoperative adhesions and clinically significant stiffness (that which required reoperation) following arthroscopic rotator cuff repair and a conservative rehabilitation protocol. (2) To determine the factors associated with higher rates of postoperative stiffness. (3) To determine the results of arthroscopic lysis of adhesions and capsular release with regard to ultimate patient outcome and satisfaction.
Design: Retrospective review.
Methods: Records from 489 consecutive arthroscopic rotator cuff repairs performed by a single surgeon from January 2003 to December 2005 were reviewed. Double-row footprint repair of the rotator cuff was performed whenever possible. All patients underwent the same conservative postoperative rehabilitation protocol. Patients who were dissatisfied because of the development of adhesions and postoperative stiffness were identified and further analyzed. Using operative and office records, both clinical and surgical factors were evaluated for their effect on stiffness in these patients. Clinic notes were retrospectively reviewed to determine pre- and postoperative range of motion, pain scores, functional strength, and patient satisfaction. Patients who were dissatisfied because of the development of postoperative stiffness underwent arthroscopic lysis of adhesions and capsular release. The results of these procedures were also analyzed.
Results: 24 of the 489 patients (4.9%) were dissatisfied with their postoperative stiffness and underwent arthroscopic lysis of adhesions and capsular release. This procedure was performed from 4 to 19 months (median, 8 months) after the initial rotator cuff repair. The need for arthroscopic lysis of adhesions and capsular release was significantly more common in patients with Workers' Compensation insurance (8.6%), patients <50 years of age (8.5%), those with a coexisting diagnosis of calcific tendonitis (16.7%) or adhesive capsulitis (15.0%), single-tendon repairs (7.3%), partial articular-sided tendon avulsion (PASTA)-type rotator cuff tears (13.5%), and patients undergoing concomitant labral repair (11.0%). Patients with concomitant coracoplasty (2.3%) or tears larger in size and/or involving ≥3 tendons were less likely (P <0.05) to develop postoperative stiffness. Following capsular release, visual analog pain scores ranged from 0 to 3 (median, 1), University of California-Los Angeles scores ranged from 28 to 35 (median, 33), range of motion normalized, and all patients were satisfied with the results of their treatment.
Conclusions: In 1 surgeon's series, the incidence of postoperative stiffness following arthroscopic rotator cuff repair is 4.9%. Risk factors for postoperative stiffness include: clinical factors (diagnosis of calcific tendinitis or adhesive capsulitis), surgical factors (single-tendon cuff repair, PASTA repair, or concomitant labral repair), demographic factors (age <50 years), and social factors (Workers' Compensation patients). Arthroscopic capsular release is effective in treating postoperative stiffness.
Reviewer's Comments: Given the biomechanical strength of double-row repairs, perhaps a more aggressive rehabilitation protocol is warranted. Future controlled studies should address this. (Reviewer-Adam J. Farber, MD).

Keywords: Complications, Postoperative Stiffness, Rotator Cuff Repair

Print Tag: Refer to original journal article

Biomechanical Properties of TOE Double-Row Rotator Cuff Repairs

A Biomechanical Comparison of 2 Transosseous-Equivalent Double-Row Rotator Cuff Repair Techniques Using Bioabsorbable Anchors: Cyclic Loading and Failure Behavior.

Spang JT, Buchmann S, et al:

Arthroscopy 2009; 25 (August): 872-879

There are no biomechanical differences between the transosseous-equivalent (TOE) double-row rotator cuff repair using 4 insertion anchors and FiberTape and the conventional TOE double-row construct using 2 suture anchors and 2 insertion anchors.

