Transtibial Technique Simplifies ACL Reconstruction

Anatomical Single-Bundle Anterior Cruciate Ligament Reconstruction With a Transtibial Technique.

Piasecki DP, Bach BR Jr:

Am J Orthop 2010; 39 (June): 302-304

With attention to detail, it is possible to perform an anatomical single-bundle anterior cruciate ligament with a transtibial technique.

**Objective:** To identify several key technical points that will allow an anatomic reconstruction of the anterior cruciate ligament (ACL) with a transtibial technique.

**Design:** Surgical technique description.

**Background:** There has been an explosion of discussion on double-bundle ACL reconstructions. These reconstructions are very challenging, expensive, and extremely difficult to revise. However, the discussion has made surgeons revisit their single-bundle techniques and improve on anatomic tunnel placement. With the knee hyperflexed, and with the use of an accessory inferomedial portal, the femoral tunnel can be drilled more laterally on the clock face. Can you achieve same anatomic tunnel placement with a transtibial technique?

**Methods:** The authors describe 6 technical points that will improve anatomic placement of the femoral tunnel using a transtibial technique. **Tip 1:** Perform an adequate notchplasty. The authors created a “roman arch” appearance to the lateral notch. The use of a posterolateral notchplasty allows a more lateral placement of the over-the-top guide. **Tips 2 and 3:** The tibial aim is placed through an accessory inferomedial portal, 1 cm distal and lateral to the medial portal. Additionally, the tibial tunnel is started 15 to 20 mm from the joint line and 15 mm medial to the tibial tubercle. This tibial tunnel placement allows for easier directing of the transtibial guide-pin to the lower, more lateral position on the lateral wall. **Tip 4:** Once the tibial tunnel is drilled, chamfer the back cortical edge of the tibial tunnel, making placement of the over-toe-top guide easier. **Tip 5:** Once the over-the-top guide is inserted, externally rotate it. This will allow lower positioning of the guide pin on the lateral wall. **Tip 6:** Once the tunnels are reamed, careful placement of the bone-tendon-bone graft will approximate the anatomic ACL. In the femoral tunnel, the cancellous plug should be anterior; in the tibial tunnel, the cancellous plug should be posterolateral. Interference screw placement can further push the reconstruction to an anatomic position.

**Conclusions:** Several technical tips will allow a more lateral anatomic position of the femoral tunnel with a transtibial technique.

**Reviewer’s Comments:** This was a very helpful article by very experienced surgeons who have excellent clinical results with this technique. The transtibial technique greatly simplifies the ACL reconstruction, especially for surgeons who operate solo or teach the technique to residents. These tips are helpful in pushing the femoral tunnel more lateral. I would caution that the technique seems to create a shorter tibial tunnel and must be accounted for to prevent graft-tunnel mismatch. (Reviewer-John H. Wilckens, MD).

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Keywords: Single-Bundle ACL, Transtibial Technique

Print Tag: Refer to original journal article
The external rotation test is a very simple and reliable test for adhesive capsulitis, allowing for earlier diagnosis and treatment.

**Objective:** To describe and determine the effectiveness of the external rotation test in the diagnosis of adhesive capsulitis.

**Design:** Case series.

**Methods:** Over a calendar year, the senior author evaluated 379 patients for atraumatic shoulder pain. Part of the evaluation included a detailed history. Patients underwent clinical examination for instability, rotator cuff pathology, and labral pathology and also had routine shoulder radiographic evaluation. Additionally, patients underwent an external rotation test. With the elbow flexed 90°, adducted to the body, the arm in the neutral position was externally rotated. Pain with this maneuver was considered a positive test. Range of motion was also recorded. Patients with a positive external rotation test and lack of glenohumeral arthritis on x-ray underwent an intra-articular injection of 1 cc (40 mg) of methylprednisolone, in addition to 2 cc of 0.5% bupivacaine with epinephrine. No formal therapy was prescribed, but patients were sent home with an informational handout and instructions on a home stretching program.

**Results:** Of the 379 patients evaluated, 91 had a positive external rotation test. Of these 91 patients, 23 had glenohumeral arthritis by x-ray. The remaining 68 patients were diagnosed as having adhesive capsulitis (84%) were available for follow-up (range, 10 to 19 months). Nine patients had a diagnosis of an endocrine disorder (hypothyroidism, insulin-dependent diabetes, hyperthyroidism, or non–insulin-dependent diabetes). There were equal number of males and females, and dominant and nondominant shoulders. Forty-nine patients were satisfied with their treatment and outcome; 15 were not satisfied. Three patients sought a second opinion. Two patients underwent manipulation under anesthesia. Four patients received 2 injections, and 3 patients received 3 injections. Of patients with an endocrine disorder, 5 (56%) had an additional injection, whereas only 2 (4%) without an endocrine disorder had an additional injection.

**Conclusions:** The external rotation test provides an early diagnosis and treatment for adhesive capsulitis. 

**Reviewer's Comments:** This very interesting article provides a lot of information from a busy shoulder surgeon on atraumatic shoulder pain. The external rotation test, along with a standard x-ray, simply screens atraumatic shoulder pain and directs appropriate further work-up, treatment, and prognosis. Earlier diagnosis and intervention may allow very good results with an injection and a home therapy program. In my practice, this test has been very sensitive in identifying adhesive capsulitis. (Reviewer-John H. Wilckens, MD).

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Keywords: Adhesive Capsulitis, External Rotation Test

Print Tag: Refer to original journal article
**Distal Hamstring Ruptures -- Is Surgery Necessary?**

*Distal Semitendinosus Ruptures in Elite-Level Athletes. Low Success Rates of Nonoperative Treatment.*

Cooper DE, Conway JE:


Complete semitendinosus hamstring ruptures have a <50% chance of healing with nonoperative treatment; early surgical intervention would not only speed recovery but also more predictably return the athlete to play.

**Objective:** To review the authors’ experience taking care of distal semitendinosus ruptures in elite-level athletes.

**Design:** Retrospective case series.

**Methods:** Over a 14-year period, the 2 authors were able to identify 25 patients with a complete distal semitendinosus rupture. There were 20 professional athletes, 4 collegiate athletes, and 1 amateur male athlete; 17 subjects were available for follow-up at an average of 13 months (range, 4 to 55 months). The study group included 8 professional athletes from the National Football League, 8 from Major League Baseball, and 1 from the National Hockey League. The patients typically presented with an acute onset of a "pop," with sharp pain in the medial aspect of the distal thigh. Very few patients had antecedent tenderness. Examination revealed pain with knee flexion, localized at the popliteal region. This was accompanied with puckering of the popliteal skin in chronic cases, and ecchymosis in acute cases. MRI revealed edema and retraction of the semitendinosus tendon, and chronic cases revealed significant fibrosis.

**Results:** All patients underwent a period of nonoperative treatment. This included rest and local modalities, followed by rehabilitation exercises in a functional progression. The end point for recovery was return to play. For those who underwent initial nonoperative treatment, only 7 were able to return to play without surgery. The average return to play was 10.4 weeks, with a range of 3 to 35 weeks. Five patients of the initial 12 treated with nonoperative treatment did not return to play at a mean of 16.8 weeks and underwent scar resection and excision of the tendon. Return to play after surgery was 12.8 weeks. Because of poor experience with nonoperative treatment, the next 5 players had acute surgery within 4 weeks of injury. They underwent resection of the torn tendon. This surgery was much like harvesting a hamstring tendon for ligament reconstruction. The average return to play was 6.8 weeks after surgery.

