Objective: To look at the incidence, types, and patterns of injury in children by age in a large trauma center.

Design: Retrospective review of a single center (Evidence Level IV).

Participants/Methods: Over a 2.5-year period (2004 to 2006), the records of the trauma center in Memphis, Tennessee for children <16 years of age were studied. Patients were grouped into pre-teens and teens, and injury patterns were compared.

Results: 96 children were injured during the 30-month period at this 1 center (ie, >3 per month). More children (56%) were in the pre-teen group, and one-third was girls. Mean age of the children was just 11 years. The youngest involved was 2 years old. There was 1 fatality. The most common injury was orthopedic (60%) followed by head injury (33%). Younger children were more likely to have an isolated lower extremity fracture, while teens were more likely to have a pelvic fracture. Lower extremity fractures occurred in 31 patients versus upper extremity fractures in 18. There were 9 open fractures and 4 spine fractures during this period. Only 9% of patients were wearing a helmet at the time of injury, despite laws requiring their use.

Conclusions: ATV accidents remain a common cause of severe morbidity and mortality in children. However, ATV manufacturers continue to make larger and faster machines, some reaching speeds of 75 miles per hour and weighing 500 pounds. From 1989 to 1997, the production of larger ATVs increased threefold despite professional societies warning against their use. Almost all children injured were riding adult-sized machines. Other studies have shown that children are 3 times more likely to sustain an injury than adults. Factors involved in this include size, strength, coordination, and judgment. More of the injuries were in the pre-teen group in this study. The authors point out that state laws vary and theirs has no lower age limit for pediatric ATV operation. In other words, any child of any age can operate an ATV. They also have no training requirements. Studies have shown that helmet use can decrease head-injury rates by nearly 50%. The authors reiterate the recommendations of the Academy of Orthopaedic Surgery, the American Academy of Pediatrics, and the American College of Surgeons that children <16 years of age should not operate or be passengers on ATVs.

Reviewer's Comments: This sobering litany mirrors our own experience at the Johns Hopkins Pediatric Trauma Center. We have seen numerous fatalities over the years related to head injury. We have also seen numerous open and severe fractures. After lawnmower injury, it is the most feared injury mechanism. The only effective way to make a dent in this is through multi-pronged regulation aimed at manufacturers and parents, including sanctions for allowing children to use these high-risk dangerous devices.

Additional Keywords: Age-Related Injury

print tag: () Refer to original journal article.
Reabsorbable Screws Fare Better Than Pins

Comparison of Bioabsorbable Versus Metallic Implant Fixation for Physeal and Epiphyseal Fractures of the Distal Tibia.

Podeszwa DA, Wilson PL, et al:
J Pediatr Orthop; 28 (December): 859-863

The PLLA implant is totally resorbed in 2 years.

**Objective:** To compare the use of resorbable and metal implants in pediatric ankle fractures.

**Design:** Retrospective case-control series (Evidence Level III).

**Participants/Methods:** All children treated over a 2.5-year period at Texas Children's Hospital were studied retrospectively. Fracture types, union rates, and complications were reviewed.

**Results:** Despite being a retrospective, nonrandomized study, the 2 groups were nearly equal in size; 24 patients were treated with bioresorbable screws and 26 with metal fixation. The most common fracture type was of the medial malleolus (Salter-Harris type III in 40% and Salter type IV in 60%). None of the implants in either group crossed the physis. The technique involved provisional fixation by K-wires, followed by screw fixation. The resorbable material was polylevolactic acid (PLLA). These screws are available in 3.5- and 4.5-mm widths. The 4.5-mm screws are available in solid and cannulated options, while the 3.5-mm screws are only available in solid shapes. The operative times were the same for both groups. All patients in both groups were treated with initial postoperative casting. A single case of loss of fixation requiring revision was seen in each group. There were no nonunions. There was 1 documented growth arrest in the metal group. These occurred in regions that would have been predicted from the fracture pattern. There were 2 superficial wound infections in the metal group and none in the bioresorbable patients. Fourteen of the metal patients have had implant removal.

**Conclusions:** Biomechanical studies show that a screw in the distal tibial epiphysis alters the mechanics of the ankle by causing a localized area of increased hardness. Biomechanical studies have shown that initially, bioresorbable implants function similarly to metal ones. It takes 12 weeks for the reabsorbable implants to lose half of their bending strength, as opposed to 2 weeks for polyglycolic acid materials. The PLLA implant is totally resorbed in 2 years. It may be an option for situations in which fixation may need to cross the physis, as animal models have shown that resorbing implants can go across the growth plate without disturbing growth. This will need clinical proof.

**Reviewer's Comments:** Reabsorbable screws fare better than pins. Pins sometimes back out and can cause drainage. Prior authors have reported a significant incidence of sterile drainage from reabsorbable pins. The same results may not be obtained from screws. The potential cost savings from implant removal is significant.

**Additional Keywords:** Bioabsorbable vs Metallic

**print tag:** () Refer to original journal article.
New Addition to Menu of Options for Tx of Femur Fx in Young Children

Flexible Interlocked Nailing of Pediatric Femoral Fractures: Experience With a New Flexible Interlocking Intramedullary Nail Compared With Other Fixation Procedures.

Jencikova-Celerin L, Phillips JH, et al:
J Pediatric Orthop; 28 (December): 864-872

Flexible interlocking intramedullary nails appear to have some advantages over other methods in controlling femur fractures; they have low rates of malunion and infection.

Objective: To compare results of flexible interlocking intramedullary nails (FIINs) with other forms of femur fracture fixation.

Design: Level III, retrospective, case-control study.

Participants/Methods: Patients 7 to 18 years of age presenting with a femoral shaft fracture to Nemours Hospital in Jacksonville or Orlando between 1998 and 2003 were studied. The flexible nail has an anterior bow, but can be customized for right versus left by mechanical bending. It has proximal and distal sections of 8.5 mm in diameter to accommodate the locking screws. It comes in 4.5- and 5.5-mm main shaft diameters. Entry point for the nail is far lateral on the greater trochanter to minimize the risk of trauma, heat, or other harm to the vessels running near the piriformis fossa. A 9-mm reamer is used to start the channel and followed by hand-held reamers. The canal of the femoral shaft does not need to be reamed as long as the isthmus is at least 9 mm in diameter. A valgus bend is incorporated into the proximal and distal end of the rod by the surgeon. The nail should not pass distal to the distal femoral physis. The proximal interlock should be done just distal to the trochanteric growth plate; interlocking screws are 4 mm. Partial weight bearing (WB) is allowed at 3 weeks if early callus is seen. Recommendations are to remove the nails 9 to 12 months after insertion. Patients with FIINs were compared with those having other fixation methods.

Results: 137 patients were studied; 58 had FIINs and 79 had other methods of fixation. The mean age was 11.5 years. Other methods of fixation included flexible nonlocking nails, rigid nails, external fixation, or plates. Mean operative time was 166 minutes. The FIIN group had fewer complications (19%) than the other group (31%), less blood loss and a shorter time to WB. Neither group had avascular necrosis of the femoral head, A subgroup of patients <100 pounds, had 8 times fewer complications with the locking versus standard flexible nails. Malunion was a big part of the difference, since it occurred in 6 of the patients treated with other methods and none with the FIINs. No infections occurred in the FIIN group versus 2 in the group treated with other methods.

