Do Pretensioning Krackow Repairs Reduce Gap Formation?


Krushinski EM, Parks BG, Hinton RY:


Pretensioning the Krackow stitch reduced gap formation in transpatellar tendon repairs.

Objective: To determine if pretensioning the Krackow stitch in a patellar tendon would decrease gap formation in transpatellar tendon repairs.

Design: Controlled laboratory study.

Methods: Cadavers had a recreated patellar tendon rupture by dissecting the patellar tendon off of the inferior pole of the patella in 8 pairs of cadaveric knees. These specimens had an average age of 84 years (range, 65 to 99 years). The control group was repaired using a standard 4-strand running, locking Krackow stitch consisting of two #2 fiber wire sutures. The Krackow repair was done with 3 loops, with a 1-cm pitch. Standard pretensioning included taking all the visible slack up between the locking loops. Four strands of suture were then passed through 3 drill holes through the patella and tied at 45º of flexion. In the experimental group, similar repair was executed. As the sutures were passed through the patella; they were fixed to a cable and the knee was cycled from 90º to 5º for 10 cycles. At that time, the sutures were then tied at 45º of flexion. Next, each specimen underwent testing at 0.25 Hz from 90º to 5º for 1000 cycles or until failure.

Results: 2 level failures were observed, a 3-mm gap and a 5-mm gap. In the control group, a 3-mm gap was observed at 1 cycle; whereas in the experimental group, a 3-mm gap was noted until 35 cycles. With gapping of 5 mm, the experimental group failed at 35 cycles, whereas the control group failed at 100 cycles. Through 100 cycles, the gap formation in the pretension group was less than in the control group (5 mm vs 6.9 mm). At 300 cycles, the gap of the experimental group was 6.5 mm versus 7.8 mm in the control group. At 500 cycles, the gap in the experimental group was 7 mm versus 8.3 mm in the control group. At 1000 cycles, the gap formation in the experimental group was 7.88 mm and 8.6 mm in the control group. Data at 300 cycles through 1000 cycles did not reach statistical significance. There were no catastrophic failures. It appeared that the stretching came from the suture tissue interface.

Conclusions: Pretensioning Krackow repairs with transpatellar patellar tendon repairs reduces gap formation.

Reviewer's Comments: Because of gap formation, many surgeons have gone to augmenting their patellar tendon repairs. This certainly complicates the procedure, and using this necessitates a second surgery to remove the augmentation. Pretensioning Krackow sutures did not completely eliminate gap formation. It is probably best to restrict their end-range flexion. This can be gradually increased over time as healing proceeds. This information also would be very helpful in those soft tissue tendon repairs elsewhere in the body, such as the Achilles tendon. It would be interesting to repeat this study utilizing a controlled range of motion. (Reviewer-John H. Wilckens, MD).

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Keywords: Patellar Tendon Repairs, Gap Formation, Krackow Sutures, Standard Repair

Print Tag: Refer to original journal article
Long-Term Effects of Rotator Cuff Repair

The Long-Term Outcome of Recurrent Defects After Rotator Cuff Repair.

Dodson CC, Kitay A, et al:


At 8 years of follow-up, patients with rotator cuff tear repair defects still had good clinical function and reduced pain despite increased size of the rotator cuff defect and progressive strength loss.

Objective: To determine the follow-up status of rotator cuff repairs with persistent defects after surgery.

Design: Case series.

Participants: From a previous study, 18 shoulders in 15 patients had rotator cuff repair with a demonstrable recurrent rotator cuff defect. Patients were reported, on average, 3.2 years after their repair. The same study underwent follow-up at 6 years. Average age at time of initial repair was 62 years, (range 44 to 74 years). Of the tears, there were 9 1-tendon tears and 6 2-tendon tears.

Methods: At follow-up, patients underwent the Simple Shoulder Test, The American Shoulder Elbow Surgeons Scoring Survey (ASES), and L'Insalata Scoring Survey. In addition, all patients underwent range of motion and strength testing using a hand-held dynamometer, as well as ultrasonography evaluation of the shoulder.