**Conclusions:** Surgical treatment of acute complete ruptures of the distal semitendinosus predictably returns elite athletes to play sooner.

**Reviewer's Comments:** This is an excellent article by 2 well-respected physicians who have a large referral practice of professional and recreational athletes. It should be noted that this injury is seen only in elite athletes. Only 3 athletes of the 17 treated nonoperatively were able to return to play in <4 weeks; 42% were not able to return to play without surgery. The authors make a strong case for early operative intervention for complete distal semitendinosus ruptures in the elite-level athletes with a shorter return to play and a more predictable return to play. (Reviewer-John H. Wilckens, MD).

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Keywords: Distal Hamstring Ruptures, Athletes, Nonsurgical Treatment

Print Tag: Refer to original journal article
What Causes Chondrotoxicity of Local Anesthetics?

Chondrotoxicity of Low pH, Epinephrine, and Preservatives Found in Local Anesthetics Containing Epinephrine.

Dragoo JL, Korotkova T, et al:


Although perioperative pain management is still important in outpatient surgery, the use of local anesthetics with epinephrine should be avoided with pain pumps.

**Objective:** To determine the chondrotoxicity of elements contained in local anesthetics with epinephrine.

**Design:** Controlled laboratory study.

**Methods:** Healthy-appearing chondrocytes were harvested from 3 individuals undergoing total knee arthroplasty and then cultured for 1 week. They were then placed in 24-well plates and perfused with the study medications by a commercially available pain pump. In addition to the media controls, the following medications were tested, 1% lidocaine, 1% lidocaine with epinephrine (1:100,000), 0.25% bupivacaine with epinephrine (1:200,000), epinephrine (1:100,000 or 1:200,000), sodium metabisulfite, and methylparaben. Metabisulfite is a preservative added to local anesthetics with epinephrine. Methylparaben is the preservative added to anesthetics without epinephrine. Local anesthetics with epinephrine require a lower pH (4.5 to 5.0) to stabilize the solution, whereas local anesthetics without epinephrine have a pH of 5.0 to 6.5. Cells were perfused for 24 hours, and then stained for cell viability. Fluorescence microscopy was used to calculate the percentage of cell death.

**Results:** Cultures perfused with just 1:100,000 and 1:200,000 epinephrine alone did not show any increased chondrocyte death. In addition, there was no significant increase in chondrocyte death with 1% lidocaine or 0.25% bupivacaine. The preservative methylparaben had no effect on chondrocyte death, whereas 0.5 mg/mL of sodium metabisulfite did. Cultures infused with local anesthetics with epinephrine and those titrated to a lower pH (4.5 and 5.0) demonstrated increased chondrocyte death at all times observed.

**Conclusions:** Local anesthetics with epinephrine, those containing sodium metabisulfite, and those at a lower pH demonstrated increased chondrocyte death compared with local anesthetics or epinephrine alone.

**Reviewer's Comments:** This is a well-conceived and executed study that provides timely laboratory evidence of the observed chondrotoxicity of local anesthetics with pain pumps. While the observed healthy cartilage harvested from total knee patients may not be the best chondrocytes to study, more juvenile chondrocytes may actually be more sensitive to the agents tested. Although perioperative pain management is still very important in outpatient surgery, the use of local anesthetics with epinephrine should be avoided with pain pumps.

(Reviewer-John H. Wilckens, MD).

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Keywords: Chondrotoxicity, Anesthetics

Print Tag: Refer to original journal article
Percutaneous 3.0-mm AO/ASIF screw fixation of nondisplaced waist scaphoid fractures results in predictable healing while allowing early range of motion and return to work.

**Objective:** To describe the technique and effectiveness of percutaneous screw fixation for waist fractures of the scaphoid with a 3.0-mm AO/ASIF cannulated screw.

**Design:** Retrospective case series.

**Methods:** Over a 5-year period, the senior author performed percutaneous screw fixation of 32 patients with an A2 or B2 scaphoid waist fracture. The technique included a 10-mm longitudinal incision made at the base of the thenar muscles. Fluoroscopy was used to advance a guide-pin along the trapezium to the distal radial pole of the scaphoid, which was then advanced centrally in the scaphoid to the proximal cortex. A measured 3.0-mm partially threaded AO/ASIF screw was then placed over the guidewire. Fluoroscopy was used to document screw position. Patients were then treated with a bulky thumb spica splint for 2 weeks and were encouraged to wear the splint for activity until healing was documented. At follow-up, patients underwent clinical exam, which included x-ray, range of motion, grip and pinch strength, and the Disabilities of the Arm, Shoulder, and Hand questionnaire.

**Results:** 18 of 32 patients were available for follow-up at an average of 3.2 years. There were 13 males and 5 females, with an average age of 30.4 years. Half of the 18 fractures were A2 fractures; the other half were B2 fractures. The fractures healed in 16 patients (89%). The 2 nonunions eventually did heal with a second procedure—open reduction and internal fixation. Patients returned to work at an average of 7.4 weeks (range, 1 week to 24 weeks). There was no statistical difference in wrist motion, except flexion-extension arc of motion (7.4°) compared with the contralateral wrist. Similarly, there was no significant difference in pinch and grip strength between the operative and nonoperative limb. Other than the 2 nonunions, additional complications included a symptomatic prominent screw that required removal after union.

**Conclusions:** Percutaneous AO/ASIF 3.0-mm screw fixation of scaphoid fractures resulted in an 89% union rate and an average time to return to work of 7.4 weeks.

**Reviewer’s Comments:** This article chronicles a board-certified hand surgeon’s experience with this technique. His 2 nonunions are a result of the learning curve associated with this procedure, getting the screw central in the scaphoid and with threads across the fracture site. Of note, the edge of the trapezium is notched to allow for proper screw placement, and the distal cortex is countersunk to bury the head of the screw. The use of a headless screw would obviate that part of the technique. While the average return to work was 7.4 weeks, there was great variability, probably representing the differences in vocation. This procedure is best indicated in patients who have light lifting demands but require fine dexterity skills. I see no advantage of this procedure to cast immobilization, as far as union rate and time to return to work, and a heavy laborer.

(Reviewer-John H. Wilckens, MD).

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Keywords: Scaphoid Fractures

Print Tag: Refer to original journal article
The use of sequential compression devices can reduce the incidence of hypotension and improve the hemodynamic function of patients undergoing shoulder surgery in the beach-chair position.

**Background:** Concerns have been raised with the beach-chair position for shoulder surgery. The sitting position can decrease cardiac preload, which can decrease mean arterial pressure (MAP), stroke volume index (SVI), and cardiac index (CI). Sequential compression devices (SCDs) may improve cardiac preload by recruiting blood that can pool in the lower extremities.

**Objective:** To examine the effect of SCD use on hypotension and other hemodynamic measures during surgery in the beach-chair position.