Conclusions: FIINs has some advantages over other methods in controlling femur fractures. The nails have low rates of malunion or infection.

Reviewer’s Comments: This is a useful addition to the menu of options for treating femur fractures in young children. It is limited by the diameter of the femoral canal, which must accommodate the 8.5-mm enlarged sections for the locking screws. This allows children as young as 7 years old with length-unstable fractures to be treated using these nails.

Additional Keywords: Flexible Interlocked Nailing

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Risk Factors for Postoperative Neurovascular Complications

Postoperative Orthopaedic Neurovascular Monitoring in the Pediatric Population.

Chang TL, Sargent MC, Sponseller PD:
J Pediatr Orthop; 29 (January/February): 80-86

Patients who have abnormal communicative ability and those with an abnormal neurologic or vascular baseline to start are at increased risk for postoperative deficits.

Objective: To look for risk factors for postoperative neurologic and vascular deficits and their delayed detection.

Design: Level II, retrospective, case-cohort study.

Participants/Methods: A systematic sample of all patients undergoing pediatric orthopedic surgery at the Johns Hopkins Hospital over a 2-year period was reviewed. Patients had both elective spine and extremity procedures and fracture care surgery. Charts for these patients were thoroughly reviewed. Those with postoperative new neurologic and vascular deficits were noted and those in which there was a delay in detection of the deficit. A list of hypothesized risk factors was developed: abnormal baseline neurovascular status; imprecise documentation of baseline neurovascular status; imprecise postoperative monitoring orders; and failure to carry out orders appropriately. From this hypothesized list, actual risk factors for both events were determined.

Results: Out of 286 patients with 343 distinct operative cases, 18% had impaired communication, 30% had abnormal preoperative neurovascular status, 12% had undocumented preoperative status, and 30% had orders not precisely written. There were 10 (3%) new postoperative neurologic or vascular events of which 4 (1%) were delayed in detection. There was 1 delayed diagnosis of peroneal neuropathy on a patient who had a different primary service, 1 delayed diagnosis of postoperative spinal monoparetic weakness, and 2 delayed loss of popliteal nerve function in patients with cerebral palsy. Fifty-seven patients (18%) had impaired communication ability, which correlated with an increased risk of postoperative deficit. Insufficient documentation of an abnormal baseline correlated with delayed detection of deficits. Significantly, all patients who had delayed detection of their problems had 1 of the following: impaired communication; abnormal baseline; or imprecisely written orders. All written orders were carried out. Orders that were part of a clinical pathway were more precisely written.

Conclusions: Certain patients are at increased risk for postoperative deficits—those who have abnormal communicative ability and those with an abnormal neurologic or vascular baseline to start. Those who have abnormal communication are at risk probably related to neurologic issues that the patient has that complicate the surgery.

Reviewer's Comments: This is a very relevant study. The authors point out that the nursing staff on a pediatric unit is typically not orthopedically specialized, but need to cover all medical and surgical services. They are not tuned in to potential neurologic deficits in the way that an orthopaedic specialist would be. They also may not have the finesse to reconcile any questions with a possibly abnormal baseline. So, many children on musculoskeletal surgery have abnormal baselines from cerebral palsy, myelomeningocele, prior trauma, etc. It is important to plan in advance how the team can reconcile these difficult distinctions.

Additional Keywords: Postoperative

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Step Osteotomy Compares Favorably With Standard Trochanteric Osteotomy

Stepped Osteotomy of the Trochanter for Stable, Anatomic Refixation.

Bastian JD, Wolf AT, et al:
Clin Orthop Relat Res; 467 (March): 732-738

The step osteotomy compares favorably with reports in the literature of 4% to 23% nonunion with standard trochanteric osteotomy.

Objective: To look at the results of an early series of a stepped osteotomy of the trochanter, especially in terms of union rate, heterotopic ossification, and implant-related pain.

Design: Level IV therapeutic, retrospective, uncontrolled series.

Participants/Methods: 109 consecutive patients (mean age, 28 years) having 113 consecutive surgical dislocations for femoracetabular impingement were prospectively followed; mean follow-up was 8 months. Most patients had not had prior hip surgery. The osteotomy was done from a straight lateral position through an incision 18 cm long. The cut began in the posterosuperior portion of the tip of the trochanter and extended distally two-thirds the length of the trochanter. Then the distal portion of the cut was inset 6 mm deeper to finish it off, and the 2 planes were connected. The fascial insertions of the glutei proximally and the vastus distally were left intact to counteract each other. The trochanteric fragment was flipped anteriorly and the surgery was performed. At the end, it was reattached using two 3.5-mm screws. After surgery, patients were instructed to use crutches and be 25% weight bearing for 5 weeks. They were then advanced as tolerated if union was evident. Patients were given nonsteroidals to minimize heterotopic ossification.

Results: Of the 113 osteotomies, there were 3 delayed unions as manifested by bending of the screws, migration of the fragment, or development of a lucency within it. There were no nonunions. One patient required refixation. Seven patients had some heterotopic ossification, mostly Brooker Class I or 2. The increase in step size from 3 to 6 mm eliminated the complications later in the series; 76 of the patients had removal of symptomatic screws.

Conclusions: The step osteotomy compares favorably with reports in the literature of 4% to 23% nonunion with standard trochanteric osteotomy. The authors also add that proper replacement of the trochanteric fragment is aided by the landmark afforded by the step.

Reviewer's Comments: This is a useful pearl for those surgeons performing trochanteric osteotomy. The authors, from a major center of hip reconstructive surgery, give nice illustrations of the technique. The step-cut resists upward pull of the stronger gluteal muscles with their large tendinous attachment. This also shows that even in ideal cases (healthy young adults) healing cannot be taken for granted and a small percent will have issues.

Additional Keywords: Stepped Osteotomy

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Partial and Complete ACL Tears Have Similar Outcomes After Primary Repair

Isolated Tears of the Anterior Cruciate Ligament: Over 30-Year Follow-Up of Patients Treated With Arthrotomy and Primary Repair.

Taylor DC, Posner M, et al:

Partial ACL tears had similar outcomes at 30-year follow-up than complete tears that underwent primary repair.

**Background:** In 1972, Feagin et al reported favorable results of primary anterior cruciate ligament (ACL) tear repairs at 2-years of follow-up. In 1976, 5-year follow-up of this same cohort was published revealing significantly worse results. This landmark article identified the importance of an intact ACL in young active patients and ignited the discovery of a satisfactory reconstruction. This article is the 30-year follow-up of these same patients.

**Objective:** To review the long-term outcomes of isolated ACL tears.

**Methods:** From 1964 to 1970, 64 knees in 62 patients at the U.S. Military Academy at West Point underwent arthrotomy for hemarthrosis and a presumptive ACL tear. Of the 64 knees, 57 had a torn ACL; 44 injuries were complete, with 41 knees undergoing primary repair and 3 excised because they were irreparable. Of the 12 partial ACL injuries, 9 were left alone and 3 were partially excised. Of these 57 patients, 34 were available to participate in the 30-year follow-up by mail, telephone, or in-person interview. Age at index operation was 20 years (range, 18 to 36 years) and 52 years (range, 47 to 67 years) at last follow-up. Twenty of the 34 injuries were noncontact injuries; football accounted for 15 injuries and lacrosse for 9. Of these 34 injuries, 26 had complete ACL tears, with 25 undergoing primary repair; 8 had partial tears. Of these 34 patients, 23 were part of the 5-year follow-up study. Patients underwent the Knee Injury and Osteoarthritis Outcome Score (KOOS), International Documentation Committee (IKDC), and single assessment numeric evaluation (SANE) questionnaires at last follow-up.