Results: The mean follow-up was 7.9 years (range, 6 to 9 years). Eleven patients and 13 shoulders were available for follow-up. At 7.9 years of follow-up, functional scores were not significantly different from the scores at 3.2 years of follow-up. The average ASES score was 95, L'Insalata score was 95, and Simple Shoulder Test score was 11. There was no demonstrable change in range of motion. At 3.2 years, mean forward flexion was 171° compared to 174° at 7.9 years. At 3.2 years, external rotation was 61° compared to 56° at 7.9 years. Forward flexion strength at 3.2 years was 20 kg compared to 12 kg at 7.9 years. External rotation strength was 15 kg at 3.2 years and 8 kg at 7.9 years. Looking at defect size, mean size at 3.2 years was 15.82-mm retraction compared to 21.9 mm at 7.9 years. Mean measurement area in millimeters squared was 273 mm² at 3.2 years, and this increased to 467 mm² at 7.9 years.

Conclusions: While patients at 7.9 years of follow-up had increased defect size and decreased strength, they continued to have excellent functional score and pain relief and did not lose range of motion.

Reviewer's Comments: These rotator cuffs were repaired both arthroscopy and by mini-open repair with no significant difference between either type of procedure. These patients demonstrated a repair defect at 3.2 years, which did not seem to affect their clinical outcome. This defect increased in size, and patients had a 40% decrease in strength by 7.9 years of follow-up. While these were statistically significant, it did not affect the patient’s outcome. They continued to have excellent function, excellent range of motion, and no pain. There is some discussion about why there was a lack of pain in these patients with recurrent defects in their rotator cuff repair. Is it decompression and/or postoperative rehabilitation that provides these patients with good clinical outcome despite having a continued rotator cuff defect? While this is sobering news for the surgeon, it is good news for the patient. (Reviewer-John H. Wilckens, MD).

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Keywords: Rotator Cuff Repair, Recurrent Defects, Long-Term Outcome

Print Tag: Refer to original journal article
There is a multiplicative increase in the risk of ACL reconstruction failure in high activity patients undergoing ACL reconstruction with allograft.

**Objective:** To determine the risk factors for anterior cruciate ligament (ACL) reconstruction failure, use of activity level, and allograft versus autograft reconstruction.

**Design:** Case control study.

**Participants:** Over a 2-year period, the surgeon performed 322 ACL reconstructions. Among these patients, the mean age was 27.9 years (range, 11.6 to 62.3 years), and there were 141 women and 181 men. Of these 322 reconstructions, 274 were primary ACL reconstructions and 48 were revisions. In addition, there were 135 autografts and 187 allografts. In this 2-year period, 21 patients were identified with ACL graft reconstruction failure. Forty-two age- and sex-matched controls in the same period were used as a control group.

**Methods:** All patients underwent identical postoperative rehabilitation protocol. Return to play criteria included no functional complaints and at least an 85% score on a single leg hop test. A telephone interview conducted to follow-up with all the patients consisted of whether they sustained a re-injury to their ACL and their reported activity level. Activity level was measured using the Marx score.

**Results:** The overall results for the 322 patients undergoing reconstruction was 21 with graft failure (6.5 failure rate). When this was looked at for graft choice, of the 135 patients with autografts, only 5 patients sustained a re-injury to their graft (3.7% re-rupture rate). Of 187 allografts, 16 ruptured a graft (8.6% failure rate). The median Marx score at the time of initial ACL injury was 16, which was very similar to the 42 controls. The median Marx score after ACL reconstruction was 12. Next, logistic regression was used to evaluate the use of allograft versus activity level. High activity level was defined as a Marx score of ≥13, and lower activity score was defined as a Marx score of ≤12. Those with higher activity level had 5.5 greater odds of ACL graft failure than patients who had a lower activity level. Patients with allograft had a 5.5 greater chance of ACL failure than those who had an autograft. When you look at patients with a Marx score >13, and allograft, they had a 14 times increased risk of ACL reconstruction failure.

**Conclusions:** Allograft ACL reconstruction had a 14 times increased risk of rupture with autograft in high activity level patients.

**Reviewer's Comments:** This study identifies the high activity group as not being one such group. The high activity patients have a higher risk of ACL reconstruction failure with allograft or autograft, but their risk is substantially higher with allograft. This article supports a growing body of evidence suggesting that allografts should not be used for young, high-activity patients at risk for re-tearing their ACL. (Reviewer-John H. Wilckens, MD).