**Design:** Therapeutic randomized, controlled trial (level of evidence, I).

**Participants/Methods:** 52 patients with an ASA classification of I or II undergoing shoulder arthroscopy were included in the study and were randomized to the study or control group. All patients initially underwent anesthesia induction in the supine position. One patient in each group was excluded from analysis due to hypotension after anesthesia induction. All patients had an SCD placed before anesthesia. Those in the study group had the devices activated before induction of anesthesia. All patients underwent the same anesthesia protocol with rocuronium, remifentanil, and sevoflurane, and all patients underwent tracheal intubation. Patients had an arterial catheter placed to record cardiac output, SVI, and CI. Heart rate, MAP, CI, and SVI were recorded before induction and 5 minutes after anesthesia induction. They were also monitored at 1, 3, and 5 minutes after the patient was raised to a 70° beach-chair position. The authors defined hypotension as an MAP <60 mm Hg or <80% of baseline. The incidence of hypotension when the patients were placed into the beach-chair position was assessed.

**Results:** The 2 groups were similar in demographics, weight, body surface area, preoperative MAP, heart rate, CI, and SVI. The incidence of hypotension was 64% (16 of 25) in the control group and 28% (7 of 25) in the study group; this was statistically significant. In the control group, there was a statistically significant decrease in MAP, CI, and SVI when the patients were placed in the beach-chair position. In the study group, CI decreased significantly, while MAP and SVI did not. When the patients were in the beach-chair position, those in the SCD group had a higher CI, MAP, and SVI than those in the control group.

**Reviewer's Comments:** This level I study demonstrates that the use of SCDs during arthroscopic surgery in the beach-chair position can improve hemodynamic parameters. This gives a further rationale to use SCDs for patients in the beach-chair position, along with their use in mitigating deep vein thromboses. (Reviewer-Nathaniel P. Cohen, MD).

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**Keywords:** Beach-Chair Position, Shoulder Surgery, Sequential Compression Devices

**Print Tag:** Refer to original journal article
Concomitant arthroscopic repair of rotator cuff tears and superior labral anterior-posterior tears can yield similar clinical results to that of rotator cuff repair alone.

**Background:** The concurrent treatment of superior labral anterior-posterior (SLAP) tears and rotator cuff tears remains controversial.

**Objective:** To compare the results of concomitant arthroscopic SLAP and rotator cuff repair with the results of arthroscopic rotator cuff repair alone.

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

**Methods:** The authors compared patients who had undergone a concomitant SLAP repair and arthroscopic rotator cuff repair with a control group of consecutive patients who had undergone rotator cuff repair alone. All patients had an MRI-arthrogram confirming the rotator cuff tear and the presence or absence of an injury to the biceps anchor. Patients underwent a double-row arthroscopic rotator cuff repair and arthroscopic subacromial decompression. The authors performed SLAP repairs using a single doubly loaded anchor placed in the midpoint of the biceps anchor on the superior glenoid. In the control group, 3 patients underwent a biceps tenodesis for bicipital fraying >30%, and 5 patients underwent concomitant debridement of a type I SLAP repair. Patients underwent the same postoperative protocol. Fifty-five patients were evaluated clinically. The other 7 patients had been evaluated at 1 year postoperatively and provided clinical results via telephone interview. The authors looked at range of motion, strength, the Constant score, the normalized Constant score, and the American Shoulder and Elbow Surgeons (ASES) score.

**Results:** 15 men and 13 women with an average age of 59.6 ± 7.9 years formed the control group, while 21 men and 13 women with an average age of 56.9 ± 7.9 years formed the control group. Demographics, litigation frequency, and etiology of the tears were similar between the 2 groups. Patients in both groups had significant improvement in the Constant score, normalized Constant score, and ASES score preoperatively to postoperatively. Preoperatively, the SLAP group had a statistically significant lower mean ASES score than the control group (22.6 vs 34.3). Postoperatively, the SLAP group had a small but statistically significant higher score on the Constant score (91.0 vs 85.0), normalized Constant score (101.0 vs 95.8), and ASES score (96.4 vs 92.3). There was no difference in range of motion between the 2 groups both preoperatively and postoperatively. Both groups had significant gains preoperatively to postoperatively.

**Conclusions:** Concomitant arthroscopic repair of rotator cuff tears and superior labral tears can yield similar clinical results to that of rotator cuff repair alone.

**Reviewer's Comments:** This article challenges the current view that one should not perform a concomitant rotator cuff and SLAP repair. The weakness of this study is its retrospective nature and that no imaging was done postoperatively. Concomitant SLAP and rotator cuff repair can be successful; it requires very careful patient selection, meticulous surgical technique, and aggressive rehabilitation. (Reviewer-Nathaniel P. Cohen, MD).

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Keywords: Superior Labral Tear, Rotator Cuff Tears, Treatment

Print Tag: Refer to original journal article
Objective: “To compare the results of patients treated with an active therapy program and those treated with a passive motion protocol following zone-II flexor tendon repair.”

Methods: Patients with repair of finger flexor tendons in zone-II were randomized to active place-and-hold or passive therapy postoperatively. Sixteen Certificate of Added Qualification hand surgeons participated. All patients had surgery within 48 hours of injury and began therapy within 72 hours of surgery. Patients aged <15 years or >75 years were excluded. Other exclusion criteria included concomitant fractures, vascular repairs, crush injuries, arthritis, and single-tendon injuries. Flexor digitorum profundus (FDP) tendon repairs involved a 4-strand 3-0 core suture and 6-0 Prolene epitendinous suture. Flexor digitorum superficialis (FDS) repairs involved 2-strand 3-0 polyester for each slip of superficialis. Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaires were completed at 1 year. Active digital range of motion was measured at 6, 12, 26, and 52 weeks. The Jebsen-Taylor hand function score and the Purdue pegboard test measured dexterity at 1 year. Ninety-three patients with 106 repaired digits completed the 12-month evaluations.

Results: Patients in the active place-and-hold therapy group had significantly greater range of motion than did patients in the passive therapy group at all times. The average range of motion of proximal interphalangeal and distal interphalangeal joints combined was 122° at 6 weeks and 156° at 1 year for the active group compared to 82° at 6 weeks and 128° at 1 year for the passive group. Patient satisfaction was significantly higher for the active group. The average DASH score at 1 year was not significantly different. There were also no significant differences between groups with regard to dexterity tests. Smokers and patients with nerve injuries had significantly worse range of motion regardless of therapy protocol. Patients treated by a certified hand therapist had significantly greater range of motion and satisfaction with treatment. Patients in the active therapy group returned to work without restriction significantly sooner. There were 2 tendon ruptures in each group.

Conclusions: Active place-and-hold therapy after zone-II flexor tendon repairs results in significantly greater range of motion and patient satisfaction without an increase in the tendon rupture rate.

Reviewer's Comments: I believe this is a landmark contribution to hand surgery, as it represents the best evidence to date for early active range of motion after flexor tendon repair in zone II of the fingers. Not surprisingly, patients were happier when they had more motion. This greater range of motion did not transfer to significantly better function as measured by DASH or dexterity scores. This is likely because these particular measures do not directly depend on the degree of range of motion of the digits. It would have been interesting to know if there were significant differences with regard to function for specific activities that require a larger range of motion, such as specific types of work, athletics, playing a musical instrument, or other pursuits. (Reviewer-Kenneth R. Means, Jr, MD).
The Bernese (Ganz) periacetabular osteotomy is technically complex. It allows powerful reorientation of the acetabulum because the cuts are close to the socket. However, it has a significant learning curve. The prevalence of complications and predisposing factors has not been previously reported.