Background: The optimal configuration for transosseous-equivalent (TOE) double-row rotator cuff repair constructs has yet to be determined.
Objective: To evaluate a novel TOE double-row technique using a newly available suture material (FiberTape) with insertion anchors for both the medial and lateral rows and to compare this novel technique with a more conventional TOE construct that uses suture anchors for the medial row and insertion anchors for the lateral row.
Design: Biomechanical cadaveric study.
Materials/Methods: 10 matched-pair sheep shoulders were utilized for this experiment. After specimens were dissected and potted, a rotator cuff tear was created with sharp dissection off the humeral insertion. Rotator cuff repairs were then performed; matched-pair shoulder specimens allowed each repair technique to be performed on the same animal. Group A shoulders were repaired with corkscrew suture anchors for the medial row and insertion anchors for the lateral row. Group B shoulders were repaired using a new tape-like suture material (FiberTape) with insertion anchors for both the medial and lateral rows. All specimens underwent cyclic loading from 10 to 150 N at a rate of 0.25 Hz for 100 cycles. Gap formation and strain within the repair area for the first and last cycles were recorded. Then specimens were loaded until structural failure at a rate of 1 mm/second. Stiffness and failure load were then calculated.
Results: There were no statistically significant biomechanical differences between Group A and Group B specimens. The ultimate failure loads were similar for both Group A and Group B specimens (421 N in group A vs 408 N in group B; $P > 0.05$). The stiffness of the 2 different repair constructs was also similar (84 N/mm in group A vs 99 N/mm in group B; $P > 0.05$). There were no significant differences ($P > 0.05$) in gap formation or strain over the repair area when Group A and Group B specimens were compared.
Conclusions: No significant biomechanical differences were found between the two different double-row rotator cuff repair techniques.
Reviewer's Comments: This study is limited by the fact that it is a biomechanical cadaveric study with only time-zero data. Clinical studies are needed to validate these results. It is also important to recognize the increased intraoperative technical complexity associated with suture passage through the rotator cuff using the tape-like material. (Reviewer-Adam J. Farber, MD).

Keywords: Rotator Cuff, Double-Row Transosseous Equivalent, Suture Anchor, Biomechanical Testing

Print Tag: Refer to original journal article

Arthroscopic Tx of Rotator Cuff Dz Has Excellent Outcomes

Prospective Analysis of Arthroscopic Rotator Cuff Repair: Subgroup Analysis.

Nho SJ, Shindle MK, et al:

J Shoulder Elbow Surg 2009; 18 (September): 697-704

Male patients with single tendon rotator cuff tears appear to have more favorable ASES scores compared to their respective counterparts following arthroscopic rotator cuff repair.

Background: Prospective studies evaluating arthroscopic rotator cuff repair are scarce in the literature. The authors of the present study established the Arthroscopic Rotator Cuff Registry to prospectively evaluate the effectiveness of arthroscopic rotator cuff repair over a 5-year period.
Objective: To report the short-term results of a cohort of patients who underwent arthroscopic rotator cuff repair and to identify factors that may affect outcomes.
Design: Prospective cohort study.
Participants/Methods: 127 patients (77 males and 50 females; mean age, 58.6 years) who underwent all-arthroscopic rotator cuff repair and completed 2-year follow-up were included in this study. Prior to surgery, all patients completed a detailed preoperative questionnaire. Intraoperative data were recorded including labral pathology (location and size), chondral lesions (location, size, and depth), biceps tearing (none, incomplete, or complete), and rotator cuff pathology (lesion size, tear thickness [full or partial]), and tendon(s) involved (single or multiple). The details of the arthroscopic rotator cuff repair were recorded and included information on the number of suture anchors, the suture anchor row configuration (single or double), and the tissue quality. Concomitant procedures were also recorded including acromioplasty, superior labrum anterior posterior (SLAP) procedures, biceps procedures, or acromioclavicular (AC) joint procedures. Outcome measures included physical examination (including manual muscle testing), validated outcome scores (the American Shoulder and Elbow Surgeons [ASES] score), and imaging techniques (ultrasonography).
Results: Mean follow-up was 28.2 months. ASES scores improved from 52.37 preoperatively to 83.88 at 1 year (P <0.0001) and 92.65 at 2 years (P <0.0001). Male gender, single tendon involvement, and patients without AC joint procedures performed had statistically significantly higher ASES scores. The percentage of healed rotator cuff tears as determined by ultrasound was 64.1% at 3 months, 64.34% at 1 year, and 75.42% at 2 years (P <0.05). Patient age, rotator cuff tissue quality, AC joint pathology, biceps pathology, and rotator cuff tear size all had a significant effect on postoperative tendon integrity. Suture anchor row configuration did not affect tendon healing. Patients with intact cuff repairs as determined by ultrasound had higher ASES scores than those with defects seen at the repair site (93.9 vs 88.0; P =0.0623). Following surgery, there were statistically significant improvements in range of motion (both forward elevation and external rotation) and strength (in forward elevation), regardless of whether healing occurred.
Conclusions: The treatment of rotator cuff disease with arthroscopic repair results in excellent clinical and radiographic outcomes.
Reviewer's Comments: This study is limited by the number of patients lost to follow-up (35%), the lack of a control group, and the use of ultrasound, as opposed to MRI or second-look arthroscopy, to determine cuff healing. It will be interesting to see the results of future long-term studies from this registry. (Reviewer-Adam J. Farber, MD).