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Keywords: ACL Reconstruction Failures, Risk Factors

Print Tag: Refer to original journal article
Early hyaluronic acid improves the cartilage in partial-thickness cartilage injuries.

**Objective:** To observe the effect of hyaluronic acid (HA) treatment on acute partial-thickness cartilage injuries.

**Design:** Controlled laboratory study.

**Methods:** 16 mature sheep had a partial thickness cartilage lesion created on one of their hindlimbs arthroscopically. The lesion created was 10 mm x 10 mm, to appear as a Type II cartilage lesion. Eight sheep were randomly selected for an intraarticular injection of HA immediately after the procedure to treat the lesion and again on day 8 and day 15 after the procedure. The remaining 8 sheep underwent injection with normal saline on the same schedule as the study animals. The other hindlimb served as the nonoperative controls. After 12 weeks of free pen activity, the sheep were sacrificed. Synovial fluid from each joint was aspirated and analyzed prior to sacrifice. The cartilage lesions were sectioned for confocal laser microscopy for cell viability, dimethylmethylene blue assay for proteoglycan, and histologic evaluation.

**Results:** The synovial fluid analysis revealed no differences between the saline and HA groups, specifically, collagen II, interleukin-1β, and nitric oxide levels. The HA group showed a trend toward less chondrocyte injury than the saline group. The HA group did have significantly more glycosaminoglycan content than the saline animals.

**Conclusions:** Early HA use appeared to have a measurable chondrocyte-sparing effect in partial-thickness cartilage lesions.

**Reviewer's Comments:** This laboratory animal study contributes to the slowly growing knowledge supporting the beneficial effects of hyaluronic acid. The HA treatment group showed less chondrocyte cell death than the saline group, in addition to smoother surfaces and greater safranin O staining for proteoglycan. The partial-thickness cartilage lesion represents more of an acute injury than arthritis lesion, suggesting there may be some value of HA in knee injuries. (Reviewer-John H. Wilckens, MD).
Perioperative Blood Transfusions Increase Risk of SSI

Effects of Perioperative Blood Product Use on Surgical Site Infection Following Thoracic and Lumbar Spinal Surgery.

SchwarzkoR, Chung C, et al:

Spine 2010; 35 (February 1): 340-346

Perioperative blood transfusion in lumbar and thoracic spine surgery increases the risk of surgical site infection.

**Background:** Surgical site infection (SSI) is a serious and widespread problem. It is the third most common type of nosocomial infection in all patients and the most common type in surgical patients. Patients with SSI have twice the risk of mortality, a 60% greater chance to be admitted to the ICU, and are 5 times more likely to be readmitted to the hospital.

**Design:** Retrospective case-control review.

**Methods:** The medical records of all patients who had undergone thoracic and lumbar spine surgeries in a 5-year period were reviewed. Patients with SSI according to the Centers for Disease Control and Prevention criteria were identified. Matched controls without SSI were randomly selected. Variables known to increase the risk of infections were analyzed in both groups.

**Results:** The medical records of 61 patients with SSI and 93 controls were reviewed. The following factors were not found to significantly increase the risk of SSI: gender; hypertension; smoking; alcohol use; diabetes; and perioperative steroid use. History of perioperative transfusions (given during surgery or the day of surgery) and higher body mass index were both associated with significantly higher incidence of SSI. The most common organisms were *Staphylococcus aureus*, *Staphylococcus epidermidis*, and *Enterococcus faecalis*.

**Conclusions:** The authors concluded that in their study, perioperative blood transfusions and obesity appear to be significant risk factors for SSIs in thoracic and lumbar surgery. While the exact cause of transfusion-related SSI is not known, the authors discussed possible causes of immunomodulation by the transfused blood. They suggested a restrictive transfusion policy (target hemoglobin values from 7 to 9), avoiding use of blood products that are >15 days old, using leukocyte-depleted blood, and intraoperative use of antifibrinolytic agents such as aprotinin, e-aminocaproic acid, or tranexamic acid to decrease blood loss and transfusion requirements.