**Objective:** To review the experience of the Texas Scottish Rite Hospital for Children over a period of 10 years for the outcome of Bernese (Ganz) periacetabular osteotomy.

**Methods:** Patients were included if they were children and did not have cerebral palsy. There were 83 osteotomies in 76 patients. The mean age of the patients was 15 years. Most of the patients had developmental dysplasia of the hip (DDH), but some had Legg-Calvé-Perthes disease, Charcot-Marie-Tooth disease, or various syndromes. Center-edge angle of Wiberg and the lateral center-edge angle (CEA) were measured. The femoral head extrusion index was also measured, with the normal being >70% coverage. Major complications were considered those that required immediate intervention or had the possibility of long-term adverse sequelae. Osteotomy was performed through an anterolateral abductor-sparing approach. Hip osteotomy was performed if there was a positive impingement sign. Fixation was performed with three to four 4.5-mm screws. A femoral osteotomy was performed if there was significant subluxation and proximal femoral deformity. Patients were restricted to 20 to 30 lbs weight-bearing immediately after surgery for 6 weeks.

**Results:** The center-edge angle was corrected from 0° to 35°, and the lateral CEA was -5° to 31°. The average time for the procedure was 4 hours, and the estimated blood loss averaged 760 cc. Of the 8 hips with Tönnis grade 2 osteoarthritis, 2 worsened (one requiring arthroplasty), and the others were stable. There were 3 major complications (4%). One case involved severe intraoperative pelvic bleeding in a patient who had a prior pelvic osteotomy. The bleeding originated from the medial aspect of the exposure but was not the superior gluteal artery. This required embolization and was thought to be an aberrant vessel. The osteotomy was completed 12 days later. There were 2 hips with osteonecrosis; one case involved the acetabulum in a patient with high-grade dysplasia, and the other involved the femoral head in a patient with Charcot-Marie-Tooth disorder who had a concomitant femoral osteotomy and intra-articular labral debridement. There were minor complications in 22% of patients.

**Conclusions:** Bernese periacetabular osteotomy is an effective procedure with a low rate of major complications. It can achieve the goal of satisfactory coverage in a high percentage of patients. The authors point out that adolescents may form a more challenging group because of the high rate of prior surgery.

**Reviewer's Comments:** This was an excellent article by a master surgical technician, Dan Sucato. It illustrates the broad range of factors that the surgeon may encounter in treating these patients. The authors did not even include their 25 patients with cerebral palsy, who can certainly present their own set of challenges. I am intrigued by the incidence of stress fractures of the inferior pubic rami, which have not been reported before. I urge all who surgeons who perform hip reconstructive surgery to read this article. (Reviewer-Paul D. Sponseller, MS, MD).

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Keywords: Periacetabular Osteotomy, Hip Dysplasia

Print Tag: Refer to original journal article
Examine Pediatric Elbow Trauma Carefully


Combourie B, Thevenin-Lemoine C, et al:

*J Bone Joint Surg Am* 2010; 92 (July): 1780-1785

Pediatric elbow fractures are sometimes as much of a diagnostic dilemma as a treatment challenge. This article shows an important pattern of dislocation that can be easily missed if you are not aware of the need to look for it.

**Objective:** The results of 3 patients with elbow dislocation seen at the Trousseau Hospital in Paris are reported.

**Methods:** 2 patients were seen acutely; in one patient, the translocation was not noticed until 2 months after the initial incomplete reduction. Patient ages ranged from 6 to 12 years. All 3 patients had incomplete ulnar paresis. One of the patients had an ossicle anterior to the radial head, which represented part of the coronoid process of the proximal ulna. The basic finding of this pattern is that the radial head is translocated over, so that it articulates with the trochlea, while the ulna is in line with the capitellum.

**Results:** 2 patients seen early were reduced closed. The reduction mechanism used for this was longitudinal traction and manual reduction of the radial head. The other patient required an open reduction via a combined medial and lateral approach. The annular ligament was reconstructed. All 3 patients maintained their reduction after 3 to 6 weeks of immobilization. One patient sustained a growth disturbance of the radial head. The authors propose that the injury resulted from hyper-pronation of the forearm on the outstretched elbow. They postulate that the translocation requires avulsion injury of the brachialis insertion, the medial collateral ligament, and the annular ligament of the elbow. All patients regained a functional range of motion, including flexion from at least 30° to 130°. There were some cases of calcification around the interosseous ligament, but this did not result in complete bridging in any case.

**Conclusions:** The authors stress that this injury can be easy to overlook because the clinical appearance is not as dramatic as a typical posterolateral elbow dislocation. Radiographically, the radial head lines up with the elbow, but it can be misleading because it articulates with the trochlea and not the capitellum. Early diagnosis can allow closed reduction and improve the outcome.

**Reviewer’s Comments:** I was impressed by how easy it might be to miss the diagnosis while looking at these images. One must make a conscious effort to check that the radial head is articulating with the correct side of the distal humeral articulation. I can understand how this might be missed (like a Monteggia fracture). The illustrations were also very helpful. I recommend this article to all those who care for pediatric elbow trauma. (Reviewer-Paul D. Sponseller, MS, MD).

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Keywords: Pediatric Elbow Dislocation, Proximal Radioulnar Translocation

Print Tag: Refer to original journal article
Objective/Methods: To report the results of 86 elbows with post-traumatic varus treated at the Keio Medical Center in Tokyo. Osteotomies were generally done when the varus exceeded 20°. These osteotomies were grouped as either group 1, 3-dimensional (3D), or group 2, coronal-plane correction. Assessment included the carrying angle and the range of motion preoperatively and at final follow-up. Osteotomies used included the 3D osteotomy, rotational dome osteotomy, lateral closing wedge osteotomy, and step-cut osteotomy. The first 2 osteotomies corrected internal rotation, while the last 2 did not. The simpler, group 2 osteotomies were further broken down into patients aged <10 years versus >10 years in order to study the remodeling potential. There were 59 males and 27 females included in the study. The mean age at osteotomy was 11.1 years. Minimum follow-up was 24 months, with a mean of 34 months. The most common operation was a simple closing wedge osteotomy (40 patients), followed by a 3D osteotomy in 34 patients; 8 patients had a modified step-cut osteotomy, and 4 had a rotational dome. The techniques of each type of osteotomy are described in the text. For the 3D osteotomy, a lateral wedge is removed, then the humerus is externally rotated and flexed so that the fingertips can touch the ipsilateral shoulder. Clinical and radiographic parameters were followed.

Results: The patients had a mean of 25° correction of the carrying angle. There was significantly more loss of correction between postoperative and final follow-up in the 3D osteotomy group than in the simple osteotomy group. Patients who were <10 years old had more correction of hyperextension and gain of flexion over time, indicating remodeling potential. These younger patients also had a gain in the total arc of motion. There were 3 recurrences of cubitus varus in the 3D group and one in the uniplanar group, which seems to be a significant difference. Although there were no postoperative infections, one patient had a radial nerve palsy from retraction. There were no secondary fractures. No patients complained of functional restrictions from loss of external rotation.

