Patients <25 years of age with a large Hill-Sachs lesion and generalized ligamentous laxity are at greater risk for recurrent anterior shoulder instability after arthroscopic Bankart capsulorrhaphy.

**Objective:** To evaluate the short-term results of arthroscopic Bankart reconstructions.

**Design:** Prospective case series.

**Participants/Methods:** Over a 1.5-year period, 109 patients underwent anterior shoulder stabilization. Exclusion criteria included full-thickness rotator cuff injury, multidirectional instability, and open procedures. Eighty-three patients met the inclusion criteria for arthroscopic stabilization utilizing suture anchors. Mean age was 32.6 years (range, 15 to 55 years), with 8 patients <20 years of age and 28 patients aged 20 to 30 years. The average time to surgery was 3.9 years (range, 15 days to 20 years), with 35 patients operated on within the first year of injury. Twenty-six patients had sustained a single dislocation. Before surgery, 30 patients had between 2 and 5 dislocations, and 17 had >5. Thirty-eight patients sustained the dislocation in a sporting activity. At surgery, 7 patients were repaired with 1 anchor, 18 with 2 anchors, 39 with 3, and 9 with ≥4 anchors; 32 patients had a Hill-Sachs lesion.

**Results:** 13 patients (18%) sustained a recurrent instability episode, 6 as a result of another traumatic injury. Average time to recurrence was 1.7 years (range, 12 to 42 months). Risk ratio for recurrent instability was 3.9 for a large Hill-Sachs lesion, 3.8 for age <25 years, 3.3 for ligamentous laxity, and 2.9 for contact sports. Overall, The American Shoulder and Elbow Surgeons (ASES) scores improved from 75.4 preoperatively to 94.9 at last follow-up. However, in those with recurrent instability, the ASES score was only 87.9. Two patients underwent a revision stabilization procedure. Two additional patients underwent additional surgery for postoperative stiffness.

**Conclusions:** Young patients playing contact sports have a high incidence of recurrent shoulder instability after arthroscopic stabilization.

**Reviewer’s Comments:** This is a very sobering article from a very accomplished group of shoulder surgeons. While overall the results seem very acceptable, this patient population was much older, with half of the dislocations from injuries other than sporting activities. Young patients playing contact sports have almost a 4 times risk of recurrence. The authors suggest that these patients should be considered for an open stabilization procedure. Perhaps addressing the Hill-Sachs lesion may improve results. These results should be discussed with patients for the risk factors for recurrence. (Reviewer—John H. Wilckens, MD).

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Keywords: Shoulder Instability, Bankart Reconstruction

Print Tag: Refer to original journal article
How Common Are ACL Reconstruction Infections?


Barker JU, Drakos MC, et al:


The use of allograft tissue does not increase the risk of infection after ACL reconstruction.

**Objective:** To review the incidence of postoperative infection in ACL reconstructions.

**Design:** Retrospective cohort study.

**Methods:** Over a 5-year period, the authors completed 3126 ACL reconstructions at their institution. A review of the infectious disease department records revealed 18 intra-articular deep infections from these 3126 reconstructions. This list was also checked against hospital computer records of ICD-9 and CPT codes, and no further ACL-associated deep infections were revealed. The authors describe their perioperative routine. All their fresh frozen allografts were obtained from 1 of 3 sources, with tissue handling detailed per company protocol. Patients with intra-articular infection underwent clinical exam, laboratory assessment, and knee aspiration when possible. Patients underwent emergent arthroscopic irrigation and debridement and graft retention when possible. Postoperatively, patients were treated with an appropriate intravenous antibiotic for 6 weeks.

**Results:** Of the 3126 reconstructions, there were 18 documented postoperative intra-articular infections, for an incidence of 0.58%. Of the 1777 autografts, there were 1430 bone-tendon-bone (BTB) autografts and 347 hamstring autografts. There were 7 BTB autograft infections (0.49%) and 5 hamstring autografts (1.44%). Of the 1349 allografts, there were 6 infections, for an incidence of 0.44%. Ten patients presented with fever (38.5°C), 10 with pain, 8 with redness, 6 with swelling, and 3 with drainage; 17 patients presented with ≥2 of the above symptoms. Mean presentation was 32 days (range, 5 to 205 days), with 5 presenting in <2 weeks, 11 within 2 weeks to 2 months of reconstruction, and 2 after 3 months. When available, the average erythrocyte sedimentation rate was 80 (range, 15 to 118), C-reactive protein was 17.5 (range, 4.5 to 38.1), and WBC count was 9.6 (range, 6.0 to 13.8). Aspiration results available on 10 patients revealed an average WBC count of 115,000 with only 2 patients with a WBC count of <50,000. Seven patients required a second irrigation and debridement, and 1 required a third procedure. Graft was retained in 13 patients (72%). The grafts debrided included 1 allograft, 1 BTB, and 3 hamstring autografts. Organisms included 6 methicillin-sensitive *Staphylococcus aureus*, 4 methicillin-resistant *S. aureus*, and 2 *Propionibacterium acnes*. In 6 deep infections, no organism was isolated.

**Conclusions:** Allograft ACL reconstructions did not demonstrate an increased incidence of infections.

**Reviewer's Comments:** This outstanding article provides a lot of very useful information for surgeons and patients alike in the decision for ACL graft, the incidence of infection, and what happens after infection. The authors highlight prompt and aggressive management, which allowed 72% retention of infected grafts, including allografts. It would be very helpful to know, in these retained grafts, the ultimate clinical outcome of stability, range of motion, pain, and function. (Reviewer-John H. Wilckens, MD).

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Keywords: ACL, Reconstruction, Infections

Print Tag: Refer to original journal article
Autologous chondrocyte implantation demonstrates long-term durability.

**Background:** In 2002, Dr. Lars Petersen reported his European results, that 84% of his patients treated with autologous chondrocyte implantation (ACI) demonstrated good or excellent results at 7.4 years (range, 5 to 11 years).

**Objective:** To review the U.S. experience with ACI.

**Design:** A multi-center case series.

**Methods:** Genzyme Biosurgery of Cambridge, MA, developed a U.S. Cartilage Repair Registry, beginning in 1995. This registry had to undergo extensive changes to comply with the Health Insurance Portability and Accountability Act (HIPAA) of 2003. To be included in this study, registered patients had to have a full-thickness chondral lesion of the distal femur, be treated with ACI before December 31, 1996, have baseline and intermediate follow-up (1 to 5 years), and be HIPAA compliant. These registry patients from several centers were again followed up 6 to 10 years after implantation. Of the 150 registered ACI patients before December 31, 1996, only 72 met all the inclusion criteria and represent the study group. Mean age was 37 years, and 61% of subjects were male. Mean surface area of the cartilage lesion was 5.2 cm² (range, 0.4 to 23.5 cm²); 83% of the patients had a single lesion. Of the 84 total lesions, 61 were on the medial femoral condyle, 15 were on the lateral femoral condyle, and 8 were in the trochlea. Cincinnati Scores were evaluated at baseline, at intermediate follow-up (1 to 5 years), and at long-term follow-up (6 to 10 years; mean, 9.2 years).

**Results:** Of the 72 study registry patients, 54 patients demonstrated improvement at 4.6 years (range, 1 to 5 years). Of these 54 patients, 47 (87%) demonstrated sustained improvement. Seven patients (13%) did not sustain improvement. Of the 18 patients who did not show improvement at intermediate follow-up, 3 (17%) demonstrated improvement, whereas 15 (83%) showed no improvement over baseline. Thirty patients in the study group underwent an additional 42 operations, with 38 occurring during the intermediate follow-up. Eighteen of these cases were not ACI failures. In the intermediate follow-up group, there were 9 ACI treatment failures, with an additional 3 patients in the long-term follow-up group.