**Reviewer's Comments:** This is a well-designed retrospective study that adds to the body of knowledge showing that blood transfusions may increase infection rates. It is the first study, to my knowledge, addressing the transfusion-related SSI risk in spine surgery. The limitations of this study included grouping of superficial and deep infections together, as acknowledged by the authors. They also noted that patients requiring transfusions could have been sicker patients with other comorbidities leading to increased risk of SSI. I agree with the authors in that, while blood transfusion may be necessary due to significant blood loss, judicial use of blood products is warranted based on the results of this and other studies. This would help to avoid surgical site infections and other potential transfusion-related problems. (Reviewer-Vladimir Sinkov, MD).

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Keywords: Surgical Site Infections, Perioperative Blood Transfusion

Print Tag: Refer to original journal article
BMP concentration in DBM affects fusion rates.

**Background:** Demineralized bone matrix (DBM) is a human tissue-derived allograft product that is commonly used in lumbar spinal fusion surgery to augment grafting material and enhance fusion. The main osteoinductive components of DBM are bone morphogenetic proteins (BMPs). Previous studies have shown that different DBM products have different BMP concentrations, potentially affecting their ability to promote fusion.

**Objective:** To determine if there are different BMP concentrations in separate lots of the same DBM product and see how those different concentrations affect lumbar fusion rates in rats.

**Design:** In vitro analysis of BMP concentration in different lots of a single DBM product; in vivo analysis of lumbar fusion rates using different lots of DBM product in rats.

**Methods:** In vitro analysis of BMP-2 and BMP-7 concentrations in 10 different lots of a single DBM product (EBI InterGro DMB Putty) was performed using enzyme-linked immunosorbent assay (ELISA) method. Forty rats underwent posterolateral L4-L5 fusion using the DBM product. Aliquots from the same lots were used in 4 rats. Lumbar spine radiographs were taken at regular intervals. The rats were then sacrificed at eight weeks postoperatively. Spines were dissected out and manually tested for the presence of solid fusion at L4-L5.

**Results:** The BMP concentrations, as measured by the ELISA method, varied greatly between lots. BMP-2 concentrations ranged from 22 to 110 picograms (pg)/mg. BMP-7 concentrations ranged from 44 to 125 pg/mg. The relative concentrations of the 2 BMP proteins correlated from lot to lot. The rates of spinal fusion, according to radiographs and manual testing, have also revealed large variability between the lots, with half of the lots resulting in no fusion. There was high and statistically significant correlation between lots with high BMP concentration resulting in higher degrees of fusion and vice versa.

**Conclusions:** The authors acknowledged that their findings are similar to previously published studies. However, this was the first study to correlate BMP concentration in DBM to its ability to promote fusion in an in vivo animal model. They cautioned physicians from generalizing the results of this study to all DBM products. They suggested, however, that BMP lots should be carefully screened for proper levels of BMP just prior to being released on the market. Further studies are under way by the authors to determine minimal effective dose of BMPs in DBMs to promote fusion.

**Reviewer’s Comments:** This was a well-conducted laboratory study. It highlighted the fact that physicians need to use caution when selecting a DBM product in lumbar fusion surgery. The study shows the necessity for terminal testing to ensure maximal effectiveness of the DBM products. (Reviewer-Vladimir Sinkov, MD).

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Keywords: Lumbar Spine Fusion, Demineralized Bone Matrix

Print Tag: Refer to original journal article
Infection rates are very low following carpal tunnel release surgery.

**Background:** The incidence of infection and indications for antibiotics in carpal tunnel release (CTR) surgery are not clear.

**Objective:** To determine the incidence of deep and superficial infections after CTR surgery and the role of prophylactic antibiotics.

**Design/Methods:** A multicenter, retrospective review of 3003 CTR procedures performed by 98 surgeons in a single health system was performed. System-wide electronic medical records, hospital data, and pharmacy records were reviewed to determine postsurgical site infection rates and the use of preoperative antibiotics. For 667 patients, antibiotic administration could not be confirmed or denied. CTRs in the setting of acute trauma were excluded. Open and endoscopic CTRs were included but not analyzed separately. The Centers for Disease Control and Prevention infection guidelines were used to group infections into superficial and deep incisional or deep space infections. The type of antibiotic and the delivery time were not collected.