Conclusions: Although supracondylar malunion often involves an internal rotation component, correction of this component increases the risk of loss of correction in the other planes and is not clinically necessary.

Reviewer's Comments: This is a practical study. It proves the old orthopaedic adage that “the enemy of good is perfect.” Of course the goal of “good” is different for every clinical condition, and this article helps establish the goal for this condition: correct the varus in all patients in a stable fashion, and correct the hyperextension in patients aged >10 years. (Reviewer-Paul D. Sponseller, MS, MD).

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Keywords: Supracondylar Osteotomy, Humerus, Cubitus Varus

Print Tag: Refer to original journal article
Bayomy AF, Aubin PM, et al:

Arthrodesis of the great toe can be used to treat pediatric, as well as adult, foot deformity.

**Objective:** To study the ideal dorsiflexion angle for this fusion procedure in order to minimize pressure on the hallux and first metatarsal head. The authors hypothesized that there would be an angle that would optimize pressure on both the metatarsal and the hallux itself.

**Methods:** 6 fresh-frozen, cadaver foot specimens were instrumented and fused in various positions of dorsiflexion. The joint was decorticated and fixed with a dorsal plate. Varying dorsiflexion angles for fusion were tested, from 15° to 30°. The antero-posterior hallux valgus angle was 14°, which was physiologic. Force measurement was done on a robotic gait simulator, applying 50% of body weight. Tendons were activated to simulate normal ankle movement at a somewhat slower than normal gait velocity. The authors used force plates to measure both peak pressure and pressure-time integral. Graphs of plantar pressure versus dorsiflexion angle were plotted.

**Results:** The plantar pressure under the first metatarsal increased directly with dorsiflexion angle. In other words, the more dorsiflexion built into the osteotomy, the more the pressure became concentrated upon the first metatarsal head. In contrast, the opposite was seen for the great toe itself. With greater dorsiflexion, there was less pressure there. The graphs were plotted against each other. They intersected at a dorsiflexion angle of 21° for the pressure-time integral and 25° for the peak pressure. Interestingly, there was not a relationship of pressure under the lesser metatarsal heads with dorsiflexion angle.

**Conclusions:** The authors recommend arthrodesis at an angle between 20° and 25° when fusing a great toe metatarsophalangeal joint. They caution that allowances should be made for preoperative foot and toe anatomy (ie, patients with cavus foot or other deformities).

**Reviewer's Comments:** This was a useful article that correlates well with recommendations in the existing literature for position of fusion. Accurate positioning may require taking an intraoperative x-ray to see what angle you have actually created. Probably, for patients who mostly function in standing rather than walking, it would be especially important to avoid excessive dorsiflexion. It would have been interesting for the authors to quantify the angle that the interphalangeal joint assumed dynamically with the varying degrees of dorsiflexion. I recommend this article to all who perform foot surgery. (Reviewer-Paul D. Sponseller, MS, MD).

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Keywords: Metatarsophalangeal Joint, Arthrodesis, Dorsiflexion Angle

Print Tag: Refer to original journal article
Following rotator cuff repair, contact pressure, force, and area all decrease over time, regardless of rotator cuff repair technique used.

**Background:** Recent biomechanical studies have evaluated the contact area and contact pressure at the rotator cuff footprint following different rotator cuff repair techniques. No study, however, has addressed the contact area, contact force, and contact pressure in the footprint over time.

**Objective:** To perform 4 different rotator cuff repair techniques and then measure the contact pressure in the rotator cuff footprint, the contact force in this area, and the contact in the footprint area over time.

**Design:** Biomechanical, cadaveric, controlled laboratory study.

**Methods:** 16 cadaveric human shoulder specimens (mean age, 72.7 years), with no evidence of rotator cuff pathology, were utilized in this study. Isolated full-thickness supraspinatus tendon tears were created and repaired using 1 of 4 different repair techniques: transosseous-equivalent suture bridge repair; single-row suture anchor repair; triangle double-row suture anchor repair; or the suture chain transosseous repair. The same anchors were used for all repair constructs. Using the TekScan thin film pressure sensor system (TekScan, South Boston, MA) inserted between the footprint and the undersurface of the rotator cuff prior to repair, contact pressure, force, and area measurements were made. Measurements were made immediately after repair and then every minute for the first 10 minutes, every 5 minutes for the next 30 minutes, and every 30 minutes until 160 minutes was reached.

**Results:** The transosseous-equivalent suture bridge repair technique had the highest contact pressure initially (13.8 psi) and at all measured points thereafter. The single-row repair had the lowest contact pressure initially (3.6 psi) and at the completion of testing (2.4 psi). Only the transosseous-equivalent suture bridge repair technique had a statistically significantly greater contact pressure than the single-row repair, both initially ($P = 0.021$) and at the completion of testing ($P = 0.028$). Contact pressure, force, and area decreased in all repair constructs with time.

**Conclusions:** Even without motion or cyclic loading, this study shows that following rotator cuff repair, contact pressure, force, and area all decrease over time regardless of the rotator cuff repair technique.

**Reviewer's Comments:** This study is limited by the fact that it is a biomechanical, cadaveric study, with no load to failure data available. The clinical implications of the findings of this study warrant further investigation, but may have serious implications for rehabilitation protocols depending upon repair technique. (Reviewer-Adam J. Farber, MD).

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Keywords: Arthroscopic Rotator Cuff Repair, Biomechanical Evaluation, Contact Pressure

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When all-inside arthroscopic meniscal repair is performed using the FasT-Fix device in the setting of a concomitant anterior cruciate ligament reconstruction, the overall healing rate of menisci, as assessed by second-look arthroscopy, is 74%.

**Background:** There are no published studies reporting the healing rate of meniscal repairs done with the FasT-Fix device (Smith & Nephew Endoscopy, Andover, MA) as assessed by second-look arthroscopy.

**Objective:** To use second-look arthroscopy to assess meniscal healing following all-inside meniscal repair (performed using the FasT-Fix device) with concomitant anterior cruciate ligament (ACL) reconstruction.

**Design:** Consecutive case series.

**Methods:** 46 of 65 consecutive patients (20 men and 26 women; mean age, 26.5 years) who underwent arthroscopic all-inside meniscal repair using the FasT-Fix device with concomitant ACL reconstruction between 2005 and 2008 were evaluated with second-look arthroscopy at the time of staged hardware removal. All repaired tears were within the red-red zone or red-white zone, were >1.5 cm in length, and were longitudinal or double longitudinal tears. All patients underwent a standardized postoperative rehabilitation course, including partial weight-bearing for 3 weeks. Second-look arthroscopy was performed at a mean of 14 months following the index procedure. Outcome measures included clinical complaints (mechanical symptoms), physical examination findings (joint line tenderness), and second-look arthroscopy evaluating the degree of meniscal healing.