**Results:** 20 of the 34 patients (71%) underwent at least 1 more knee surgery; 64% of ACL repairs and 50% of partial tears underwent additional knee surgery. Seven of the complete and 1 partial ACL patient underwent an additional stabilizing procedure. On IKDC score, 18 patients rated their knee as normal or nearly normal. The overall KOOS rating was 68.6; Tegner activity score was 3.7. Of the 23 patients who participated in the 5- and 30-year follow-up, the average SANE score was 74.8 at 5-years, and 68.9 at 30-years. There were no significant differences in outcome scores between complete and partial ACL tears at final follow-up. Poorer outcomes were related to subsequent operations and further meniscal surgery.

**Conclusions:** At 30-year follow-up, patients undergoing ACL repair had an equal number of acceptable and unacceptable results.

**Reviewer's Comments:** Patients acceptable outcomes at 5 years were, for the most part, acceptable at 30 years. It would have been good to know if their surgery had worked or they were "ACL copers." The decrease in Tegner score is compatible with the patient population aging 30 years. Long-term ACL reconstruction follow-up studies will be measured against these results.

**Additional Keywords:** Arthrotomy/Primary Repair

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Does FNB Decrease Pain After ACL Reconstruction?

Femoral Nerve Blockade as a Preemptive Anesthetic in Patients Undergoing Anterior Cruciate Ligament Reconstruction: A Prospective, Randomized, Double-Blinded, Placebo-Controlled Study.

Matava MJ, Prickett WD, et al; 
Am J Sports Med; 37 (January): 78-86

Preemptive FNB did not demonstrate significant improvement in pain scores in patients undergoing ACL reconstruction.

Objective: To evaluate the efficacy of preemptive femoral nerve block (FNB) in the management of patients undergoing anterior cruciate ligament (ACL) reconstruction with the central third of the patellar tendon.

Design: Prospective, randomized, double-blinded, placebo-controlled trial.

Methods: 56 patients 18 years of age underwent single incision endoscopic ACL reconstruction with the central third patellar tendon, agreed to participate in the randomized trial. Thirty-one patients were randomized to the FNB group, and received 30 mL of 0.5% bupivacaine with 1:200,000 epinephrine via nerve stimulation guidance. The remaining 25 control patients underwent a 2 mL injection of normal saline subcutaneously just lateral to the femoral artery with no intent to place it close to the femoral nerve. Intraoperatively, all patients underwent general laryngeal mask or endotracheal intubation. Nitrous oxide and sevoflurane were used to titrate the patient's blood pressure to within 20% of baseline. Intraoperative pain was controlled with morphine (Meperidine for those allergic to morphine). After graft harvest and fixation, during closure, 60 mg of IV ketorolac was given in addition to 10 mL of 0.5% bupivacaine in the surgical wound and equally distributed intra-articularly (10 mL). A Cryo-Cuff was used for postoperative cryotherapy. Outcome measures included postoperative pain as measured on a visual analog scale for 72 hours, intra- and postoperative narcotic consumption, hospital charges, patient satisfaction, admission rate, and complications.

Results: While the block group demonstrated a slight improvement in pain at all time intervals, the difference never reached statistical significance; 26% of the block group and 44% of the control group were admitted, not reaching statistical significance. Total time of hospitalization favored the control group by 1 hour, but the hospital cost favored the block group by about $200.00 (not statistically significant). There were no complications in either group. Patient satisfaction was only slightly higher in the block group.

Conclusions: Preemptive FNB did not statistically improve patient pain after endoscopic ACL reconstruction.

Reviewer’s Comments: This is a well-conceived and executed study with a level of evidence level of I. Several things should be noted. One, all patients received 60 mg of IV ketorolac, which is very useful in postoperative pain management. However, most orthopaedic surgeons do not use ketorolac perioperatively secondary to potential bleeding, wound healing, and systemic reactions. I suspect the FNB would have been more efficacious if ketorolac was not used. A longer acting nerve block may have also improved its efficacy. In this general population, FNB did not provide significant benefits. But, I think FNBs have a definite role in certain select patient groups (ie, patients with long-standing pain issues), but most especially in adolescent patients. Adolescents undergoing ACL surgery are very sensitive to anesthetic agents and narcotics. Nerve blocks in this group are very efficacious.

Additional Keywords: Pain Management

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Easy-to-Read Review of Chronic Achilles Tendon Disorders

Surgical Treatment for Chronic Disease and Disorders of the Achilles Tendon.

Reddy SS, Pedowitz DI, et al:
J Am Acad Orthop Surg; 17 (January): 3-14

If at time of debridement surgery, >50% of the Achilles tendon is involved with degenerative changes, the remaining Achilles tendon should be augmented.

Objective: To review the pathophysiology, diagnosis, and management of chronic Achilles tendinopathy.

Design: Review article.

Classification: The earliest phase of Achilles tendon disease is peritendinitis, during which the paratenon demonstrates an inflammatory process. Paratenon is tender to palpation and ankle dorsiflexion. Most cases respond to conservative treatment, though it may be extended. Rarely is surgical excision of the paratenon necessary. Achilles tendinosis is the next entity in the spectrum of disease. This is a degenerative process rather than inflammatory and is thought to be caused by the accumulation of microtrauma without healing. Excessive foot pronation is thought to be a biomechanical etiology factor. The thickening and nodularity of the Achilles tendon 2 to 3 cm proximal to its distal insertion may or may not be symptomatic. Conservative treatment may include bracing and physical therapy. Recalcitrant cases can be treated with surgical debridement of the affected tendon. If >50% of the tendon is debrided, local tissue augmentation with the flexor hallucis longus (FHL) tendon or flexor digitorum longus (FDL) tendon, or suitable tissue, is recommended. Tendinosis and paratenonitis can co-exist. With this presentation, the physician should have a high index or suspicion for a partial rupture. This is usually heralded with an incident of sharp or repeated sharp pain episodes. If intrasubstance changes are found on MRI, conservative treatment will unlikely be successful and earlier surgical intervention is recommended. Again, >50% of the tendon is involved, augmentation is recommended. Retrocalcaneal bursitis presents with heel pain. Patients are tender when pinched anterior to their Achilles tendon. The bursa can become inflamed from mechanical compression, typically, a Haglund's deformity. Early, nonsurgical treatment can be successful. Recalcitrant cases can be treated with bursectomy and partial calcaneal ostectomy. Insertional tendinosis represents an inflammatory process at the insertion of the Achilles tendon onto the calcaneus. Rest, heel-lift, and therapy are usually an effective treatment. Surgical treatment can involve a local bursectomy, local tendon debridement or tendon detachment and reattachment. Chronic rupture of the Achilles tendon is defined as rupture >4 weeks. After 4 weeks, there is enough retraction of the torn ends, stiffness, and scarring to make a primary repair difficult, necessitating some type of tissue augmentation. Synthetics and allografts have been used with limited success and should be reserved for defects >10 cm. MRI followed by ultrasound can help the clinician identify, locate, classify, and manage patients with chronic Achilles tendinopathy.