**Conclusions:** The long-term U.S. experience demonstrated durability of ACI treatment of full-thickness lesions of the distal femur.

**Reviewer’s Comments:** The article presents exhaustive data that capture the very early U.S experience of ACI. Those familiar with ACI can account for the learning curve. Sixty-nine percent of patients were improved at 9.2 years, 12.5% had no change, and 17% failed ACI treatment. Most of the failures in ACI occurred at a mean follow-up of 2.5 years. It will be interesting to see if better patient selection, more aggressive treatment of concomitant instability and malalignment, and mastering the learning curve can improve on these modest results for this very difficult problem. (Reviewer—John H. Wilckens, MD).

© 2010, Oakstone Medical Publishing

Keywords: Cartilage Restoration, Autologous Chondrocyte Implantation

Print Tag: Refer to original journal article
A technique using single #5 FiberWire core stitch with side-locking loop can allow patients to ambulate without immobilization after Achilles tendon repair.

**Objective:** To review the results of Achilles tendon repair using a single #5 braided FiberWire and early postoperative range of motion and ambulation.

**Design:** Case series.

**Methods:** Over a 2-year period, the authors identified 20 consecutive patients (14 men, 6 women) who sustained an acute Achilles tendon rupture. Mean age was 43.4 years (range, 16 to 70 years). All patients underwent acute repair within 3 days of injury through a 7-cm incision along the medial border of the Achilles tendon. Paratenon was elevated off the ruptured tendon. The bulk of the tendon was repaired with a single #5 braided FiberWire using a single-core stitch with a locking loop on the proximal and distal ends. Additionally, tendon ends were approximated and fixed with a 3-0 Vicryl suture and a peripheral running polypropylene stitch. The paratenon was also repaired. Recorded information included time to full ankle range of motion, when patients could walk without pain or fear, when they could do a double-leg heel raise, and when they could do 20 continuous single-leg heel raises. Patients were allowed partial weight bearing at 1 week and full weight bearing at 4 weeks; at 6 weeks, they were allowed to do double-leg heel raises. At the end of 12 weeks, patients were allowed to resume sporting activities and heavy labor. Time to full range of motion was 3.2 weeks. Patients were able to walk without pain or fear at an average of 4.5 weeks from surgery. Patients were able to do double-leg heel raises at 6.3 weeks and 20 continuous repetitions with single-leg raises at 9.9 weeks. Patients were able to return to heavy labor or sporting activities at an average of 14.4 weeks. No complications were noted.

**Conclusions:** #5 FiberWire core stitch with locking loop allowed early range of motion and weight bearing in patients undergoing acute Achilles tendon repair.

**Reviewer's Comments:** This is a very impressive but small case series of Achilles tendon repairs. These patients had no complications. Patients had excellent early range of motion and were able to return to weight bearing very early. I would be concerned that there would be some elongation at the repair site. A #5 FiberWire is a large stitch with obvious adequate strength to allow early weight bearing and range of motion. The authors demonstrated a novel way to bury the large knot during the repair. I would feel more comfortable returning patients back to sporting activities with at least 90% strength to the opposite side. It appears that early range of motion and walking actually stimulates healing. While the repair may be strong enough for generalized weight bearing, most surgeons probably have their patients wear a postoperative orthosis to prevent against an accidental fall and re-rupture of the repair. (Reviewer-John H. Wilckens, MD).

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**Keywords:** Achilles Tendon Repairs

**Print Tag:** Refer to original journal article
Uncontrolled pain is the primary reason for considering proximal interphalangeal joint arthroplasty.

**Background:** Options for proximal interphalangeal (PIP) joint arthritis include nonoperative treatments, such as activity modification, anti-inflammatory medications (such as corticosteroid injections), and other pain-modifying alternatives. When nonoperative options fail to relieve symptoms to the patient's satisfaction, surgical choices include arthrodesis or arthroplasty. Arthroplasty may be performed with monoblock silicone or 2-or-more-piece metal or metal-alternative "unconstrained" devices.

**Objective:** To report outcomes after PIP pyrocarbon arthroplasty with minimum 1-year follow-up.

**Methods:** 50 joints in 40 patients were assessed ≥1 year out from PIP pyrocarbon arthroplasty. The primary indication for surgery was pain, and diagnoses included osteoarthritis, posttraumatic arthritis, and rheumatoid arthritis. Surgery was performed through a dorsal incision that detached the central slip, which was repaired through burr holes at the end of the procedure. Postoperatively, patients had therapy including an extension block splint to limit extension to around 20° short of neutral.

**Results:** The visual analog scale for pain decreased for all patients from an average of 3.1 preoperatively to 0.4 postoperatively (\(P<0.001\)). Of the 40 patients, 36 were pain free at rest. Range of motion at the PIP joint was unchanged; however, the DIP joint had an 8° loss of range of motion postoperatively (\(P<0.03\)). Grip strength was unchanged. Mean Disability of the Arm, Shoulder, and Hand score decreased from 38 preoperatively to 28 postoperatively (\(P<0.026\)). Seven patients required various reoperations for significant complications (eg, pain, contracture, hyperextension, loosening, etc; this did not include squeaking joints, superficial wound issues, etc).

**Conclusions:** The primary indication for PIP arthroplasty should be pain. The distal interphalangeal joint should not be neglected during postoperative management.

**Reviewer's Comments:** This prospective cohort adds further evidence regarding PIP pyrocarbon arthroplasty; it can often relieve pain and improve patient function and satisfaction. Unfortunately, no control or comparison group was used, which limits the results. Overall, this trial provides findings similar to those of previous studies of this implant. These results are in keeping with the prevailing opinion—pain that cannot be controlled nonoperatively should be the primary surgical indication. This is in line with other orthopaedic arthroplasty principles in which an increase in range of motion or strength is typically not expected. This study also adds to the existing literature suggesting that pyrocarbon arthroplasty is associated with a relatively high complication rate (7 of 40 patients in this series, or 17.5%). Another limitation of the study is that no radiographic results are presented as aseptic loosening, which is a concern with this implant in many surgeons' minds. The authors also do not describe the final results of the patients who had complications that required reoperation. Finally, the postoperative protocol differed from other studies in that an effort was made to limit hyperextension of the PIP joint postoperatively, although this has not been a previously reported concern. (Reviewer-Kenneth R. Means, Jr, MD.)

© 2010, Oakstone Medical Publishing

Keywords: Proximal Interphalangeal Joint Arthroplasty

Print Tag: Refer to original journal article
Can Hip Exam Be Both Comprehensive and Time Efficient?


Martin HO, Kelly BT, et al:

Arthroscopy 2010; 26 (2): 161-172

It is possible to perform a comprehensive examination of the hip that is both comprehensive and time-efficient.

**Background:** There are few reports that have established which clinical tests are most important for examining the hip.

**Objective:** To evaluate the physical examination tests used by 6 orthopaedic surgeons who specialize in treating hip disorders.