Keywords: Rotator Cuff Tear, Repair, Arthroscopy, Ultrasonography

Print Tag: Refer to original journal article

Determining Shoulder Laxity During Examination Under Anesthesia

An Analysis of Shoulder Laxity in Patients Undergoing Shoulder Surgery.

Jia X, Ji JH, et al:

J Bone Joint Surg Am 2009; 91 (September): 2144-2150

During EUA, the ability to subluxate the humeral head over the glenoid rim is common regardless of diagnosis, and the extent and distribution of shoulder laxity grades vary according to diagnosis.

Objectives: (1) To determine if, during examination under anesthesia (EUA), the humeral head can be translated over the glenoid rim in the majority of patients undergoing shoulder surgery for any reason; (2) to determine if patients undergoing shoulder surgery for unilateral instability had asymmetric laxity during EUA; and (3) to see if the grade of shoulder laxity during EUA correlates with the diagnosis of shoulder instability.
Methods: 1206 patients (716 males and 490 females; mean age, 45 years; age range, 12 to 86 years), who underwent shoulder surgery, including diagnostic arthroscopy, for any reason at 1 institution from 1992 to 2007 were included in the study. Bilateral shoulder laxity was assessed in all patients with an EUA. The examination included a modified anterior and posterior drawer test as well as a sulcus sign. The anterior and posterior laxity was measured using the modified Hawkins scale: grade I is the inability to translate the humeral head over the glenoid rim. Grade II is subluxation over the glenoid rim with spontaneous reduction. Grade III is subluxation without spontaneous reduction. The sulcus sign was graded as <1.0 cm (Grade I), 1.0 to 2.0 cm (Grade II), or >2.0 cm (Grade III).
Results: During EUA, 81.6% of the patients had anterior laxity grade II or III; in other words, the humeral head could be translated over the glenoid rim. In addition, 57.5% of the patients had posterior laxity grade II or III. When the results of the EUA were compared to the results of the preoperative examination performed in the office setting, the grade of laxity increased during the EUA in 50.8% of the patients anteriorly, in 36.3% posteriorly, and in 15.8% inferiorly. When the results of the EUA were analyzed by diagnosis, higher grades of laxity in any direction were associated with an increased likelihood that the patient had a diagnosis of instability. The presence of grade III laxity, as opposed to grade I laxity, during EUA was highly suggestive of the diagnosis of instability; the odds ratio was 170 for the anterior direction, 32 for the posterior direction, and 10.3 for the inferior direction.
Conclusions: Regardless of the indication for shoulder surgery, during EUA the humeral head can be translated over the glenoid rim anteriorly in >80% of patients and posteriorly in >55% of patients. However, grade III shoulder laxity during EUA is strongly associated with shoulder instability.
Reviewer's Comments: This study is limited by the lack of a control group of patients not undergoing surgery, as well as by the inherent variability associated with noninstrumented laxity testing. Future studies utilizing instrumented laxity testing may be able to define a critical threshold or side-to-side difference that can be used to better diagnose instability. (Reviewer-Adam J. Farber, MD).

Keywords: Anesthesia, Shoulder Examination, Laxity, Instability

Print Tag: Refer to original journal article

N-Acetylcysteine--A Chondroprotective Agent

N-Acetylcysteine Inhibits Post-Impact Chondrocyte Death in Osteochondral Explants.

Martin JA, McCabe D, et al:

J Bone Joint Surg Am 2009; 91 (August): 1890-1897

N-acetylcysteine can preserve chondrocytes following impact injury to articular cartilage.