**Results:** 11 of the total 3003 CTR patients developed a surgical site infection with 7 being incisional infections and 4 (0.13%) being deep space infections. There was no significant difference in surgical infection rate between diabetics and nondiabetics. Of the 2336 patients with adequate records regarding antibiotic administration, 1419 received antibiotics and 917 did not. There was no significant difference in infection rate or type between these 2 groups or in diabetics versus nondiabetics. There was extreme variability between medical centers and surgeons with regard to the rate of routine preoperative antibiotic usage for CTR procedures from 0% to 100% usage.

**Conclusions:** Routine use of antibiotic prophylaxis for CTR is not indicated.

**Reviewer's Comments:** The authors of this retrospective review found a lower rate of deep infection than that seen in previous large cohorts and attribute this to a lower use of ancillary procedures such as flexor tenosynovectomy and internal neurolysis, which were more commonplace in the past, though the study did not specifically investigate this. All of the infections that occurred in the study followed an open CTR but unfortunately, infection rates were not independently determined for open versus endoscopic cases. I believe the biggest concern with the study is its heavy reliance on accurate recording of infections and antibiotic usage across a large multi-surgeon electronic medical records system that had no evaluation of its ability or accuracy in capturing these data. This ties in with the retrospective nature of the report, whereas a prospective evaluation would most likely have been able to more accurately track the relevant information. Nonetheless, the "strength in numbers" of the study is helpful to further strengthen the case for only select use of prophylactic antibiotics for clean, relatively short, soft tissue procedures. (Reviewer-Kenneth R. Means, Jr, MD).

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Keywords: Carpal Tunnel Surgery, Infection, Prophylactic Antibiotics

Print Tag: Refer to original journal article
An arthroscopically performed modified Weaver-Dunn-Chuinard procedure results in successful outcomes with a low complication rate.

**Background:** The management of acromioclavicular (AC) joint dislocations is controversial. To minimize the need for extensive exposure, the authors have developed an arthroscopic technique to perform a modified Weaver-Dunn-Chuinard (WDC) procedure.

**Objective:** To describe the technique for an all-arthroscopic WDC AC stabilization and to report its early results.

**Design:** Therapeutic case series; level IV level of evidence.

**Methods:** The authors prospectively followed 10 patients who underwent an arthroscopic WDC procedure for a complete AC joint dislocation (Rockwood grade III or greater). The authors provide a rationale for the procedure. Fixation with ligament augmentation is necessary in chronic cases, since the ligaments will resorb. Using the coracoacromial (CA) ligament alone runs a risk of failure. Augmenting the CA ligament with a piece of acromion should enhance the strength of the Weaver-Dunn repair, particularly if it is performed with additional fixation. The authors have designed a device for this procedure using 2 EndoButtons connected with heavy nonabsorbable suture. In the all-arthroscopic WDC procedure, the authors resect the distal clavicle and create a socket in its medullary canal, harvest the CA ligament along with the tip of the acromion, and maintain fixation with the Double-Button. Patients were immobilized for 3 to 4 weeks and permitted to perform activities of daily living (ADL). Patients began strengthening at 2 months and returned to full activity and sports at 3 to 6 months postoperatively. Patients were followed for a minimum of 6 months postoperatively clinically with clinical examination, the Subjective Shoulder Value (SSV) score, the University of California, Los Angeles (UCLA) score, and radiographs.

**Results:** 8 men and 2 women underwent the all-arthroscopic procedure. There were no intraoperative complications and no conversions to open AC stabilization. Patients were followed for an average of 12.9 months. Patients had a significant improvement in their SSV and mean UCLA score. There was no recurrence of AC instability, either clinically or radiographically. All but 1 patient had returned to their work and previous level of sports. There was a superficial infection of a portal that resolved with oral antibiotics. One of the EndoButtons migrated laterally, most likely due to cut out of the sutures through the coracoid process. Additionally, 2 patients had incomplete union of the acromial fragment to the clavicle.

**Conclusions:** The authors conclude that the arthroscopic WDC procedure is a safe and effective way to stabilize the AC joint.