**Design:** Observational study of physical examinations.

**Participants/Methods:** 11 volunteers with hip pain underwent clinical examination by 6 orthopaedic surgeons who specialize in treating hip problems. The clinical examinations were videotaped to assess the number and type of clinical test and the tests that reproduced pain. Standing assessment included gait, the single-leg stance phase test (similar to the Trendelenburg Test), and overall laxity. Range of motion (ROM) testing was performed with the patient in either the supine or seated position. Patients underwent palpation, performed a straight leg raise against resistance (SLRAR), and underwent strength testing in the supine position. Other supine tests included the dynamic external rotatory impingement test (DEXRIT), the dynamic internal rotatory impingement test (DIRIT), the flexion/abduction/external rotation (FABER) test, the passive supine rotation test, the posterior rim impingement test, and the flexion/adduction/internal rotation (FADDIR) test. The hip specialists performed passive adduction tests to assess tensor fascia lata contracture, gluteus medius contracture, and gluteus maximus contracture. Femoral anteversion was assessed with the patient in the prone position.

**Results:** The surgeons averaged 6.6 minutes examining the patients. Eighteen tests were performed by 40% of the examiners. Ten tests were performed by >50% of the examiners. The surgeons performed the gait test, single-leg stance phase test, and a test for laxity with the patient in the standing position. When the patient was supine, the examiners performed the following tests: ROM for flexion, internal rotation, and external rotation; FADDIR; FABER; SLRAR; DIRIT; DEXRIT; strength assessment; passive supine rotation test; and palpation. Three tests were performed in the lateral position: palpation, passive adduction, and abductor strength. The one common test performed with the patients in the prone position was the test for femoral anteversion. When the authors looked at the agreement for obtaining positive test results, they found that ROM testing had the greatest concordance. The FABER and FADDIR tests had somewhat less concordance.

**Conclusions:** There are enough common tests performed by examiners in this study that can serve as a basis for examining a patient with hip pathology.

**Reviewer's Comments:** This is an extremely thorough article that covers the physical examination tests performed by some of the foremost leaders in hip arthroscopy in the United States. The authors present a cogent strategy for examining patients with hip disorders. The article is primarily expert opinion. There is some attempt to validate their physical findings; further studies to elucidate which physical examination tests are most accurate will be very useful. (Reviewer-Nathaniel P. Cohen, MD).

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**Keywords:** Hip, Physical Examination

**Print Tag:** Refer to original journal article
Arthroscopic rotator cuff repair in patients aged ≥65 years can yield successful results. Smaller tears are associated with better outcomes.

**Background:** Age has been proposed as a factor in rotator cuff failure, although no studies have reported on this factor's effect on healing.

**Objective:** To examine the success of arthroscopic rotator cuff repair in patients aged ≥65 years.

**Design:** Therapeutic case series (level of evidence, IV).

**Methods:** The senior author performed 458 arthroscopic rotator cuff repairs over a 4-year period. Eighty-eight of these patients were enrolled in the study. Inclusion criteria were age ≥65 years, the presence of a rotator cuff tear, all-arthroscopic repair, and complete clinical and radiographic follow-up. All patients underwent an arthroscopic single-row repair with suture anchors. Biceps tenotomy was performed in 66 patients. Tear size was determined arthroscopically. Patients underwent arthroscopic subacromial decompression routinely, and were followed up clinically at 3, 6, 12, and 24 months and then at yearly intervals. They also underwent CT arthrography to assess healing at 6 months. Repair integrity was assessed on a 3-stage scale: stage 1, watertight seal with anatomic healing; stage 2, watertight seal and partial healing; and stage 3, non-watertight seal with a re-tear.

**Results:** 34 men and 54 women (average age, 70 years) underwent repair. Seven patients were lost to follow-up. Sixty-one patients had chronic shoulder pain for at least 6 months. In fact, 25 patients had symptoms for >1 year before surgery. Seventy patients had undergone a subacromial injection. Final follow-up averaged 41 months (range, 24 to 77 months). Clinically, there was a significant improvement in the Constant score (45.1 preoperatively to 78.5 postoperatively) and in the Simple Shoulder Test (SST; 2.4 preoperatively to 10.03 postoperatively). Radiographically, 27 shoulders (33.3%) had a stage 1 repair, 20 shoulders (24.7%) had a stage 2 repair, and 34 shoulders (42%) had a stage 3 repair. The 6 massive repairs in the study all went on to radiographic failure. A number of factors were associated with a higher degree of radiographic failure, including time >12 months to surgery, higher degree of fatty infiltration, increased number of tendons involved, poor rotator cuff and bone quality, and difficult tendon reduction. Patients with stage 3 healing had significantly lower Constant scores and SST scores than those with healed rotator cuffs.

**Conclusions:** Arthroscopic rotator cuff repair in patients aged ≥65 years can yield successful results. Smaller tears are associated with better outcomes.

**Reviewer's Comments:** This study reinforces the fact that rotator cuff repair yields excellent clinical results, but there is still a high rate of radiographic failure. Cuff integrity affects clinical outcome. This article highlights the necessity of proper preoperative counseling concerning failure rates. (Reviewer-Nathaniel P. Cohen, MD).

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Keywords: Rotator Cuff Repair, Elderly Patients

Print Tag: Refer to original journal article
Risks of Metallic Suture Anchor Pullout

The Incidence of Early Metallic Suture Anchor Pullout After Arthroscopic Rotator Cuff Repair.

Benson EC, MacDermid JC, et al:
Arthroscopy 2010; 26 (March): 310-315

There is a very small risk of metallic suture anchor pullout in small-to-medium rotator cuff tears. There is a statistically significantly higher rate of metallic suture anchor pullout in larger tears.

**Background:** There are numerous basic science studies of suture anchors that report on pullout strength and failure. It is currently thought that the most common method of failure is by failure of the tendon-suture interface. There are, however, very few studies that specifically examine anchor pullout of suture anchors in a clinical situation.

**Objective:** To examine the rate of suture anchor pullout after arthroscopic rotator cuff repair and the effects of tear size on anchor pullout. The authors hypothesize that there is a nontrivial incidence of suture anchor pullout and that this pullout is higher in larger tears.

**Design:** Retrospective cohort study (level of evidence, IV).

**Methods:** The authors reviewed patients who had undergone arthroscopic rotator cuff repair by the 2 senior authors. The authors identified 269 patients who had a total of 550 5-mm metallic anchors double loaded with high strength suture placed. One hundred eighty-nine men, with a mean age of 55 years, and 80 women, with a mean age of 56 years, underwent rotator cuff repair. A small-to-medium tear was defined as one with an exposed footprint of ≤3 cm, while a large tear was defined as having an exposed footprint of >3 cm. All patients underwent repair with a sliding Westin knot with half hitches. Patient records and radiographs at 2 weeks and at 6 to 12 weeks were evaluated. Suture anchor pullout was defined as a metallic anchor that had pulled out of the greater or lesser tuberosity completely.

**Results:** 9 anchors in 6 patients pulled out early. The authors calculated that the overall incidence of failure was 2.4% (6 of 251). The incidence in small tears was 0.5% (1 of 205), while the incidence in medium-to-large tears was 11% (5 of 46). There was a trend toward higher age in the anchor pullout group. All anchors pulled out of the greater tuberosity; none pulled out of the lesser tuberosity. All 6 patients underwent a revision. At surgery, the anchors were found to be sutured to the rotator cuff. There was no evidence of wear in the glenohumeral joint.

**Conclusions:** There is a very small risk of metallic suture anchor pullout in small-to-medium rotator cuff tears. There is a statistically significantly higher rate of metallic suture anchor pullout in larger tears.