Background: Cartilage damage caused by a single impact is thought to be a major risk factor for posttraumatic osteoarthritis. Studies have shown that chondrocytes begin to die within moments after impact and continue to die for up to several days. Chondrocyte death in injured cartilage can be dramatically reduced by apoptosis inhibitors. *N*-acetylcysteine inhibits apoptosis by acting as a free-radical scavenger.
Methods: Articular cartilage explants were obtained from fresh bovine specimens and immediately placed in culture. The specimens were impacted with a 5.0-mm diameter brass rod by dropping a 2-kg mass from a height of 14 or 7 cm onto an indenter. Stains were used to identify viable and nonviable cells. Cartilage proteoglycan content was measured by glycosaminoglycan assay. The effect of impact energy on severity and timing of chondrocyte death, the effect of treatment of specimens with *N*-acetylcysteine, the effect of timing of *N*-acetylcysteine treatment on chondrocyte viability, and the effect of *N*-acetylcysteine on proteoglycan content were evaluated.
Results: Structural damage to the cartilage extracellular matrix was evident immediately after impact at both impact-energy levels, but was more severe in the 14-J/cm2 group. The viability in the 7- and 14-J/cm2 groups decreased to 45% and 35%, respectively. More than 85% of the chondrocyte death occurred within the first 6 to 12 hours after impact loading. Treatment with *N*-acetylcysteine immediately after impact improved viability at 48 hours, a time when death had reached a steady state. The improvement was from 35% (without treatment) to 64% (with *N*-acetylcysteine treatment) after a 14-J/cm2 injury and from 40% to 72% after a 7-J/cm2 injury. When treatment with *N*-acetylcysteine was delayed, chondrocyte viability decreased. The percentage of viable cells measured 48 hours after a 7-J/cm2 injury fell from 74% to 68% with a 2-hour delay, 59% with a 4-hour delay, and 39% with a 12-hour delay.
Conclusions: *N*-acetylcysteine can help preserve chondrocytes following impact injury to articular cartilage. Treatment with *N*-acetylcysteine significantly inhibited matrix glycosaminoglycan loss at impact sites for up to 14 days following injury, an indication that this agent may have long-term beneficial effects beyond acute preservation of viability.
Reviewer's Comments: This basic science study provides valuable information on the potential for developing a clinically useful chondroprotective agent. One limiting factor in the practical application of *N*-acetylcysteine is the rapidity at which its effectiveness diminishes after chondral injury. In clinical practice, it would be difficult to diagnose a chondral injury in <12 hours after injury. I am also unsure if the impact loading method used in this study mimics en vivo loading conditions. Still, it is encouraging to know that the potential exists to preserve chondrocytes after they have been damaged. (Reviewer-Carl H. Wierks, MD).

Keywords: Antioxidants, Chondrocyte Damage

Print Tag: Refer to original journal article

Treatment of Glenoid Bone Deficiency Based on Bone Loss

Glenoid Bone Deficiency in Recurrent Anterior Shoulder Instability: Diagnosis and Management.

Piasecki DP, Verma NN, et al:

J Am Acad Orthop Surg 2009; 17 (August): 482-493

The glenoid rim is altered in up to 90% of shoulders with recurrent instability.

Background: Fracture and/or attritional glenoid bone loss may contribute to recurrent instability by altering the glenohumeral contact area and the function of the static restraints. Glenoid bone loss has been reported in up to 90% of recurrent instability cases. Most defects are located between 2:30 and 4:20 on a clock face around the glenoid. Some lesions occur at the time of initial dislocation, whereas others develop, progress, or remodel as a consequence of repeated instability episodes. CT imaging and arthroscopic techniques can be used to measure the amount of bone loss. Arthroscopically, percent of bone loss is calculated by subtracting the distance from the bare spot to the anterior rim from the distance from the bare spot to the posterior rim and dividing this sum by twice the distance from the bare spot to the posterior rim. Data suggest that significant instability will accompany anterior width losses of >25% to 30% at the level of the bare spot, or inferior glenoid surface area losses of >20% to 25%. If an engaging Hill-Sachs lesion is present, smaller glenoid defects take on greater significance. **Management:** Nonsurgical treatment is best applied to low demand patients with <20% anterior bone loss. The focus is on enhancing the dynamic stabilizers, such as the periscapular and rotator cuff musculature. Most active patients with acute >30% glenoid bone loss should be considered for surgery. If the bone loss is <15%, incorporating the bone fragment into the repair may be critical in preventing future instability. If the bone loss approaches 25%, the rim avulsion fracture can be arthroscopically reduced and fixed to the glenoid rim with suture anchors in the labral interface. For bone loss of >25% (<4 to 5 mm of bone remaining anterior to the bare spot and/or an inverted pear appearance), best results require reconstitution of the glenoid bony arc. Ideally, this is obtained by repairing fracture fragments along with the capsulolabral tissues either through an open or arthroscopic technique. If sufficient native bone is not present, bone augmentation is necessary to restore the glenoid to a near-anatomic state. No one technique has demonstrated superiority over another, but the most popular are ones that transfer the coracoid process to the anterior-inferior glenoid (ie, Bristow or Latarjet procedures). **Summary:** As the degree of bone loss increases, the ability to ensure predictable function and return to play diminishes. A satisfactory return to function can be attained in most patients, however, if attention is paid to basic biomechanical, clinical, and reconstructive principles.