**Reviewer’s Comments:** This small case series shows that it is possible to perform an all-arthroscopic version of the Weaver-Dunn procedure. This does seem like a fairly technically demanding procedure. I do have some concerns with the potential for hardware migration, particularly in the case of the subcoracoid EndoButton. The button is very close to the brachial artery and plexus. (Reviewer-Nathaniel P. Cohen, MD).

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Keywords: Arthroscopy, Acromioclavicular Stabilization

Print Tag: Refer to original journal article
Consider Baclofen Pump in Severe CP

Complications of Intrathecal Baclofen Pump Therapy in Pediatric Patients.

Borowski A, Littleton AG, et al:

J Pediatr Orthop 2010; 30 (January/February): 76-81

Retrospective review

**Objective:** To review the results and complications of intrathecal baclofen (ITB) pump use at a single institution.

**Participants/Methods:** At the Alfred I. duPont Hospital for Children in Wilmington Delaware, there is a large clinic dedicated to the care of children with cerebral palsy (CP). The role of a baclofen pump was determined at a spasticity clinic run by an orthopaedic surgeon and a physiatrist. An intrathecal test dose was given to potential candidates. If it was beneficial, the pump was inserted by the orthopaedic surgeon under general anesthetic. The pump was inserted under the external abdominal oblique muscle and tubing was tunneled around into the spine. It was inserted through one of the L1-5 interlaminar spaces and threaded proximally. For effects on primarily lower extremity muscle tone, it was advanced proximally to T8-10. For upper and lower extremities, it was advanced to T3-6. For neck posturing as well, it was advanced to C5-T5. Changes in activities of daily living (ADLs), as well as caregiver satisfaction and complications were assessed over a 10-year period of use. A total of 174 patients received the pump. Their average age was 12 years, and most had spastic quadriplegia.

**Results:** There were 46 battery changes, 4 pump replacements, 26 catheter replacements at spine fusion, and 5 reinsertions. There were 78 procedures related to infections. The device-related complication rate was 12%. The acute infection rate was 4%, and thereafter, 1% per year. Two-thirds of the infections were at the pump, and one-third was due to a posterior spine infection. There were 9 catheter breaks and 7 catheter disconnections. The most common medical complications were urinary retention and constipation. Sixty-two percent reported an increase in ADLs, and 88% reported increased comfort after ITB. The patient/family satisfaction rate was 81%. There was no difference whether the pump was inserted as an isolated procedure or as part of a multilevel procedure.

**Conclusions:** The authors feel that this is a worthwhile procedure for severely involved children with spasticity. It can be used in severe diplegics, as well as totally-involved children. Subfascial pump placement has fewer complications. They stress not to put the surgical incision directly over the intended pump pocket. Importantly, no instances of meningitis were reported, and 80% of patients were satisfied.

**Reviewer’s Comments:** This is an interesting overview. Infection of the pump and device-related complications create an additional drain on the lives of these patients and families, but most seem to regard the intervention as worthwhile. It is also possible to do spine fusion while working under the pump tubing and not replacing it. Remember to refer patients with severe global spasticity to a clinic for this purpose. Also, I would caution surgeons to be aware of the symptoms of baclofen withdrawal in the case of one of the above malfunctions. These include hypertension, agitation, disorientation, and seizures among other symptoms. (Reviewer-Paul D. Sponseller, MS, MD).

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Keywords: Cerebral Palsy, Intrathecal Baclofen Pump Therapy, Complications

Print Tag: Refer to original journal article
How Do You Treat Medial Epicondyle Fractures in Children?

Intraobserver and Interobserver Agreement in the Measurement of Displaced Humeral Medial Epicondyle Fractures in Children.

Pappas N, Lawrence JT, et al:

J Bone Joint Surg Am 2010; 92 (February): 322-327

The AP film should be used to measure medial epicondyle displacement.

Objective: To evaluate inter- and intraobserver agreement regarding measurements of displacement in humeral medical epicondyle fractures on radiographs by orthopaedic surgeons with differing training levels. 