**Reviewer’s Comments:** This sobering study reminds us that hardware does fail. Metal anchors are generally considered stronger than PEEK or bioabsorbable anchors. The take-home message for me is that one needs to be vigilant especially if a patient is not doing well. A low threshold for imaging will prevent missing a loose anchor and potential further complications. (Reviewer-Nathaniel P. Cohen, MD).

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Keywords: Suture Anchor Failure, Arthroscopic Rotator Cuff Repair

Print Tag: Refer to original journal article
Innominate osteotomy results in improved hip centering and acetabular development compared to femoral osteotomy when performed in isolation at the time of open reduction for developmental dysplasia of the hip.

**Objective:** To compare the two osteotomies directly in similar patient groups.

**Design:** Case control, center-randomized study; Level III evidence.

**Participants/Methods:** Patients treated at Toronto Hospital for Sick Children underwent an anterior open reduction and Salter iliac osteotomy by Dr. John Wedge. Those who were treated over a similar period at Great Ormond Street Hospital in London underwent an open reduction and femoral osteotomy by a single surgeon. The neck shaft angle was corrected to 110° and anteversion was placed at 5°. All patients had a minimum of 4 years of follow-up. Patients with severe avascular necrosis (AVN) were excluded. The primary outcome measure was the acetabular index; secondary measures were lateral and superior centering ratios for the femoral head and acetabular floor thickness. A total of 490 radiographs were reviewed. Reoperation rates were compared. For bilateral cases, only 1 hip was randomly selected for inclusion in the study.

**Results:** There were 38 patients who had a femoral osteotomy and 37 who had an iliac osteotomy. The mean patient age was approximately 2 years. The iliac patients were 3 months younger. Mean follow-up was 6 years. The iliac patients had an acetabular index that was immediately 15° lower and remained lower throughout the study period, reaching a 10° difference at the end of the study. The lateral and superior centering ratios and medial wall thicknesses were also better in the innominate group. There were more revisions in the femoral group (6 vs 1), and there was a higher rate of AVN in the femoral group.

**Conclusions:** Innominate osteotomy results in improved hip centering and acetabular development compared to femoral osteotomy when performed in isolation at the time of open reduction for developmental dysplasia of the hip. The rate of AVN was not higher in the innominate osteotomy. The complication rate was not higher in the iliac group.

**Reviewer’s Comments:** This paper makes sense intuitively. The acetabulum is immediately repositioned with Salter’s osteotomy, and this improves hip centering. However, Dr. Wedge was taught the procedure directly by Dr. Salter, and the procedure has more variability when performed by a wide group of surgeons. This is probably, in part, because there is no specific device to ensure a uniform positioning of the acetabulum. Nevertheless, it is probably the procedure of choice when the surgeon is familiar with achieving acetabular correction. The authors also point out that in children >3 years of age, they also perform a concomitant femoral shortening osteotomy to decrease the risk of AVN. (Reviewer-Paul D. Sponseller, MS, MD).

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Keywords: Hip Dysplasia, Open Reduction, Osteotomy, Acetabular Development

Print Tag: Refer to original journal article
The recognition of spinal cord injury without radiographic abnormality, along with the potentially
catastrophic nature of cervical spine injury, has led to a lot of concern regarding recognition (clearance) of
the cervical spine.

**Background:** On a yearly basis, >10 million patients present to the emergency department for evaluation.
Assessing the cervical spine for possible injury is a priority of treatment in patients who have suffered a blunt
trauma.

**Results:** Asymptomatic patients should have a neurologic examination. If normal, the authors discuss the
Canadian cervical-spine rules for clearance. This consists of separating patients into high-risk and low-risk
subgroups. The high-risk patients are the elderly or those with a high-energy mechanism of injury such as a
high-speed motor vehicle accident, fall from over 5 stairs, age >65 years, or paresthesias. It is only in the low-
risk group, of asymptomatic patients, that range of motion (ROM) should be tested. This consists of palpating
for tenderness or step-off in the neck, then asking the patient to actively rotate 45° to each side. If this can be
done without pain, then they can be asked to flex and extend the neck. Performance of these tasks constitutes
adequate clearance. The authors state that 10% to 20% of asymptomatic patients who can do this may have a
minor injury, but it is of no clinical significance so that further imaging is not needed. If the patient has
symptoms with ROM, then they move to the algorithm for the symptomatic patient. Only patients with
uncompromised sensorium should be cleared. The temporarily unassessable patient should be immobilized
and re-examined in 24 to 48 hours when they regain normal alertness. If they are nontender and pass the
criteria for the asymptomatic patient, they can be cleared. If they do not regain their alertness by this time, they
move into the algorithm for the obtunded patient. The symptomatic patient has the most complex algorithm.
Imaging is required. If there is a neurologic deficit, MRI is needed. If not, the imaging does not need to include
MRI. It can be either 3 views of the neck (AP, lateral, and open mouth) followed by collar and flexion-extension
films 2 weeks later. Another option is to obtain a multidetector CT at the start. If these films are negative, then
the collar can be removed. If there are findings on the CT or MRI, treatment follows. The fourth group
(obtunded patients) should be imaged with CT. If this is negative, the authors feel that the patient can be
cleared. However, they acknowledge that there are others who feel that an MRI is indicated in such patients. It
is just that injuries identified by MRI only and negative on CT are likely to be minor. The authors recommend
against the use of flexion-extension radiographs in the obtunded patient.

**Reviewer’s Comments:** This article is very helpful. It will decrease my use of early flexion-extension films, and
it will also decrease our use of routine CT if the patient is asymptomatic and low-energy. This in turn could
save significant expense and radiation exposure. I recommend it to all who take care of trauma patients.
(Reviewer-Paul D. Sponseller, MS, MD).

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Keywords: Cervical Spine, Blunt Trauma

Print Tag: Refer to original journal article
Combining Techniques for Difficult Radial Neck Fractures

Displaced Radial Neck Fractures in Children: Association of the Métaizeau and Böhler Surgical Techniques.

Brandão GF, Soares CB, et al:

J Pediatr Orthop 2010; 30 (March): 110-114

This combined technique allows a powerful set of tools to both achieve and hold reduction without needing to open the fractures and risk growth disturbance and stiffness, even in this large series of only the most highly displaced fractures.

Background: Radial neck fractures are innocuous-looking but can produce significant stiffness and growth disturbance. O’Brien has classified these into 3 groups of those with <30°, 30° to 60°, and >60° of angulation. The grade III is the hardest to treat. We now know that open exposure increases the risk of complications. The Böhler technique involves percutaneously pushing the fracture back into place, which does not always allow a good means of holding the reduction. The Métaizeau technique, which we have reviewed recently, involves inserting an intramedullary device retrograde across the fracture and spinning the device 180° to rotate it back into place. However, it often cannot be inserted into the epiphysis when the displacement is grade III.

Design: Case series, retrospective review; Level IV.

Objective: To describe the combination of the Böhler and Métaizeau techniques to better reduce and hold the fractures.

Participants/Methods: The authors studied 68 children in their hospital in Brazil and looked at the results of those who were O’Brien type III with >60° of angulation (n=26). The children had a mean age of 8 years, and 5 of them had >1 fracture site in the affected elbow. The procedure used a 2-mm Kirschner wire inserted retrograde up the radius. The wire had a 25° bend that was 1.5 cm from its tip. It was advanced to the fracture site. Then a 2.5-mm Kirschner wire was inserted percutaneously in the fracture site to partially or fully reduce the fracture. Next, the long bent-tip Kirschner wire was advanced further and rotated 180°. The elbow was splinted for 1 week, and the wire is removed after 7 weeks.