**Results:** 28 medial meniscal repairs and 34 lateral meniscal repairs were performed. An average of 2.2 implants was used in each repair. At final follow-up, 8 patients were symptomatic and were defined as clinical failures; 2 patients had mechanical symptoms, 7 patients were tender at the joint line, and 1 patient reported persistent swelling. Therefore, the overall clinical success rate was 82.6%. During second-look arthroscopy, 11.3% of repairs failed to heal, 14.5% were healed partially, and 74.2% were completely healed. In the failed meniscal repairs, only 14% of patients had meniscal symptoms. Only 60.5% of the clinical successes were completely healed during arthroscopy, and only 12.5% of the clinical failures were not healed during arthroscopy. Newly formed injuries were present in 34.5% of patients.

**Conclusions:** When all-inside arthroscopic meniscal repair is performed using the FasT-Fix device in the setting of a concomitant ACL reconstruction, the overall healing rate of menisci, as assessed by second-look arthroscopy, is 74%. Clinical success does not correlate well with findings at second-look arthroscopy.

**Reviewer’s Comments:** This study is limited by the number patients lost to follow-up, the short duration of follow-up, and the lack of a control group. The findings of the study highlight the poor correlation between clinical success and arthroscopic findings during second-look arthroscopy. As the authors note, longer follow-up may lead to more clinical and arthroscopic failures. Future controlled clinical studies with longer follow-up are needed to further assess the efficacy of the FasT-Fix device for meniscal repair. (Reviewer-Adam J. Farber, MD).

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Keywords: Knee Meniscus All-Inside Repair, FasT-Fix Device

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Patients ≤18 years of age that undergo meniscal repair with concomitant anterior cruciate ligament reconstruction have a 74% clinical success rate at 8-year follow-up.

Background: Few published studies exist documenting the results of meniscal repair performed with concomitant anterior cruciate ligament (ACL) reconstruction in the adolescent and pediatric population. 

Objective: To report the results of meniscal repair in adolescent and pediatric patients who undergo concomitant ACL reconstruction, identify factors that may affect the results of meniscal repair in this population, and compare the results of meniscal repair with concomitant ACL reconstruction to isolated meniscal repairs.

Methods: 99 patients (56 females and 43 males; mean age, 16 years) ≤18 years of age, who underwent arthroscopic meniscal repair and concomitant ACL reconstruction, were included in the study. This cohort was compared to a previous group of 48 patients <18 years of age who underwent isolated meniscal repair. Repair techniques included inside-out repair, all-inside repair, or a combination of the 2 techniques. Postoperatively, all patients underwent a standard rehabilitation protocol. Clinical success was defined as the absence of mechanical symptoms and pain without the need for additional surgical procedures. Objective outcome measures included the Tegner score and the International Knee Documentation Committee (IKDC) score.

Results: The mean final follow-up was 8.3 years (range, 2.4 to 19.1 years). The clinical success rate was 90.9% at 2 years, 76.8% at 5 years, and 74% at final follow-up. Simple tears were associated with greater clinical success than bucket-handle tears or complex tears (84% vs 59% and 57%, respectively). The IKDC score improved from 48 preoperatively to 90 postoperatively ($P<0.0001$). The mean Tegner score improved from 1.9 preoperatively to 6.2 postoperatively ($P<0.0001$). Statistical analysis revealed that complex tears and bucket-handle tears were more likely to fail repair than simple tears ($P=0.01$), and medial meniscal repairs were more likely to fail than lateral meniscal repairs ($P=0.03$). Surprisingly, skeletally immature patients were at greater risk for failure of repair than skeletally mature patients ($P=0.01$). When this cohort was compared with a previous cohort of patients who underwent isolated meniscal repair, results revealed that complex tears repaired with concomitant ACL reconstruction had a greater rate of clinical success than when repaired in isolation ($P=0.004$).

Conclusions: Patients ≤18 years of age that undergo meniscal repair with concomitant ACL reconstruction have a 74% clinical success rate at 8-year follow-up. Repairs of lateral meniscal tears and simple tears have a greater clinical success than repairs of medial meniscus tears or complex or bucket-handle meniscal tears.

Reviewer’s Comments: This is the largest series of pediatric patients who have undergone meniscal repair with concomitant ACL reconstruction, and thereby provides valuable information. The study is limited by the heterogeneity of repair techniques utilized, the reliance on historical controls, and lack of a nonoperative control group. (Reviewer-Adam J. Farber, MD).

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Keywords: Meniscal Tears, Surgical Repair, ACL Arthroscopy, Adolescents, Pediatriacs

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Single Tunnel CC Reconstruction With Hamstring Tendon Gives Good Results

Clinical Results of Single-Tunnel Coracoclavicular Ligament Reconstruction Using Autogenous Semitendinosus Tendon.


Single-tunnel coracoclavicular ligament reconstruction using autograft semitendinosus tendon for the treatment of acute grade IV or V acromioclavicular (AC) separations, chronic grade III AC separations, or distal clavicle nonunions reliably leads to good or excellent clinical results.

Background: Numerous surgical techniques have been described for the treatment of high-grade acromioclavicular (AC) joint separations indicating the lack of clear superiority of one technique. Recent studies have investigated anatomic coracoclavicular (CC) ligament reconstruction and single or multiple tunnels. Two-tunnel reconstructions have the risk of clavicle fracture, whereas single-tunnel reconstructions may not recreate the anatomy entirely.

Objective: To report the outcomes, both clinical and radiographic, of 1 group's experience performing a single-tunnel CC ligament reconstruction with autogenous semitendinosus tendon.

Design: Retrospectively reviewed case series.

Participants/Methods: 16 patients (14 men and 2 women; mean age, 39.8 years) who underwent CC ligament reconstruction using an autogenous semitendinosus tendon between 2005 and 2008 were included in this study. Indications for surgery included the following: acute grade IV or grade V AC joint separation (n=11); chronic symptomatic grade III AC joint separation (n=5); or symptomatic distal clavicle fracture nonunion with CC ligament disruption (n=5). All patients were treated with an open surgical technique in which a single drill hole was placed in the clavicle and the semitendinosus tendon autograft was looped around the undersurface of the coracoid. In addition, three #5 Ethibond sutures were used for augmentation of the CC reconstruction. All patients underwent a standard postoperative rehabilitation protocol, including sling immobilization for 6 weeks. Outcome measures included the Constant score, the UCLA score, AC (AC Joint Separation Questionnaire) scores, pain as defined by a visual analog scale, and radiographic analysis.

Results: Mean final follow-up occurred at 33 months (range, 18 to 47 months). According to the AC scores, there were 10 excellent and 11 good results. At final follow-up, the mean constant score was 84.7, the mean UCLA score was 30.0, and the mean pain score was 1.85 on a scale of 0 to 10. On radiographic analysis, the CC interval was anatomically reduced on anteroposterior radiographs in 81% patients. One noncompliant patient had complete loss of reduction, and 3 patients had partial loss of reduction. When subluxation in the anterior-posterior plane was assessed by axillary radiographs, 6% of patients had partial subluxation and 94% had appropriate reduction in this plane.

Conclusions: Single-tunnel CC ligament reconstruction using autograft semitendinosus tendon for the treatment of acute grade IV or V AC separations, chronic grade III AC separations, or distal clavicle nonunions reliably leads to good or excellent clinical results.

Reviewer's Comments: This study is limited by a small sample size, short-term follow up, and retrospective nature. Despite these limitations, it provides encouraging results for this surgical technique. Although there is some anterior subluxation in a small percentage of patients, this does not appear to have functional consequences. In addition, there were no postoperative clavicle fractures noted; clavicle fracture is a significant risk and serious complication associated with double-bundle anatomic CC reconstructions.