Conclusions: When >50% of the Achilles tendon is diseased, strong consideration should be given to surgical augmentation.

Reviewer's Comments: This is an easy-to-read review of chronic Achilles tendon disorders. While many treating physicians refer recalcitrant causes to foot and ankle specialists, early and accurate diagnosis and appropriate management may obviate the need for surgical management.

Additional Keywords: Surgical Tx

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AC Joint Reconstruction

Semitendinosus Tendon Graft Versus a Modified Weaver-Dunn Procedure for Acromioclavicular Joint Reconstruction in Chronic Cases: A Prospective Comparative Study.

Tauber M, Gordon K, et al:

A free ST tendon graft AC joint reconstruction provides superior clinical results to a modified Weaver-Dunn procedure.

**Objective:** To compare the clinical results of an acromioclavicular (AC) joint reconstruction done with a free autogenous semitendinosus (ST) graft to a traditional modified Weaver-Dunn procedure.

**Design:** Cohort study.

**Methods:** Over a 5-year period, 24 patients with a symptomatic chronic type III, IV, or V AC joint separation underwent surgical stabilization. The first 12 patients underwent a traditional modified Weaver-Dunn procedure. The coracoacromial ligament was taken from the anterior acromion with a piece of bone. This bone piece with suture was advanced intramedullary into the end of osteotomized distal clavicle and tensioned through drill holes in the clavicle. The repair was further protected with a wire loop around the coracoid and the clavicle. The other 12 patients underwent a harvest of their ipsilateral ST hamstring tendon. The free tendon graft was placed through two 4.0-mm holes in the osteotomized distal clavicle with an 8- to 10-mm bone bridge between the holes. The graft was then passed in a figure 8 fashion around the coracoid process, tensioned, and sutured together. This reconstruction was also protected with a cerclage wire similar to the Weaver-Dunn patients. All patients underwent similar immobilization in a sling for 4 weeks and gradual increase range of motion. The cerclage wire was removed at 3 months. Patients underwent follow-up a minimum of 2 years with American Shoulder and Elbow Surgeons (ASES) and Constant score, measured range of motion, and follow-up AC joint and axillary radiographs.

**Results:** All 24 patients (mean age, 42 years) were followed a mean of 37 months. ASES score improved from 74 7 preoperatively to 86 8 postoperatively in the Weaver-Dunn group. The ST reconstruction group improved their ASES score from 74 4 to 96 5 points. Weaver-Dunn Constant scores improved 70 8 to 81 8, while ST Constant scores improved from 71 5 to 93 7. For each score, the ST score was significantly better. Mean coracoclavicular (CC) distance in the Weaver-Dunn group was 12.3 4 mm and increased to 14.9 6 mm with stress loading. In the noninjured side, the CC distance was 11.1 2 mm. The 11.4 3 mm distance in the ST group increased only to 11.8 3 mm under stress. The noninjured CC distance in the ST group was 10.8 2 mm.

**Conclusions:** ST reconstruction provided superior clinical results to the modified Weaver-Dunn procedure for symptomatic, high-grade AC separations.

**Reviewer's Comments:** The authors provide a simple, but conclusive study demonstrating the superior efficacy for a free ST AC joint reconstruction. Given the strength of ST graft, I am not sure a cerclage wire and the attendant second procedure to remove it is necessary. That would be a nice follow on study.

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What Sort of Weakness Is Seen With an Asymptomatic Rotator Cuff Tear?

Shoulder Strength in Asymptomatic Individuals With Intact Compared With Torn Rotator Cuffs.
Kim HM, Teefey SA, et al:
J Bone Joint Surg Am; 91 (February): 289-296

There is a relatively high age-related prevalence of asymptomatic rotator cuff tears in those >40 years of age; decreased abduction to external rotation seems to be an indicator of an asymptomatic rotator cuff tear.

**Objective:** To examine shoulder strength in asymptomatic subjects with and without a rotator cuff tear and to determine the prevalence of asymptomatic rotator cuff tears.

**Design:** Evaluation of asymptomatic individuals.

**Participants/Methods:** 237 asymptomatic volunteers were evaluated by the authors. There were 4 groups: group A (age range, 40 to 49 years); group B (age range, 50 to 59 years); group C (age range, 60 to 69 years); and group D (70 years). Participants provided their age, weight, height, and hand dominance. Ultrasound was used to assess rotator cuff integrity, and strength was measured with a dynamometer for seated external rotation and for standing isometric 90 abduction in the scapular plane.

**Results:** In normal subjects, the mean external rotation strength and abduction strength were similar between both shoulders in men. In women, there was a significant difference in strength between the dominant and nondominant shoulder for both external rotation and abduction. In men, there was an age-related decrease in both abduction and external rotation, but in females, there was a significant decrease only in abduction. Age, weight, height, and body mass index all had a significant effect on both external rotation and abduction. Forty-one patients had either a partial- or full-thickness rotator cuff tear. The prevalence of rotator cuff tears was 0% in group A, 10% in group B, 20% in group C, and 40.7% in group D. In patients with unilateral partial tears and full-thickness tears, there were no significant differences in external rotation and abduction strength. Abduction strength was decreased in the 6 participants with large to massive tears when compared with the contralateral side. There was a nonsignificant trend to external rotation weakness in subjects with a large to massive rotator cuff tear. The ratio of abduction strength to external rotation strength was decreased in subjects with a full-thickness rotator cuff tear; it was even lower in those with large to massive tears.

**Conclusions:** The authors showed a relatively high age-related prevalence of asymptomatic rotator cuff tears in those >40 years of age. Decreased abduction to external rotation seems to be an indicator of an asymptomatic rotator cuff tear.

**Reviewer’s Comments:** This is a very detailed study of normative strength data for asymptomatic shoulders in people >40 years of age. It is interesting to see the age- and gender-related differences and the relationship between age and rotator cuff pathology in this asymptomatic group. It is somewhat surprising that external rotation strength was not so affected.

**Additional Keywords:** Normative Data

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Is It Possible to Augment a Rotator Cuff Repair With the Biceps Tendon?

Arthroscopic Biceps Augmentation for Avoiding Undue Tension in Repair of Massive Rotator Cuff Tears.

Cho NS, Yi JW, Rhee YG:
Arthroscopy; 25 (February): 183-191

Augmentation of a repair of a massive rotator cuff repair with biceps tendon increases strength and postoperative rotator cuff integrity.

**Background:** Some authors have proposed use of alternative tissues, such as allograft, xenograft, or synthetic materials for tissue augmentation when fixing massive rotator cuff tears.

**Objective:** To evaluate the outcome of arthroscopic rotator cuff repairs with and without augmentation from an arthroscopic biceps tenodesis.

**Design:** Retrospective therapeutic case series; Level of Evidence IV.

**Participants/Methods:** 37 patients (group A) who underwent arthroscopic rotator cuff repair with biceps tenodesis augmentation were compared with a control group of 31 patients (group B) undergoing single-row arthroscopic repair of a massive rotator cuff tear. For those patients undergoing biceps augmentation, the biceps were cut and then attached to the lateral margin of the rotator cuff with sutures. The rotator cuff tendon and biceps were then attached to the greater tuberosity using suture anchors. Postoperative rehabilitation was similar between the 2 groups. Pre- and postoperative visual analog scale (VAS) score, muscle strength, and range of motion were evaluated, as was the Constant Score, University of California, Los Angeles (UCLA) score, and Simple Shoulder Test. Twenty-four patients in group A and 19 in group B had both pre- and postoperative MRI scans.