Results: All patients’ fractures were able to be reduced closed; none required open reduction. The mean follow-up was 4 years. There were no redisplacements, infections, or cases of avascular necrosis. There were 17 excellent results, 6 good, 2 fair, and only 1 poor result. The patient with a poor result had significant heterotopic ossification in the brachialis muscle. Overall, 88% had satisfactory results.

Conclusions: This combined technique allows a powerful set of tools to both achieve and hold reduction without needing to open the fractures and risk growth disturbance and stiffness, even in this large series of only the most highly displaced fractures.

Reviewer’s Comments: I liked this idea. Sometimes the radial head seems to be impacted and the Böhler technique alone does not always work. The details of how to bend the wire 25° at 1.5 cm from the tip are important. I would also add that the Métaizeau technique does not carry the risks of elbow joint infection that would be seen with leaving the percutaneous Böhler wire in place long term. I would also note that even with this closed technique, there was still a case of significant heterotopic ossification, indicating that it is sometimes a feature of the injury itself rather than the surgery. I recommend this technique for all who treat children’s trauma. (Reviewer-Paul D. Sponseller, MS, MD).

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Keywords: Métaizeau, Radial Neck Fracture, Avascular Necrosis

Print Tag: Refer to original journal article
The role of surgery is primarily for the rare case that cannot be reduced in a closed fashion.

**Objective:** To describe a technique for closed reduction of odontoid fractures that does not reduce with positioning. **Case Report:** A 3-year-old girl with a displaced odontoid fracture presented to our office when her neck pain and torticollis persisted 1 week after a fall. Her x-ray showed that she had a fracture with 40° of angulation. Her MRI showed no other neck injuries besides the odontoid fracture. A reduction was attempted in a supine position and extension with sedation. This position was maintained for 2 days with a bump under the shoulders, but the fracture still did not improve. Since her fracture did not improve, she was taken to the operating room and maintained supine with the intent to perform reduction and fusion. First, another trial of reduction was carried out with the patient in the supine position and the shoulders elevated. The girls fracture still did not reduce. However, transoral palpation revealed a palpable odontoid. The odontoid had firm resistance. However, with sustained digital pressure, the fracture could be slowly translated back into place. The residual angulation was minimal. The patient was immobilized in a Minerva cast for 8 weeks, and the fracture healed with no significant angulation.

**Reviewer's Comments:** This was the first reported case of transoral manipulation of an odontoid fracture. The delay in recognizing the fracture was probably one of the reasons that the initial manipulative reduction was not successful. This is a very valuable technique to know about for children because once the fracture is reduced, it has an excellent chance of healing. The ability to avoid an open procedure preserves important c 1-2 motion. (Reviewer-Paul D. Sponseller, MS, MD).

© 2010, Oakstone Medical Publishing

Keywords: Odontoid Synchondrosis Fracture, Reduction

Print Tag: Refer to original journal article
Surgery performed after-hours results in an increased need for removal of painful femoral nails.

**Background:** Some orthopedic injuries require urgent surgical care, regardless of the time of day or the condition of the surgical team.

**Objective:** To quantify the effect of operations performed after hours by comparing intramedullary nail fixation of femoral and tibial shaft fractures performed in normal daytime hours with the same procedures performed after hours.

**Design:** Prospective comparative study.

**Participants/Methods:** 203 consecutive patients treated at 1 of 4 Level-I trauma centers, who underwent tibial or femoral rod fixation, were included. Of these, 100 had surgery between 6:00 AM and 4:00 PM and were considered the daytime group; 103 of the patients had surgery between 4:00 PM and 6:00 AM and constituted the after-hours group. The demographics between number of tibial and femoral nails, fracture patterns and mechanisms, and the number and severity of open fractures were similar between the 2 groups. The attending physician was present for all cases. Operative time, fluoroscopic time, and postoperative fracture alignment were collected prospectively. Nonunion, delayed union, malalignment, infections, and reoperation were recorded.

**Results:** The mean operative time was shorter for the after-hours group in both the tibial and femoral nail group by 23% and 19%, respectively. Radiation exposure was less in the after-hours group by 10 and 13 seconds for the tibial and femoral groups, respectively. The after-hours group had a 2-fold higher likelihood of undergoing an unplanned reoperation (34% vs 17%). Reoperation for removal of painful implants was much more common in the after-hours group. Twenty-seven percent of patients in the after-hours femoral group required removal of hardware, while only 3% of those in the daytime group required removal of hardware. There was no difference between the tibial subgroups for removal of painful hardware. No difference was found in the healing complication rate between the groups.

**Conclusions:** The conditions associated with after-hours surgery, particularly femoral nail fixation, appear to contribute to an increased prevalence of technical complications leading to reoperation for the removal of painful implants.

**Reviewer’s Comments:** The strengths of this study are its prospective, multicenter design. Since 3 of the 4 centers are residency training centers, I imagine there was significant variability in attending involvement in the surgery. Still, the study highlights the fact that after-hours surgical conditions are often suboptimal, and the surgeon must pay close attention to the technical details of the surgery so as not to predispose the patient to symptomatic hardware. (Reviewer-Carl H. Wierks, MD).

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Background: Platelet-rich plasma (PRP) is defined as a sample of autologous blood with concentrations of platelets above baseline values. Platelets play an instrumental role in the normal healing response via the local secretion of growth factors and recruitment of reparative cells. PRP is prepared by taking a sample of autologous, anticoagulated blood and using a centrifuge or filter to separate red blood cells from leukocytes and platelets. Debate exists as to what is the optimal quantity of platelets and growth factors required for muscle and tendon healing. Clinically effective PRP was defined as having at least 4 times the normal platelet concentration.

Nonsurgical Use: PRP has shown benefit when used to treat lateral and medial epicondylitis. One study has shown benefit over corticosteroid injection for lateral epicondylitis. When PRP was used to treat patellar tendinosis via 3 serial injections at 15-day intervals, 70% showed complete or marked functional recovery. Seven of 9 patients treated with PRP for plantar fasciitis had complete resolution at 1 year. Treating muscle injuries with PRP has also been investigated. Full functional recovery of 22 muscle injuries in 20 professional athletes was achieved in half the expected recovery time. Comparing intra-articular PRP injections with hyaluronic acid substitute injections demonstrated improved pain scores with PRP at 5-week follow-up.

Surgical Use: When PRP was used to augment acute Achilles tendon repair and compared to repair alone, the treatment group experienced earlier functional restoration of range of motion and earlier return to jogging and training as well as no wound problems. PRP was also used to assist in rotator cuff repair. It was placed at the footprint of the repaired tendon. At 2-year follow-up, all patients had significant improvements in validated shoulder scores compared with preoperative values. In a separate study, use of PRP in patients undergoing open subacromial decompression showed faster recovery with less pain, greater range of motion, and greater ability to perform activities of daily living. When used to improve graft incorporation in ACL reconstruction, PRP has not shown significant effect at 6-month follow-up.

Conclusions: Acceleration of muscle and tendon healing with PRP appears to be promising; however, clinical use should proceed cautiously because there is little, if any, high-level clinical evidence supporting the efficacy of this therapeutic modality.

Reviewer's Comments: This is an excellent review article of this young and emerging field of study. Basic science studies done so far support the use of PRP to promote tendon and bone healing. It will be interesting to see how it may be of significant use clinically as more "en vivo" research is done. (Reviewer-Carl H. Wierks, MD).