(Reviewer-Adam J. Farber, MD).

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Keywords: Coracoclavicular Joint, AC-CC Injury, Reconstruction, Hamstring Tendon

Print Tag: Refer to original journal article
Over 90% of patients are satisfied 10 to 20 years after undergoing autologous chondrocyte implantation procedures for chondral or osteochondral lesions of the knee.

**Background:** Although short-term and medium-term results for autologous chondrocyte implantation (ACI) procedures have been published, no long-term data exist regarding the outcomes of ACI.

**Objective:** To investigate the long-term clinical results of ACI in the knee for patients with follow-up of 10 to 20 years postoperatively.

**Design:** Uncontrolled case series.

**Participants/Methods:** 341 patients who underwent ACI procedures on their knee at least 10 years previously were included in the study. Questionnaires, which included numerous validated outcome scores, were sent to these patients. Outcome scores included the Lysholm, Tegner-Wallgren, Brittberg-Peterson, modified Cincinnati (Noyes), and the Knee Injury and Osteoarthritis Outcome Score (KOOS). These scores were compared to preoperative scores, which were obtained from the patient's chart, when available. In addition, all patients were asked (via questionnaire) to subjectively rate their outcomes and whether or not they would proceed with the operation again. Patient demographic factors, the presence of concomitant injuries or previous surgery, and the nature of the chondral lesions were correlated with patient outcomes.

**Results:** 224 of 341 patients responded to the questionnaire for a response rate of 65%. The mean cartilage lesion size treated by ACI was 5.3 cm². The age of the patients at the time of ACI was 33.3 years (range, 14 to 61.5 years). Thirty-four percent of the patients had a history of a partial or total meniscectomy before or during ACI, and 37% of the patients had a prior operation for the chondral injury. Questionnaires were sent to patients 10 years after the ACI procedure (mean, 12.8 years; range, 9.3 to 20.7 years). Overall, 92% of patients stated they would proceed with the operation again, and 74% felt that their status was better or the same during the past years. When compared to preoperative levels, all outcome scores were significantly improved at final follow-up. The Lysholm score improved from 60.3 preoperatively to 69.5 postoperatively, the Tegner score improved from 7.22 preoperatively to 8.2 postoperatively, and the Brittberg-Peterson score improved from 59.4 preoperatively to 40.9 at follow up ($P<$0.05 for all). The presence of bipolar lesions was associated with poor outcome scores, but patient age, lesion size, pre-existing marrow stimulation procedures, or the presence of concomitant meniscal injuries did not affect the final outcome scores.

**Conclusions:** This study demonstrates the subjective long-term efficacy and durability of ACI for chondral lesions of the knee.

**Reviewer's Comments:** This study is limited by the heterogeneity of lesions treated and concomitant procedures involved. In addition, the response rate is only 65% and no control group was included in the study. Despite these limitations, the study provides useful long-term data supporting the efficacy of ACI. Future prospective controlled studies are needed to further investigate this procedure, especially now that newer techniques are employed with ACI procedures. (Reviewer-Adam J. Farber, MD).

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Keywords: Autologous Chondrocyte Implantation, Cartilage, Chondral Lesions, Knee

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The technique described, using flip-button devices to anatomically reduce the acromioclavicular (AC) joint for the treatment of acute high-grade AC joint injuries, leads to good clinical results, but less than ideal radiographic results, at 2 years.

**Objective:** To assess the clinical and radiographic outcomes of a novel surgical technique for the treatment of high-grade acromioclavicular (AC) joint injuries. This technique utilizes 2 suture-based flip button devices that attempt to restore the native AC joint anatomy and allow the coracoclavicular ligaments to scar in and heal at the appropriate length.

**Participants/Methods:** 23 consecutive patients (21 men and 2 women; mean age, 37.5 years; range, 21 to 59 years) who underwent surgical treatment of the AC joint from 2006 to 2007 were included in the study; 7 patients who underwent the same procedure were not included in this study (4 were lost to follow-up, 2 had hardware failure, and 1 needed hardware removal due to infection). Indications for surgery included acute (<3 weeks) high-grade (type III [n=3], type IV [n=3], or type V [n=17]) AC joint injuries. Surgical reconstruction of the conoid and trapezoid ligaments were performed individually using 2 suture-based flip-button devices (TightRope; Arthrex; Naples, FL). Using arthroscopic visualization, 2 bony tunnels were drilled through both the coracoid and the clavicle to allow passage of the TightRope devices. All patients were followed both clinically and radiographically for 2 years postoperatively. Outcome measures included pain and validated outcome instruments, including the Constant score and the simple shoulder test score.

**Results:** Mean final follow-up occurred at 30.6 months (range, 24 to 40 months). At final follow-up, all but 1 patient regained full range of motion, and only 1 patient had tenderness over the AC joint. Pain scores improved from 4.5 preoperatively to 0.25 postoperatively (P < 0.05); the Constant score improved from 34.3 preoperatively to 94.3 postoperatively (P < 0.05), and the simple shoulder test score improved from 2.8 preoperatively to 12.0 postoperatively. Results did not vary according to the severity of the AC joint injury. X-rays revealed that the average coracoclavicular (CC) distance decreased from 20.5 mm preoperatively to 9.3 mm at the 6-month visit; this distance did not change between 6 months and 24 months. There were 8 radiographic failures (under correction of CC distance, posterior displacement, or both and 5 over corrections of the CC distance). These x-ray findings, however, did not affect clinical outcomes. One patient, who was excluded from the study, sustained a coracoid fracture postoperatively.

**Conclusions:** The technique described, using flip-button devices to anatomically reduce the AC joint for the treatment of acute high-grade AC joint injuries, leads to good clinical results at 2 years.

**Reviewer's Comments:** This study is limited by the lack of a control group, either treated nonoperatively or with alternative surgical techniques. In addition, this technique is only useful for acute injuries because it relies on healing of the native CC ligaments. Finally, the rate of radiographic failures is alarmingly high. (Reviewer-Adam J. Farber, MD).

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Keywords: Shoulder, Acromioclavicular Joint Subluxation, Anatomical Reconstruction

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The incidence of screw cutout or screw malpositioning when performing open reduction and internal fixation of 3- and 4-part proximal humerus fractures using a locking plate is 13.7%.

**Objective:** To determine the complications and pitfalls related to performing open reduction and internal fixation (ORIF) of proximal humeral fractures with a locking plate and to identify predictors of these complications.

**Methods:** From 2004 to 2005, 73 adult patients (26 men and 47 women; mean age, 65 years; range, 34 to 97 years) with acute displaced 3- or 4-part fractures of the proximal humerus were treated with ORIF using a locking plate; 17 patients had 3-part fractures and 56 had 4-part fractures of the proximal humerus. Fixation was performed using 1 specific plate (LPHP – SYNTHES, Oberdorf, Switzerland). All patients underwent a standardized postoperative protocol, including early active range of motion beginning 2 weeks after surgery. All patients were evaluated with clinical and radiographic examinations for at least 6 months; 44 patients had a minimum of 18 months of follow-up. Functional outcomes were assessed using the Constant score. Radiographic findings, including secondary displacement, nonunion, osteonecrosis, and hardware failure, were also assessed.