**Results:** Demographics and preoperative VAS scores were similar between the 2 groups. Both groups had some form of biceps pathology. At final follow-up, the Constant Score, UCLA score, and VAS score were similar between the 2 groups. There was no significant difference in range of motion. There was a significant increase in strength of forward flexion, external rotation, and internal rotation in group A as compared to group B. In patients with both preoperative and postoperative MRIs, there was a re-tear rate in 41.8% of group A patients and a re-tear rate of 73.7% of patients in group B that was statistically significant.

**Conclusions:** Augmentation of a repair of a massive rotator cuff tear with biceps tendon increases strength and postoperative rotator cuff integrity. There were equivalent clinical results between tendon augmentation and standard rotator cuff repair.

**Reviewer's Comments:** The authors present a relatively simple technique for arthroscopically performing a biceps tenodesis and augmenting a rotator cuff repair that can increase patients' strength and repair integrity when compared with standard single-row repair. It obviates the need for using more expensive grafts that have, at best, a mixed track record for improving repairs. This is a well-done retrospective study examining a difficult patient population. The re-tear rates seen here are similar to other studies and highlight the problem of achieving a structurally sound repair with a massive rotator cuff tear. It is interesting to note that clinical outcomes were similar between the 2 groups, which is likely due to the rather short follow-up time in the study.

**Additional Keywords:** Biceps Tenodesis

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Traumatic Anterosuperior Rotator Cuff Tears Often Result of Trauma

Traumatic Anterosuperior Rotator Cuff Tears: The Outcome of Open Surgical Repair.

Namdari A, Henn ED III, Green A:
J Bone Joint Surg Am; 90 (September): 1906-1913

Anterosuperior rotator cuff tears that involve the supraspinatus and subscapularis are frequently a result of trauma and often are associated with pathology of the long head of the biceps tendon.

Background: Anterosuperior rotator cuff tears involving the subscapularis and supraspinatus tendons are rarely discussed in the literature.

Objectives: To analyze the characteristics of patients with traumatic anterosuperior rotator cuff tears, identify associated pathology, describe our approach to open surgical repair, and analyze the outcome of repair.

Design: Retrospective review.

Participants/Methods: 30 consecutive patients (24 males, 6 females; mean age, 57 years) who had an open repair of a traumatic anterosuperior rotator cuff tear comprised the study group. Twenty-three (77%) had an associated biceps tendon disorder. Surgical approaches included an isolated superior deltoid-splitting approach (n=20), an isolated deltopectoral approach (n=5), and a combined approach (n=5).

Results: At final follow-up (mean, 56 months; range, 26 to 90 months), 70% of patients were satisfied with their symptoms, and 97% would have the surgery again. The mean pain score on the visual analog scale improved from 6.2 to 1.2 (P <0.001). The mean score on the Disabilities of the Arm, Shoulder, and Hand questionnaire improved from 41.7 to 12.2 (P <0.001). The mean percentage of functions that patients were able to perform on the Simple Shoulder Test improved from 36.4% to 82.8% (P <0.001). Prior to surgery, the mean age- and sex-adjusted Constant score was 93.4. The mean elevation, external rotation, and internal rotation of the involved shoulders were 97%, 109%, and 97%, respectively, and 85%, 93%, and 101%, respectively, of those of the contralateral side. Infraspinatus involvement (P =0.04) and the extent of the supraspinatus tear (P =0.03) were associated with worse outcomes and decreased satisfaction.

Conclusions: Anterosuperior rotator cuff tears are often the result of trauma. Patients typically present with internal rotation weakness, and they usually have a biceps tendon disorder. Tears that involve a large portion of the supraspinatus or extend into the infraspinatus are associated with poorer outcomes. Open surgical repair can reliably restore shoulder function to near normal levels.

Reviewer's Comments: This study is limited in that it is retrospective and lacks a control group. Furthermore, there is significant heterogeneity in terms of tear size, surgical approach, and associated biceps pathology. Future studies that examine the results following arthroscopic rotator cuff repair of anterosuperior tears would be interesting to compare to these results.

Additional Keywords: Subscapularis Surgery

print tag: () Refer to original journal article.
Tear of Posterior Root of Medial Meniscus-Biomechanical Consequences

Biomechanical Consequences of a Tear of the Posterior Root of the Medial Meniscus. Similar to Total Meniscectomy.


A posterior root tear of the medial meniscus causes increased knee contact pressures and kinematic derangements in a cadaver model.

**Background:** There are no studies on the biomechanical consequences of a tear of the posterior root of the medial meniscus in the orthopaedic literature.

**Objective:** To determine the effects of a posterior root tear of the medial meniscus and a total medial meniscectomy on tibiofemoral joint contact stresses and kinematics in an in vitro model and to evaluate the ability of a repair of the meniscal root tear to restore joint contact stresses and kinematics.

**Materials/Methods:** 9 fresh-frozen cadaver knees (6 male and 3 female) with no evidence of meniscal, ligamentous, or chondral pathology were used. At each of 4 knee-flexion angles (0, 30, 60, and 90), an axial load of 1000 N was applied using a custom testing jig. Four conditions (intact, a posterior root tear of the medial meniscus, a repaired posterior root tear, and a total medial meniscectomy) were tested. Contact pressure and area as well as kinematic data were gathered for each testing condition.

**Results:** When pooled across all flexion angles, the overall peak contact pressure in the medial compartment was significantly increased by a posterior root tear of the medial meniscus as compared with the pressure in the intact knee (+25.4%; \( P < 0.001 \)). Repair of the posterior root tear of the medial meniscus restored the overall peak contact pressure to control values. No difference was detected between the effects of the posterior root tear of the medial meniscus and the total medial meniscectomy on the overall peak contact pressure in the medial compartment. Significant increases in external rotation and lateral tibial translation, compared with the values in the intact knee, were observed in association with the posterior root tear (2.98 and 0.84 mm, respectively) and the meniscectomy (4.45 and 0.80 mm, respectively), and these increases were corrected by the repair.

**Conclusions:** A posterior root tear of the medial meniscus causes increased knee contact pressures and kinematic derangements in a cadaver model. The peak pressures in the medial compartment were significantly elevated by a posterior root tear of the medial meniscus and were restored to baseline after a repair of such a tear.

**Reviewer's Comments:** This study is limited because it is a biomechanical, cadaveric study with no in vivo data. Clinical studies are mandatory to define the appropriate patient population for, and to determine the clinical efficacy of, surgical treatment of this injury.

**Additional Keywords:** Posterior Root Tear

**print tag:** () Refer to original journal article.
Repair Methods Leads to Significant Improvement in Clinical Outcome

Repair of Partial Thickness Rotator Cuff Tears: A Retrospective Review With Minimum Two-Year Follow-Up.
Porat S, Nottage WM, Fouse MN:
*J Shoulder Elbow Surg*; 17 (September/October): 729-731

Completion of a high-grade partial thickness tear to full thickness and repair of that tear with an all-arthroscopic repair technique leads to significant improvement in clinical outcome.