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Keywords: Platelet-Rich Plasma, Injections

Print Tag: Refer to original journal article
Arthroscopy performed directly after an ankle fracture often shows more damage to the cartilage than was expected on the basis of plain radiographs.

**Background:** Unlike osteoarthritis in the hip or knee, osteoarthritis in the ankle joint is predominantly the result of a traumatic event. Surprisingly little is known about the relationship between initial cartilage damage and the development of osteoarthritis of the ankle.

**Objective:** To examine the correlation between the initial cartilage damage seen at arthroscopy performed directly after a displaced ankle fracture and the clinical and radiographic long-term results associated with that fracture.

**Design:** Prospective cohort study. Prognostic Level II.

**Methods:** A long-term follow-up study of 109 patients in whom an ankle fracture had been treated operatively according to the American Orthopaedic principles at the Kantonsspital Liestal and the Kantonsspital St. Gallen, both in Switzerland, was performed. The mean duration of follow-up was 12.9 years. The clinical results were evaluated by an independent orthopaedic foot and ankle surgeon without knowledge of the injury or the intra-articular lesions that had been identified arthroscopically. The American Orthopaedic Foot and Ankle Society (AOFAS) hindfoot score was used to quantify the long-term clinical outcome. Anteroposterior and lateral radiographs of the ankle were evaluated by an experienced radiologist, without knowledge of the clinical results, who used a modification of the Kannus arthritis score to determine the severity of the osteoarthritis on a 100-point scale.

**Results:** At arthroscopy, a cartilage lesion was found on the talus in 65% of the patients, on the tibia in 50%, and on the fibula in 39%. No cartilage damage was seen in 19% of the patients. All 3 surfaces were affected in 21% of the patients. At the time of long-term follow-up, clinical signs of osteoarthritis were seen in 39% of the 109 patients, whereas radiographic signs of osteoarthritis were seen in 43%. Cartilage damage in the ankle joint was associated with an AOFAS score of ≤90 points and with a radiographic score of ≤90 points. Cartilage damage on the tibia, including the medial malleolus, and cartilage damage on the talus were each associated with an AOFAS score of ≤90 points as well as with a radiographic score of ≤90 points.

**Conclusions:** Initial cartilage damage seen arthroscopically after an ankle fracture is an independent predictor of posttraumatic osteoarthritis. Lesions on the talus and tibia are associated with negative long-term results, whereas lesions on the fibula do not correlate with a worse long-term outcome. Specifically, deep lesions on the anterior and lateral aspects of the talus and on the medial malleolus correlated with an unfavorable clinical outcome.

**Reviewer's Comments:** This is an important and informative study. Its strengths are its prospective design and length of follow-up. It is limited by its somewhat arbitrary definition of arthritis. It begs the question of the role of routine arthroscopy in the management of displaced ankle fractures. (Reviewer-Carl H. Wierks, MD).

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Keywords: Ankle Fracture, Ankle Arthroscopy, Talar Chondral Defect

Print Tag: Refer to original journal article
ACI Treatment Can Result in Significant Improvement

Long-Term Durability of Autologous Chondrocyte Implantation: A Multicenter, Observational Study in US Patients.

Moseley JB Jr, Anderson AF, et al:


Sixty-nine percent of ACI patients are improved from baseline at 6- to 10-year follow-up.

Background: Full-thickness chondral injuries of the knee are common, lack the intrinsic ability for self-repair, and can be symptomatic and debilitating.

Objective: To assess whether the U.S. multicenter experience was comparable with the long-term durability results of other authors by comparing the results of 6 to 10 years of follow-up to those of 1 to 5 years.

Design: Prospective outcome study.

Participants/Methods: Study participants consisted of a predefined cohort of patients implanted with ACI (Carticel [autologous cultured chondrocytes], Genzyme Biosurgery, Cambridge, Massachusetts) and enrolled in the Cartilage Repair Registry. Inclusion criteria consisted of patients who had (1) ACI-treated full-thickness (Outerbridge grade III or IV) lesions on the distal femur and (2) data collected at baseline and at an intermediate follow-up time point (at 1- to 5-year follow-up). Patients were excluded if they had ACI before enrollment into the Registry, ACI performed on both knees, and/or implanted patella or tibia lesions. Seventy-two patients met the study criteria. At baseline and follow-up, patients prospectively rated their overall condition, pain, and swelling using modified scales of the Cincinnati Knee Rating System. Failures were defined as cases in which a patient needed an operation after ACI that necessitated removal of the graft, confirmed a loss of defect fill, or violated the subchondral bone.

Results: At 1- to 5-year follow-up, 75% of patients had improved a mean change in overall condition score of 4.3 points, and 25% did not, including 9 patients who met the study definition of treatment failure. At 6- to 10-year follow-up, improvement from baseline was noted in 69% of patients. Of note, 87% of patients who improved at the earlier follow-up period sustained a mean improvement in overall condition score of 3.8 points at 6- to 10-year follow-up. Over the study period, 12 patients (17%) met the study definition of treatment failure. The majority of failures (75%) occurred during the 1- to 5-year follow-up period, with a mean time to treatment failure of 2.5 years.

Conclusions: ACI treatment for large, symptomatic, full-thickness lesions of the distal femur in patients who had low baseline scores can result in early significant improvement that is sustained at longer follow-up (up to 10 years) in the majority of patients.

Reviewer's Comments: I applaud the authors for a well-conducted multicenter, prospective study. The majority of patients were treated during the authors' learning curve for ACI, indicating that the reported results may be a conservative take on the success of the procedure. There were, however, several surgeries performed on patients who did not meet the study criteria of failure. The most common reasons for these surgeries were fibrotic tissue, periosteal flap complications, and adhesions. (Reviewer-Carl H. Wierks, MD).

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Keywords: Autologous Chondrocyte Implantation, Chondral Lesion

Print Tag: Refer to original journal article
Results of Revision Arthroscopic Rotator Cuff Repair

Revision Arthroscopic Rotator Cuff Repair: Repair Integrity and Clinical Outcome.

Keener JD, Wei AS, et al:

J Bone Joint Surg Am 2010; 92-A (March): 590-598

Although persistent rotator cuff integrity may occur in only 50% of patients, revision arthroscopic rotator cuff repair leads to good results in terms of pain relief and shoulder function.