**Results:** The mean final follow-up for the 44 patients was 20.7 months (range, 18 to 40 months). Of the 73 patients, 11 required additional surgery after the index procedure and were not included in the analysis. Indications for revision surgery were secondary displacement (n=4), screw cut out (n=2), pseudoarthrosis (n=2), infection (n=1), rupture of the rotator cuff (n=1), and subacromial impingement (n=1). Three additional patients required arthroscopic capsular release for adhesive capsulitis. The mean final Constant score was 62.3. Patients <65 years of age had significantly better Constant scores than patients >65 years of age (P <0.05). Malunion of the greater tuberosity, but not the lesser tuberosity, also had a significant influence on the Constant score (P <0.05). Excessively superior plate placement, screw malpositioning, and secondary screw cutout all had a significant influence on the Constant score (P <0.05). When x-rays were analyzed, the incidence of screw cutout or screw malpositioning was 13.7%, the incidence of secondary displacement was 8.2%, the rate of nonunion was 5.5%, and the rate of osteonecrosis of the humeral head was 16.4%. The presence of osteonecrosis or nonunion both had a significant effect on the final Constant score (P <0.05).

**Conclusions:** There is a high complication rate following ORIF of 3- and 4-part proximal humerus fracture using locking plates. Avoidable technical factors, including superior plate positioning and screw malpositioning, have a significant effect on clinical outcomes.

**Reviewer's Comments:** This study is limited by its retrospective nature and the high number of patients lost to follow-up. Despite these shortcomings, it highlights the high complication rate associated with ORIF of proximal humerus fractures using locking plates. (Reviewer-Adam J. Farber, MD).

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Keywords: Shoulder, Proximal Humerus Fracture, Complication, Locking Plate

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Joint space narrowing, increased age, and delayed treatment all lead to lower satisfaction in patients who undergo arthroscopic intervention with acetabular labral reconstruction for labral deficiency or advanced labral degeneration.

**Background:** The labrum acts as a seal that ensures adequate joint lubrication and deepens the acetabulum while extending coverage of the femoral head. Labral tears alter the biomechanical environment of the hip, and it has been postulated that this can lead to the degeneration of the articular cartilage and eventually to osteoarthritis. In cases of labral deficiency or advanced degeneration, repair may not be possible.

**Objective:** To investigate the indications for and outcomes of arthroscopic labral reconstruction in the hip by use of iliotibial band autograft.

**Design:** Therapeutic case series; Level IV.

**Participants/Methods:** 47 patients met the inclusion criteria of having a labral reconstruction using a tubularized iliotibial band autograft. The mean age at the time of arthroscopy was 37 years. Patients completed a questionnaire preoperatively and postoperatively that included the modified Harris Hip Score (MHHS) and patient satisfaction scales scored from 1 to 10, with 10 being very satisfied.

**Results:** Of the 47 patients, 23 (49%) had previous hip surgery. Of these 23 patients, at initial hip surgery, 18 (78%) underwent labral debridement, 2 underwent labral excision, 2 underwent labral repair, and 1 underwent intramedullary nailing of a femoral fracture. Four patients (9%) progressed to total hip arthroplasty (THA). The mean age of these patients was 49 years (range, 39 to 54 years), which was significantly older than the mean age of patients who did not require THA (36 years; $P = 0.027$). Three patients who progressed to THA had joint space of <2 mm. The mean time to follow-up was 18 months (range, 12 to 32 months). The mean MHHS improved from 62 (range, 35 to 92) preoperatively to 85 (range, 53 to 100) postoperatively. The median patient satisfaction with outcome was 8 out of 10. There was a significant association between age and patient satisfaction with outcome ($P = 0.03$). Patients with <2 mm of joint space were less satisfied ($P = 0.039$). Patients who were treated within 1 year of injury had higher MHHS than patients who waited longer than 1 year ($P = 0.03$).

**Conclusions:** This study showed that patients who have labral deficiency or advanced labral degeneration had good outcomes and high patient satisfaction after arthroscopic intervention with acetabular labral reconstruction. Lower satisfaction was associated with joint space narrowing and increased age. Patients who waited >1 year from the time of injury to surgery had lower function at follow-up than those treated in the first year.

**Reviewer's Comments:** This report identifies increased age, narrow joint space, and delayed treatment as important demographics of which to be wary when considering labral reconstruction. In addition, it provides a baseline of expected improvement after a relatively novel procedure. (Reviewer-Carl H. Wierks, MD).
How to Estimate the Change in the CE Angle

Acetabular Rim Reduction for the Treatment of Femoroacetabular Impingement Correlates With Preoperative and Postoperative Center-Edge Angle.
Philippon MJ, Wolff AB, et al:
Arthroscopy 2010; 26 (June): 757-761

One millimeter of rim reduction results in a 2.4° reduction in center-edge angle.

Background: The rationale for acetabular rim trimming is 3-fold: (1) to directly address the offending pathology causing the impingement as in pincer-type or mixed pincer-cam–type femoroacetabular impingement (FAI), (2) to resect areas of grade IV chondral damage, and (3) to protect repaired damaged labrum from further impingement. To minimize the risk of creating an underconstrained hip or a hip that will probably have progression of osteoarthritis, it might help to be able to correlate the amount of resection performed with preoperative and postoperative radiographic imaging.

Objective: To determine whether the change in center-edge (CE) angle effected by arthroscopic acetabular rim trimming could be estimated by intraoperative measurements.

Design: Prospective diagnostic study; Level II.

Participants/Methods: 58 patients (23 men, 35 women) were prospectively enrolled. Inclusion criteria were hip arthroscopy for the treatment of FAI and rim reduction at the time of hip arthroscopy. The CE angle was measured as the angle subtended between a perpendicular line from the center of the femoral head and the lateral margin of the acetabulum; measurements were taken pre-and postoperatively. The acetabular depth was measured intraoperatively by a single surgeon from the superior aspect of the cotyloid fossa to approximately the 12-o’clock position of the lunate surface, opposite the transverse acetabular ligament.

Results: The mean preoperative CE angle was 36.4° for observer 1 and 36.7° for observer 2. The mean postoperative CE angle was 32.3° for observer 1 and 33.1° for observer 2. The interobserver intraclass correlation coefficient for radiographic measurement of the CE angle was 0.92. The mean preoperative 12-o’clock acetabular depth was 25 mm, and the mean postoperative 12-o’clock acetabular depth was 21.8 mm. The mean rim reduction performed was 3.2 mm. The change in CE angle correlated with the reduction of acetabular rim ($r = 0.4; P = 0.004$). The following equation was obtained to estimate the relation: Change in CE angle = 1.8 + (0.64 x rim reduction in mm). A 2.4° reduction in CE angle can be anticipated for 1 mm of rim reduction, and 5 mm of bony resection equals 5° of change in the CE angle.

Conclusions: The amount of change in the CE angle can be estimated by the amount of bony resection performed at the 12-o’clock position on the lunate surface in the arthroscopic treatment of FAI. (Reviewer-Carl H. Wierks, MD).

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Keywords: Hip Arthroscopy, Center-Edge Angle, Rim Trimming

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