Reviewer's Comments: This is a nice review article of a difficult topic. The authors provided a nice treatment algorithm based on quantity of bone loss and patient activity level. (Reviewer-Carl H. Wierks, MD).

Keywords: Glenoid Bone Deficiency, Recurrent Shoulder Instability

Print Tag: Refer to original journal article

Epidemiology of ACL Reconstruction

Epidemiology of Anterior Cruciate Ligament Reconstruction: Trends, Readmissions, and Subsequent Knee Surgery.

Lyman S, Koulouvaris P, et al:

J Bone Joint Surg Am 2009; 91 (October): 2321-2328

The risk of subsequent operation after ACL reconstruction is higher in younger patients and those treated at lower-volume hospitals or by lower-volume surgeons.

Objective: To determine the frequency of anterior cruciate ligament (ACL) reconstruction and identify factors affecting the frequency of hospital readmissions within 90 days and to explore the risk factors for subsequent operations on either knee following ACL reconstruction.
Design: Database query.
Methods: A statewide database from the New York State Department of Health was used to identify primary ACL reconstruction procedures performed in the state of New York from 1997 to 2006. Hospital readmissions within 90 days after surgery, subsequent operations on either knee within 1 year, and subsequent ACL reconstructions on either knee within 1 year were recorded. Laterality indicator of the index procedure and subsequent knee surgeries were not documented in the database, so revision knee surgery could not be differentiated from subsequent surgery on the contralateral knee. The hospital's yearly volume of ACL reconstructions and surgeon volume of the same was calculated from 12 months prior to the index procedure.
Results: A total of 70,547 ACL reconstructions were performed between 1997 and 2006 in New York State. Thirty-seven percent of these procedures were isolated ACL reconstructions, >50% involved a concomitant meniscal procedure, and >30% involved another concomitant knee procedure. A 21% increase in the frequency of ACL reconstruction occured from 1997 to 2006. The frequency of readmission within 90 days was 2.3%, and the frequency of subsequent surgery on either knee within 1 year was 6.5%. The frequency of a subsequent ACL reconstruction on either knee within 1 year was 1.9%. Patient-based predictors of readmission within 90 days were age (patients <40 years old had a substantially decreased risk of readmission), male sex, a higher comorbidity index, and other concomitant knee surgery. Hospital-based predictors of readmission were an index inpatient operation, a hospital volume of <125 cases per year, and a surgeon volume of <6 cases per year. Patient-based risk factors for subsequent surgery on either knee within 1 year were female sex and other concomitant knee surgery. An index inpatient operation and surgeon volume of <52 cases/year were significant hospital-based predictors. Patient-based predictors of a subsequent ACL reconstruction on either knee within 1 year were age <40 years, concomitant meniscectomy, and other concomitant knee surgery.
Conclusions: The frequency of ACL reconstruction is increasing in the United States. Younger patients are at higher risk for a subsequent ACL reconstruction on either knee within 1 year, and selected outcomes are better when the procedures are performed at higher-volume hospitals and by higher-volume surgeons.
Reviewer's Comments: This is an informative article that demonstrates that higher surgeon and hospital volume in ACL reconstruction, like other surgeries, such as joint arthroplasty, results in safer surgery and may have superior outcomes compared to lower-volume surgeons and hospitals. (Reviewer-Carl H. Wierks, MD).

Keywords: Anterior Cruciate Ligament, Epidemiology, Readmissions

Print Tag: Refer to original journal article