Background: There is a paucity of published data regarding the results of revision rotator cuff repair surgery. Objective: To report the results (both clinical outcomes and rotator cuff tendon integrity) of a series of patients who underwent revision arthroscopic rotator cuff repair. Design: Retrospective review. Participants/Methods: 21 patients (13 men and 8 women; mean age, 55.6 years; age range, 47 to 73 years) who underwent revision arthroscopic rotator cuff repair between 2004 and 2006 were included in this study. Patients with both single-tendon tears (n=10) and those with supraspinatus and infraspinatus tears (n=11) were included. Eighteen patients had a double-row anchor repair performed, and 3 patients underwent a single-row repair when the cuff could not be mobilized laterally enough. All patients had a minimum of 2 years of postoperative follow-up. Outcome measures included both rotator cuff integrity, as measured by ultrasound, as well as pain, range of motion, and validated outcomes scoring systems (including the Simple Shoulder Test [SST], the American Shoulder and Elbow Surgeons [ASES] score, and the Constant score). Results: Mean final follow-up occurred at 33 months (range, 24 to 51 months). As compared to the preoperative state, revision arthroscopic rotator cuff repair lead to significant improvements in pain, active range of motion (both forward elevation and external rotation), SST scores, and ASES scores (P <0.05 for all). As determined by ultrasound, overall, 48% of the patients had an intact rotator cuff repair. Two-tendon tears had a lower rate of rotator cuff integrity on ultrasound (27% in two-tendon repairs vs 70% in single-tendon repairs; P =0.05). In addition to the number of tendons involved in the tear, younger patient age was also significantly associated with repair integrity (P <0.05). When patients with intact repairs were compared to those with recurrent tears, those with intact rotator cuff repairs had better postoperative Constant scores and abduction strength (P <0.05 for both). There were no complications, and no patients had undergone a repeat shoulder operation at final follow-up. Conclusions: Although persistent rotator cuff integrity may occur in only 50% of patients, revision arthroscopic rotator cuff repair leads to good results in terms of pain relief and shoulder function. Younger patients and those with single-tendon tears are less likely to have a recurrent tear. Reviewer's Comments: Although this study is limited by its small sample size and short-term follow-up, this well-done study provides useful information for both the shoulder surgeon and patients undergoing revision arthroscopic rotator cuff repair. Unfortunately, this study is underpowered to detect outcomes difference between the patients with and without intact repairs. Future studies are needed to see if repair integrity is associated with better functional outcomes. (Reviewer-Adam J. Farber, MD).

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Keywords: Arthroscopic Rotator Cuff Repair, Revision, Cuff Integrity, Ultrasound

Print Tag: Refer to original journal article
Intra-articular injections are associated with better objective shoulder scores, improvements in range of motion, and patient satisfaction than oral corticosteroids in the treatment of idiopathic adhesive capsulitis.

Background: There are no published reports comparing the efficacy of oral corticosteroids versus intra-articular corticosteroids for the treatment of idiopathic adhesive capsulitis.

Objective: To prospectively compare the efficacy of oral corticosteroids versus intra-articular corticosteroids for the treatment of idiopathic adhesive capsulitis.

Design: Prospective randomized trial.

Participants/Methods: 40 patients with idiopathic adhesive capsulitis of the shoulder were included in this study. Patients with prior surgery or diabetes were excluded. The patients were divided into 2 groups and randomized to receive treatment with either oral steroids for 21 days (n=20) or a total of 3 intra-articular injections of corticosteroids (n=20). Injections were given under fluoroscopic guidance and were performed at time zero, week 4, and week 8. All patients underwent a routine course of physical therapy and were followed at routine intervals for 1 year. Outcome measures included pain, shoulder function, range of motion, patient satisfaction, and validated outcomes instruments including the Constant-Murley (CM) score and the Simple Shoulder Test (SST) score.

Results: Both groups of patients had significant improvements in pain, range of motion, CM scores, and SST scores by the 4-week follow-up ($P < 0.05$ for all). When compared to the pretreatment state, these significant improvements were maintained at all subsequent follow-up visits. Patients treated with intra-articular corticosteroid injections showed greater improvements in range of motion, patient satisfaction, CM scores, and SST scores when compared to patients treated with oral corticosteroids ($P < 0.05$ for all). There was, however, no significant difference in pain or function when these 2 cohorts were compared ($P > 0.05$).

Conclusions: Corticosteroids, whether oral or intra-articular, are effective for relieving pain and improving function for patients with idiopathic adhesive capsulitis. The benefits of steroids are seen within 1 month, and the effects are lasting for up to 1 year. Intra-articular injections, however, seem to be associated with better objective shoulder scores, greater improvements in range of motion, and superior patient satisfaction as compared to oral steroids.

Reviewer's Comments: Although this study provides useful information, it has several limitations. First, diabetic patients were excluded, and these patients account for a high percentage of patients with idiopathic adhesive capsulitis. Also, there is no control group of patients treated with placebo or physical therapy alone. Finally, the dosing regimen is a bit unusual. For example, a 21-day course of oral steroids seems excessive. Also, I typically only give 1 or sometimes 2 injections, but in this study patients received 3 injections over 8 weeks. (Reviewer-Adam J. Farber, MD).

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Keywords: Adhesive Capsulitis, Frozen Shoulder, Intra-Articular, Oral Corticosteroids

Print Tag: Refer to original journal article
The Walch classification scheme for evaluating glenoid morphology in the setting of glenohumeral osteoarthritis has moderate interobserver reliability and substantial intraobserver reliability.

**Background:** The Walch classification system describing glenoid morphology is used in the setting of glenohumeral osteoarthritis. The system is based upon the presence of posterior subluxation of the humeral head, glenoid bone loss, glenoid version, and/or dysplasia. When first described, the developers reported excellent intraobserver and interobserver reliability, but subsequent independent authors have reported lower intraobserver and interobserver reliability.

**Objective:** To evaluate the intraobserver and interobserver reliability of the Walch classification system for describing glenoid morphology in the setting of glenohumeral osteoarthritis.

**Participants/Methods:** 26 shoulders in 23 consecutive patients (15 males and 11 females; mean age, 71.6 years; age range, 56 to 88 years) with severe primary glenohumeral osteoarthritis were included in this study. All patients underwent a CT scan of the shoulder. Each CT scan was reviewed independently by 3 attending shoulder surgeons and 5 shoulder/sports medicine-trained fellows. Each reviewer was blinded and classified the glenoid morphology using the Walch classification scheme. In this system, A1 is defined as a concentric humeral head with minor bone loss. A2 is defined as a as a concentric humeral head with major bone loss. B1 is defined as the presence of posterior subluxation of the humeral head with no significant bone loss, and B2 is defined as the presence of posterior subluxation of the humeral head with a biconcave glenoid. C is defined as glenoid retroversion >25°. All physicians then re-reviewed the CT scans at a later date, at least 6 weeks later, and classified the glenoid morphology a second time. Based upon these data, both interobserver reliability and intraobserver reliability were calculated. Reliability was defined by the kappa value and graded as follows: slight (k <0.20), fair (k between 0.21 and 0.40), moderate (k between 0.41 and 0.60), substantial (k between 0.61 and 0.80), or excellent (k >0.81).

**Results:** When the results of all 8 physicians were pooled for all Walch classes, the interobserver agreement was moderate (k =0.508). The Walch B2 category had the greatest reliability (substantial, k =0.714). When all 8 physicians were pooled, the intraobserver reliability was substantial (k =0.611). When the intraobserver results of the attending physicians were compared to the fellows, there was no significant difference (P =0.61).

**Conclusions:** The Walch classification scheme for evaluating glenoid morphology in the setting of glenohumeral osteoarthritis has moderate interobserver reliability and substantial intraobserver reliability.

**Reviewer’s Comments:** This simple study confirms the reliability of the Walch classification system. The authors of this study suggest that the Walch system should continue to be used by shoulder surgeons until a better system is devised and validated. (Reviewer-Adam J. Farber, MD).
Axial 2D-CT slices are not as accurate as 3D reconstructions for measuring glenoid version and for locating the direction of maximum glenoid wear in the setting of glenohumeral arthritis.

**Background:** In preparation for total shoulder arthroplasty, it is important to try to assess the morphology and version of the glenoid. Currently, most surgeons use axial 2-dimensional (2D) CT to measure glenoid version; in this scenario, version is defined as the angle between a line drawn from the medial border of the scapula to the center of the glenoid and the line perpendicular to the face of the glenoid. The accuracy and reproducibility of this method has not been evaluated.

**Objective:** To assess the accuracy of glenoid version and wear on 2D CT relative to a 3D-CT reconstruction and to determine the variability in glenoid version measurement between adjacent 2D-CT slices.