**Background:** Partial thickness rotator cuff tears (PTRCT) involving >50% of the rotator cuff thickness are often treated surgically. There is significant controversy regarding the most appropriate method of surgically repairing PTRCT. The most common arthroscopic surgical techniques used are conversion of PTRCT to a full thickness tear followed by repair and trans-tendon repair of the rotator cuff.

**Objective:** To assess the functional and clinical outcomes of arthroscopic completion of PTRCT with repair.

**Design:** Retrospective review.

**Methods:** Between 2001 and 2005, 51 patients (30 males and 21 females; mean age, 59.7 years) with the diagnosis of >50% PTRCT who underwent conversion to full thickness tears and arthroscopic repair of the tear by a single surgeon were included in the study. All 51 cases had tears of the supraspinatus tendon alone without extension into the other rotator cuff tendons. Forty-two patients also had an arthroscopic subacromial decompression, 3 underwent a subacromial decompression and a distal clavicle resection, and 4 additionally had a subacromial decompression and a biceps tenodesis. Clinical outcomes were measured using a University of California, Los Angeles (UCLA) self-assessment questionnaire and physical examination to assess range of motion.

**Results:** Patients were followed for a minimum of 2 years (range, 24 to 73 months). They showed a significant functional improvement, as measured by the UCLA self-assessment questionnaire ($P < 0.05$). The mean preoperative UCLA score was 17.24 and the mean postoperative UCLA score 31.24. In addition, 27.8% of patients had excellent results (UCLA score range, 34 to 35), 55.6% had good results (score range, 28 to 33), and 16.7% had fair results (score range, 24 to 27); there were no poor outcomes. Forward flexion improved from an average of 158, preoperatively, to 167, postoperatively ($P < 0.05$). Abduction improved from 152 to 165 ($P < 0.05$). External and internal rotation did not show any statistically significant improvement. One patient required manipulation under anesthesia and arthroscopic lysis of adhesions for postoperative stiffness; there were no other complications.

**Conclusions:** Completion of a high-grade partial thickness tear to full thickness and repair of that tear with an all-arthroscopic repair technique leads to significant improvement in clinical outcome.

**Reviewer's Comments:** This study is limited by its retrospective nature and lack of a control group. Future prospective controlled studies comparing this technique to trans-tendon rotator cuff repair techniques are needed to help determine the optimal surgical technique for treating high-grade PTRCT.

**Additional Keywords:** Repair

**print tag:** () Refer to original journal article.
In Situ Transtendon Repair for Partial Articular-Sided Supraspinatus Tendon Tears

In Situ Transtendon Repair Outperforms Tear Completion and Repair for Partial Articular-Sided Supraspinatus Tendon Tears.

Gonzalez-Lomas G, Kippe MA, et al:
J Shoulder Elbow Surg; 17 (September/October): 722-728

In situ transtendon repair is biomechanically superior (in terms of gap formation and load to failure) to tear completion for the treatment of partial, articular-sided supraspinatus tendon tears.

Background: High-grade partial-thickness articular-sided rotator cuff tears may be treated by either completing the tear and performing a full-thickness rotator cuff repair or performing a transtendon repair. To date, no studies have compared the biomechanical properties of transtendon and tear-completion repairs.

Objective: To compare the biomechanical characteristics of these 2 commonly performed repair techniques for partial articular-sided tears.

Design: Biomechanical cadaveric study.

Methods: 10 matched pairs (20 shoulders; 6 men, 4 women) of fresh, frozen cadaver shoulders aged 54-8 years (range, 41 to 63 years) were used to test the 2 repair techniques. Standardized, 50% partial, articular-sided supraspinatus lesions were created in these shoulders. Ten shoulders underwent partial lesion repair with an in situ transtendon technique using 2 suture anchors. In the contralateral 10 shoulders, the partial lesion was converted to a full-thickness tear and repaired with a double-row technique using 4 suture anchors. Cyclic loading to failure of the supraspinatus tendon was performed using a material testing machine. Gap formation was measured for internal rotation (IR), external rotation (ER), and neutral rotation (NR).

Results: Gapping of the tendon demonstrated significantly (P = 0.0001) less gapping in the transtendon repair than in the tear-completion repair. The mean tendon gap formation for the transtendon repair was 0.35 mm in IR, 0.20 mm in ER, and 0.16 mm in NR, whereas the mean tendon gap formation in the double-row repair was 1.4 mm in IR, 0.98 mm in ER, and 0.81 mm in NR. The point at which each repair failed completely (i.e., when the tendon detached from the proximal humerus) was then measured. The transtendon repair had a statistically significant (P = 0.0011) higher load before ultimate failure (485 N) than did the double-row repair (246 N).

Conclusions: Based on this study, the authors conclude that preserving the integrity of the intact rotator cuff tendon in the repair of high-grade, partial, articular-sided supraspinatus tendon avulsions provides a stronger construct than completing the tear and repairing the resultant full-thickness tear with a double-row technique using 4 suture anchors.

Reviewer's Comments: This study is limited by the fact that it is a biomechanical cadaveric study with time-zero data only. Controlled clinical trials comparing these 2 techniques are needed to validate these findings.

Additional Keywords: Partial Thickness Tear

print tag: () Refer to original journal article.
**Tenodesis Screw vs Anchor for Subpectoral Biceps Tenodesis**

*Interference Screw Versus Suture Anchor Fixation for Subpectoral Tenodesis of the Proximal Biceps Tendon: A Cadaveric Study.*


In this cadaveric study, the Bio-Tenodesis screw showed a significantly higher load to failure and higher stiffness than the Bio-Corkscrew anchor when used for tenodesis of the proximal biceps tendon in a subpectoral location.

**Objective:** To compare the biomechanical characteristics of a bioabsorbable interference screw (Bio-Tenodesis screw; Arthrex, Naples, FL) with those of a single bioabsorbable suture anchor loaded with composite polyethylene suture (Bio-Corkscrew; Arthrex) for subpectoral biceps tenodesis.

**Design:** Biomechanical cadaveric study.

**Methods:** 9 matched pairs of cadaveric shoulders (5 females and 4 males; mean age, 81.6 years) were assigned to 2 procedure groups. For each pair, 1 shoulder underwent open subpectoral tenodesis of the long head of the biceps with the 8 x 12-mm Bio-Tenodesis screw with No. 2 FiberWire sutures. The contralateral shoulder underwent tenodesis with the 5.5-mm Bio-Corkscrew double-loaded suture anchor with No. 2 FiberWire sutures. The specimens were dissected and mounted in a material-testing machine. The construct was preloaded to 5 N and underwent cyclic loading from 20 N to 60 N for 100 cycles at 0.5 mm/s. Any specimens in which failure did not occur during the cyclic loading protocol underwent a load-to-failure protocol. Ultimate load (in Newtons), stiffness (in Newtons per mm), and modes of failure were recorded.

**Results:** The tenodesis screw construct had a significantly higher ultimate load than the suture anchor construct (mean, 169.6 N vs 68.5 N) by paired t-test (*P* =0.002). The tenodesis screw construct also had a significantly higher mean stiffness than the suture anchor construct (mean, 34.1 N/mm vs 19.3 N/mm) by paired t-test (*P* =0.038). None of the tenodeses failed by anchor or screw pullout; the failure modes were all at the suture-tendon interface and within the substance of the tendon.

**Conclusions:** In this cadaveric study, the Bio-Tenodesis screw showed a significantly higher load to failure and significantly higher stiffness than the Bio-Corkscrew anchor when used for tenodesis of the proximal biceps tendon in a subpectoral location.