**Participants/Methods:** 33 patients (11 males and 22 females; mean age, 75 years; age range, 56 to 90 years) with end-stage glenohumeral arthritis scheduled for total shoulder arthroplasty underwent preoperative CT scans. Glenoid version and osseous erosions were measured using both 2D images and 3D reconstructions. The true glenoid version was defined as the version measured by the 3D-CT images.

**Results:** In this cohort, the true glenoid retroversion (as measured on 3D-CT reconstruction) was −8.6°. When 2D-CT images at the level of the tip of the coracoid were used to record glenoid version, the average absolute error was 5.1° (range, 0° to 16°; P <0.001) compared to the 3D measurement. When 2D images were used to record version at more superior or inferior levels within 5 mm of the coracoid tip, the measured glenoid version varied by an average of 6.7°. As measured by 3D CT, the location of maximum wear in the glenoid was most commonly in the posteroinferior quadrant; 36% of patients had maximal glenoid bone loss in the 9 o’clock area and 21% of patients had maximal glenoid bone loss in the 8 o’clock area. As measured by 2D CT, this glenoid bone wear was detected accurately only 48% of the time.

**Conclusions:** When 2D CT is used to assess glenoid version and glenoid wear in the setting of glenohumeral osteoarthritis, 3D-CT reconstructions appear to be more accurate than axial 2D CT images.

**Reviewer’s Comments:** This study is limited by the lack of a true knowledge of glenoid version. Furthermore, it would be interesting to assess the accuracy of 2D versus 3D CT in patients without glenohumeral arthritis. Nevertheless, the authors call into question the accuracy of using 2D CT to prepare for total shoulder arthroplasty, especially in patients with significant bone loss or increased retroversion. (Reviewer-Adam J. Farber, MD).

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Keywords: Total Shoulder Arthroplasty, Shoulder Arthritis, 3-D Reconstruction

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Are Triple-Loaded Suture Anchors Superior for Rotator Cuff Repair?

**Biomechanical Advantages of Triple-Loaded Suture Anchors Compared With Double-Row Rotator Cuff Repairs.**

Barber FA, Herbert MA, et al:

*Arthroscopy* 2010; 26 (March): 316-323

In this rotator cuff repair model, single-row repair constructs performed using triple-loaded suture anchors were more resistant to displacement with cyclic loading than the double-row repair constructs tested.

**Background:** Previous studies suggest that rotator cuff repairs performed with suture anchors in a double-row configuration are biomechanically superior to single-row repairs. These findings may be due to the fact that the single-row constructs tested did not have adequate numbers of sutures used or that sutures were not optimally placed.

**Objective:** To evaluate the strength of rotator cuff repairs performed with either double-loaded or triple-loaded suture anchors with both single-row and double-row repair constructs.

**Design:** Biomechanical cadaveric animal study.

**Materials/Methods:** 40 bovine shoulders were utilized. All soft-tissues were excised from the proximal humerus, except the infraspinatus tendon; the infraspinatus tendon insertion was then sharply detached at its insertion, creating a rotator cuff tear model. Specimens were divided into 5 different groups, and tears were then repaired by 1 of 5 different methods. Group 1 specimens were repaired with 2 triple-loaded screw suture anchors in a single-row fashion utilizing simple stitches. Group 2 specimens were repaired using 2 triple-loaded screw anchors in a single-row fashion utilizing simple stitches tied over an independently passed perpendicular horizontal mattress "rip-stop" suture. Group 3 specimens were repaired using a double-row technique; the medial row consisted of 2 double-loaded suture anchors with vertical mattress sutures, and the lateral row included 2 anchors with simple stitches. Both Groups 4 and 5 were repaired using double-row transosseous-equivalent techniques. Group 4 specimens were repaired using 2 double-loaded Mitek anchors with Orthocord suture medially with suture limbs crisscrossing over the cuff and secured by 2 lateral knotless anchors, whereas Group 5 specimens were repaired in a similar fashion with Arthrex anchors and FiberWire suture in a suture-bridge manner. All specimens were cycled at 1 Hz for 3,500 cycles or until failure. Displacement with cyclic loading, total displacement, and ultimate failure load were recorded.

**Results:** Group 1 and 2 repairs performed using a single-row technique with triple-loaded anchors were less likely to displace by 5 mm with cyclic loading than the double-row repair constructs in groups 3, 4, and 5 (*P* <0.05). The group 4 specimens repaired with a double-row technique using crisscross sutures was the least resistant to displacement (*P* <0.05); there was no significant difference in total displacement between the other 4 groups. There was no statistical difference between the 5 groups in ultimate failure load (*P* =0.15).

**Conclusions:** In this rotator cuff repair model, single-row repair constructs performed using triple-loaded suture anchors were more resistant to displacement with cyclic loading than the double-row repair constructs tested.

**Reviewer's Comments:** This study is limited by the fact that it is a cadaveric biomechanical study that represents time zero, and does not account for in vivo healing potential. Future clinical studies utilizing triple-loaded suture anchors are needed to validate these findings. (Reviewer-Adam J. Farber, MD).

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**Keywords:** Suture Anchors, Double-Loaded, Triple-Loaded, Biomechanical Rotator Cuff Repair

**Print Tag:** Refer to original journal article
Cementing Femoral Component Does Not Influence Perioperative Blood Loss

The Influence of Femoral Cementing on Perioperative Blood Loss in Total Knee Arthroplasty: A Prospective Randomized Study.

Demey G, Servien E, et al:

J Bone Joint Surg Am 2010; 92-A (March): 536-541

Whether the femoral component is cemented or not will not influence the need for postoperative blood transfusion or the amount of perioperative blood loss.

Background: Knee replacement surgery is associated with significant blood loss. The authors postulated that cementing of the femoral component may influence perioperative blood loss. They hypothesized that an uncemented femoral component is a risk factor for bleeding.

Objective: To assess the effects of femoral cementing on peripheral blood loss among patients undergoing total knee arthroplasty.

Participants/Methods: After inclusion criteria were met, 107 patients were prospectively randomized into 2 groups each using the same medial parapatellar approach and semiconstrained posterior stabilized prosthesis. The cement group (Group 1) consisted of 42 women and 12 men (age range, 56 to 85 years). Group 2 (the hybrid group) was composed of 16 men and 37 women with the same age range. The hemoglobin and hematocrit levels were recorded preoperatively and on the first, third, and fifth days postoperatively for each patient. The rate of blood transfusion and the volumes of postoperative suction drainage were also recorded.

Results: Total measured blood loss was similar in both groups. In terms of transfusion rates, total measured blood loss, hemoglobin and hematocrit levels, or postoperative drainage amounts, no statistical differences were noted.

Conclusions: According to the authors, "Cementing the femoral component during a total knee arthroplasty does not appear to influence the amount of perioperative blood loss or the need for postoperative blood transfusion."

Reviewer's Comments: The authors report this study to have an 80% power to detect a difference in blood loss of 340 mL. In some patients, this amount could correspond to an entire unit of packed red blood cells (PRBC). One unit of PRBCs typically will raise the hematocrit by 3% to 4% and the blood hemoglobin concentration by 1 gm/dL. This study was otherwise well done and demonstrates no difference in press fit versus cementing of the femoral component in terms of perioperative blood loss. (Reviewer-Nima Salari, MD).

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Keywords: Total Knee Arthroplasty, Femoral Cementing, Perioperative Blood Loss

Print Tag: Refer to original journal article