**Reviewer’s Comments:** This study is limited by the fact that it is a biomechanical cadaveric study that lacks in vivo data. Furthermore, the age of the specimens and bone/tendon quality does not match the typical profile of a patient undergoing biceps tenodesis. It would be interesting to compare the 2 constructs tested in this study to a trans-osseous tunnel technique, which utilizes 2 anchors, or to some of the newer anchors that are designed to work in cortical bone as opposed to cancellous metaphyseal bone.

**Additional Keywords:** Subpectoral Proximal Biceps Tenodesis

**print tag:** () Refer to original journal article.
When to Operate on OCD Lesions

The Healing Potential of Stable Juvenile Osteochondritis Dissecans Knee Lesions.
Wall EJ, Vourazeris J, et al:
J Bone Joint Surg Am; 90 (December): 2655-2664

Background: Adult osteochondritis dissecans (OCD) lesions usually require operative treatment. Those in the skeletally immature population may heal with immobilization or activity modification. Information is lacking as to which characteristics of these lesions predict reliable healing without surgical stimulation.

Objective: To determine which patients will respond to nonoperative treatment and which ones will not.

Design: Retrospective cohort study.

Participants/Methods: 42 patients (47 knees) with open growth plates and an OCD lesion without disruption of the articular cartilage or subchondral bone-lesion interface (stable lesions) were identified and studied for up to 6 months of follow-up. Patient ages ranged from 8 to 14 years. Conventional radiographs and an MRI were obtained at the time of diagnosis, and serial radiographs were taken every 6 weeks for up to 6 months of nonoperative treatment. Patients were treated for 6 weeks of weight-bearing immobilization in a cylinder or long-leg cast. The cast was used again for another 4 to 6 weeks after a 3- to 7-day rest period to regain motion if the radiographs showed no re-ossification of the lesion after 6 weeks. After casting, the patient was placed in a weight-bearing osteoarthritis brace to unload the involved compartment (CounterForce Brace; Breg, Vista, CA). Initial athletic activity was restricted in the brace and was gradually allowed as radiographic re-ossification occurred. The location, size, and symptoms associated with the lesion were recorded. After 6 months of nonoperative treatment, patients were stratified into 1 of 2 categories. Outcome 1 included patients progressing toward healing. Outcome 2 included patients with no signs of healing.

Results: After 6 months of nonoperative treatment, 16 patients (34%) failed to progress toward healing. Of the 31 lesions that progressed toward healing, 7 had completely re-ossified. The non-healing lesions were larger on average. Forty-one lesions involved the medial femoral condyle. All of the 6 lateral condyle lesions healed or were healing. Isolated pain without mechanical symptoms increased the odds of healing. Age was not a significant predictor of healing.

Conclusions: Two-thirds of juvenile patients with a stable OCD lesion progress toward healing after 6 months of nonoperative treatment.

Reviewer's Comments: This is a very useful study that can help provide informed decision making with patients and their parents. It is useful to know that lesion size, location, and symptoms play a role in the relative risk of healing. These variables could be further evaluated in a prospective study.

Additional Keywords: Juvenile
Utility of Pivot Shift Test

The Pivot Shift.
Lane CG, Warren R, Pearle AD:
J Am Acad Orthop Surg; 16 (December): 679-688

The predominant pathologic motion of the pivot shift is coupled internal rotation and anterior tibial translation.

**Background:** The anterior cruciate ligament (ACL)-deficient knee is associated with clinical instability due to anterior translation and external rotation of the tibia. Galway et al coined the term "pivot shift" to test this instability.

**Sensitivities, Specificities, and Reliabilities:** The broad range of examination techniques, variability in the force applied by the examiner, individual physiologic variability, and the subjective nature of the results make it difficult to accurately assess the importance of the pivot shift test. The addition of other soft-tissue abnormalities may mask or falsely highlight a positive result. For example, a tight iliotibial band (ITB) decreases the effect of a pivot shift test because it restricts subluxation of the tibial plateau on the femoral condyle. Paradoxically, a loose ITB also decreases the effect of a pivot shift because it allows internal rotation throughout range of motion so there is no shift. A patient who has had a medial meniscectomy may have a falsely positive test because there is increased anterior translation of the tibia. In addition, patients tolerate the test poorly. The sensitivity has been shown to increase from approximately 30% to about 90% before and after anesthesia.

**Implications of a Positive Test:** The grade of pivot shift correlates closely with patient outcomes, while the Lachman test does not. The pivot shift results are better in patients who return to sports and patients who have higher satisfaction and relief of symptoms. Neither the pivot shift nor the Lachman test correlates with radiographic evidence of arthritis.

**Rotational Kinematics After ACL Reconstruction:** Several biomechanical and clinical studies indicate that current ACL reconstruction techniques may not restore rotational stability. One study reported a positive pivot shift in 16% of patients after ACL reconstruction. The use of a double-bundle technique may improve rotational control, although this has not been shown yet.

**Pathologic Motions of the Pivot Shift:** Galway et al theorized that, with the knee in full extension and internal rotation applied to the tibia, the tibial plateau subluxates anteriorly (the lateral side more so than the medial side). When a valgus force is applied to the knee, the lateral plateau impinges against the lateral condyle. When the knee is forcibly flexed, the plateau reduces back into position, creating a glide or clunk, depending on the degree of subluxation.

**Conclusions:** The predominant pathologic motion of the pivot shift is coupled internal rotation and anterior tibial translation.

**Reviewer's Comments:** This excellent review of the pivot shift provides important information to surgeons who treat ACL injuries. There is also a nice table showing how the presence of concomitant soft-tissue pathology affects the pivot shift result.

**Additional Keywords:** Diagnosis

**print tag:** () Refer to original journal article.
How to Diagnose and Treat Hip Pathology in Young Patients

*Hip Disease in the Young, Active Patient: Evaluation and Nonarthroplasty Surgical Options.*

Sierra RJ, Trousdale RT, et al:

*J Am Acad Orthop Surg;* 16 (December): 689-703

When FAI is present, it is most common to have evidence of both cam and pincer pathology.

**Background:** In the 1990s, Ganz and co-authors documented that minor anatomic variations in hip anatomy could result in femoroacetabular impingement (FAI), with subsequent cartilage degeneration. This may be due to an abnormality in the acetabulum (retroverted, coxa profunda, protrusio) or an abnormality in the proximal femur (poor head-neck offset, posttraumatic deformities, slipped capital femoral epiphysis, femoral retrotorsion, coxa vara, necrosis with flattening). Cam and pincer impingement have been described. Cam impingement results from jamming of the abnormally shaped femoral head into the acetabulum with flexion and internal rotation. Pincer impingement results from abutment between the femoral head-neck junction and the pelvic rim. It is most common to have a combination of the 2 types.

**Clinical Presentation:** Most patients present with groin pain with activities. Loss of hip motion is almost always seen. The impingement test is helpful and is performed by flexing the hip to 90 and internally rotating and adducting it maximally. Pain indicates contact between the anterosuperior acetabular rim and the femoral neck. Posterior FAI can be tested by hyperextending and externally rotating the hip. Pain is indicative of the femoral head contacting the posterior acetabular cartilage and rim. A centered anteroposterior pelvic radiograph is essential in making the diagnosis of FAI. For normal acetabular anteversion to be present, the anterior wall must cover less of the femoral head than the posterior wall without a "crossover" sign. Projection of the ischial spine into the pelvic cavity suggests acetabular retroversion. If the lateral edge of the posterior acetabular wall is medial to the center of the femoral head, it is considered a positive "posterior wall sign," and a reverse periacetabular osteotomy is indicated to improve posterior coverage. MRI arthrography may be used to diagnose labral pathology and cartilage degeneration.

**Nonarthroplasty Surgical Options:** Surgical hip dislocation is the gold standard for management of FAI. Advantages include direct visualization of the femoral vessels, acetabulum, and femoral head and the ability to address intra- and extra-articular components of FAI. Periacetabular osteotomy for correction of retroversion is indicated for hips with a positive anterior impingement test and acetabular rim lesions on MRI. Hip arthroscopy can address much of the same pathology as hip dislocation, but it is technically more difficult and may risk traction injury and over-resection during femoral osteoplasty.

**Conclusions:** Early diagnosis and treatment of FAI is important to delay degeneration in young, active patients. Hip dislocation, periacetabular osteotomy, and hip arthroscopy may be performed to address the various anatomic abnormalities.

**Reviewer's Comments:** This is an excellent review article. I learned 3 radiographic signs to look for: the crossover sign, the posterior wall sign, and protrusion of the ischial spine into the pelvis.

**Additional Keywords:** Young Patients

**print tag:** () Refer to original journal article.
Single vs Double-Bundle ACL Reconstruction

Anterior Cruciate Ligament Reconstruction With Use of a Single or Double-Bundle Technique in Patients With Generalized Ligamentous Laxity.

J Bone Joint Surg Am; 91 (February): 257-262

In ACL reconstruction, double-bundle reconstruction results in less anterior translation but no functional benefit or increased rotational stability.

Background: For patients with generalized ligamentous laxity, some authors have stated that the risk of instability is greater with a conventionally reconstructed anterior cruciate ligament (ACL). Double-bundle ACL reconstruction has been shown to provide more improvement in knee stability.

Objective: To compare the clinical outcome of double-bundle reconstruction with use of the quadriceps tendon-bone autograft versus single-bundle reconstruction with use of a bone-patellar tendon-bone autograft in patients with generalized ligamentous laxity.

Design: Retrospective cohort study.

Methods: Single-bundle ACL reconstruction with a bone-patellar tendon-bone autograft was performed in 118 patients (group 1), and a double-bundle ACL reconstruction with a quadriceps tendon-bone autograft was done in 72 patients (group 2). The selection of a quadriceps tendon-bone graft was dependent on the thickness of the tendon as measured on MRI; a quadriceps tendon-bone graft was selected if the thickness of the tendon was >7 mm. Patients with <4 positive findings of ligamentous laxity were excluded. Ligament stability was assessed with the Lachman and pivot-shift tests and a KT-2000 arthrometer (MEDmetric, San Diego, CA). The Hospital for Special Surgery (HSS) knee ligament questionnaire and the Lysholm knee scoring scale were used to evaluate functional outcome. Results before surgery and 24 months after surgery were obtained.

Results: Based on the Lachman test, patients in group 1 had significantly more laxity than did patients in group 2 (P =0.032). With regard to the pivot-shift test, 3 patients had a grade 1 pivot shift in group 1, whereas no patient had an abnormal pivot shift in group 2 (P =0.091). According to the KT-2000 arthrometer measurement of anterior tibial translation, the postoperative mean side-to-side difference was greater in group 1 (3.37 ± 1.76 mm; range, 1.00 to 8.00 mm) than in group 2 (2.03 ± 1.11 mm; range, 0.00 to 3.50 mm) (P =0.02). Substantial improvements in both HSS and Lysholm scores between the preoperative and the follow-up examinations were seen in both groups, but the values were not significantly different.

Conclusions: Double-bundle ACL reconstruction provided less anterior translation than single-bundle ACL reconstruction. However, no significant difference in functional outcome was found between groups.

Reviewer's Comments: This article contributes to the growing literature showing an underwhelming difference between single- and double-bundle ACL reconstructions. The authors showed a small difference in anterior translation and a non-significant trend toward less rotation in the double-bundle group. It was interesting that the authors chose to use autograft in patients with generalized ligamentous laxity, yet demonstrated good short-term results.

Additional Keywords: Double Bundle

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Rotator Cuff Repair—Does Functional Outcome Correlate With Anatomic Outcome?

Prognostic Factors Affecting Anatomic Outcome of Rotator Cuff Repair and Correlation With Functional Outcome.
Oh JH, Kim SH, et al:
Arthroscopy; 25 (January): 30-39

Fatty degeneration of the infraspinatus muscle is an independent predictor of rotator cuff repair re-tears.

**Background:** In general, rotator cuff repair yields good clinical outcomes. However, several studies have questioned the correlation of the integrity of the repair (anatomic outcomes) with functional outcomes.

**Objective:** To analyze the relationship between functional outcomes and anatomic outcomes, and to reveal any prognostic factors that may affect these outcomes.

**Design:** Case series with level IV evidence.

**Methods:** Over almost a 3-year period, 197 consecutive patients had surgery for rotator cuff pathology. Of these injuries, 116 were full-thickness tears. Seventy-eight patients were enrolled in the study (67.2%) and were evaluated with CT arthrography (CTA) and functional evaluation. Mean follow-up was 19.6 months (range, 12 to 39 months). CTA was used to assess anatomic outcome (sensitivity, 99%; specificity, 100%). Functional outcome was evaluated with a visual analog scale (VAS), Constant score, simple shoulder test (SST), and American Shoulder and Elbow Surgeons (ASES) scores.

**Results:** The mean tear size was 2.5 cm, and the mean retraction was 2.3 cm. Biceps pathology requiring treatment was seen in 20% of patients, and type II and IV SLAP (Superior Labrum Anterior to Posterior) tears were found and repaired in 28%. All patients showed improvements with regard to functional outcome. Postoperative VAS scores for pain and satisfaction and the Constant score showed no correlation with any of the variables ($P >0.05$). Female patients and old age, however, did correlate with functional outcome as measured by the SST, and size of the tear correlated with ASES scores. Functional outcome did not correlate with anatomic outcome ($P <0.5$). Anatomic healing and no contrast media leakage were seen in 31 patients (40%), and maintenance of the cuff to the footprint with contrast media leakage was found in 25 patients (32%). Definite retear was shown in 22 patients (28%). Several factors influenced retear rate, including older age, fatty degeneration, and tear size. Multivariate analysis indicated that fatty degeneration of the infraspinatus muscle was the most independent predictor of anatomic outcome.

**Conclusions:** Rotator cuff repair results in significant functional improvement. However, functional improvement did not correlate with anatomic outcome.

**Reviewer's Comments:** This article is one of many looking at the anatomy of rotator cuff repairs and whether it has anything to do with functional outcomes. The article points out that there are numerous functional outcome instruments with unique characteristics that must be taken into account when reviewing these data and similar studies. Use of CTA was a strength of the article but, as noted in the discussion, was an impediment to study enrollment. The authors discuss the need for longer follow-up and a larger cohort to shed remaining light on this relevant topic.

**Additional Keywords:** Outcome

**print tag:** ( ) Refer to original journal article.