Participants/Methods: At Children's Hospital of Philadelphia, 38 images of displaced pediatric medial epicondyle fractures were studied, including an anteroposterior (AP), lateral and oblique view of each. Most of these had more than trivial displacement. They were measured by 5 different observers and repeated on different occasions. The observers varied in level of experience from junior resident to fellow to junior and senior attending. Inter- and intraobserver differences were studied. A threshold of 2 mm difference was set as clinical disagreement, and the number of times that readings differed by at least this much was determined. An intraclass correlation coefficient of 1 would represent perfect agreement.

Results: The intraclass correlation coefficient for intraobserver readings of AP films was 0.76. Thus, the same reader differed by at least 2 mm 26% of the time. The intraclass correlation coefficient for interobserver variation was 0.80; the readers disagreed among themselves 54% of the time. The AP view was found to produce far higher reliability than the lateral or oblique views. The level of experience did not seem to make much difference in the reproducibility of measurement.

Conclusions: There is significant limitation to the orthopaedic surgeons' ability to consistently measure medial epicondyle displacement. The authors stress that the AP film should be used to make this measurement, not the lateral or oblique. They also recommend taking the maximum displacement, not the median amount. The amount of displacement is probably not a good guideline for whether or not to operate.

Reviewer's Comments: The medial epicondyle separates most often between 9 and 14 years of age. It can be difficult to measure when it is displaced. Part of this difficulty arises from the smooth, almost featureless surface of the medial border of the distal humerus once the epicondyle is removed from it. There is almost no good landmark from which to measure. Perhaps the authors should consider a follow-up study in which they measure a distance from a given landmark to quantify the displacement. Another point that was not addressed was the distinction between lateral spread and distal displacement. The latter seems like a greater indication of instability. Personally, I get around this controversy by treating medial epicondyle fractures all conservatively if they are not in the joint, since there are studies showing that this produces equivalent results to fixing them. (Reviewer-Paul D. Sponseller, MS, MD).

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Keywords: Displaced Humeral Medial Epicondyle Fractures, Measurement

Print Tag: Refer to original journal article
When children require surgery in the cervical spine, it is almost always in the upper C-spine. Fixation has clearly been shown to affect fusion rates here as in other areas of the spine.

**Objective:** To compare the potential for fixation of the lamina versus the pedicles of the atlas in children.

**Participants/Methods:** 23 CT scans of children in a children's hospital in Westmead, Australia, were studied, all of which had been read as normal. They were done with 3-mm slice thickness. Ages of the children ranged from 2 to 11 years old. On the transaxial images, the spaces between the cortices of the C2 laminae, the C2 pedicles, and the C1 lateral masses were measured. Each of these sites was rated as to whether it would accept a 3.5-mm screw in the atlas and a 3.0-mm and a 3.5-mm screw in the lamina or the pedicle of the axis. The percentage of each site that accepted such fixation was compared.

**Results:** There were 20 males and 3 females in the image sets studied; the participants mean age was 6 years. In 80% of patients, the measurements of the laminar width were greater than that of the pedicle width. Twenty-four percent of the pedicles of the atlas and 65% of its laminae were able to accommodate a 3.5-mm screw radiographically. This difference was statistically significant. If the implant was downsized to 3.0 mm, the percentages were 41% and 80%, respectively. Looking at the lateral masses of the atlas, 95% were able to accommodate a 3.5-mm screw. The only exception was a 2-year-old child.

**Conclusions:** C2 laminae provide a suitable option for fixation of the pediatric axis. The authors also point out that many children needing upper cervical spine surgery have abnormal anatomy. CT scans and a range of options for fixation techniques and implants are needed.

**Reviewer’s Comments:** Previous series of 32 children and 55 children have shown successful implantation of screws across the pedicle. Also, the slice thickness probably does not capture the maximum diameter of the bony structures in some of these cases. Finally, the alignment of rods to the skull base and to the lower cervical spine is better with pedicle fixation than with laminar fixation. However, I agree that it is good to have this option for fixation of the pediatric spine. (Reviewer-Paul D. Sponseller, MS, MD).

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Keywords: C1-C2, Children, Craniocervical Spine, Fixation

Print Tag: Refer to original journal article
Perthe's disease often unfavorably affects the relationship between the hip and the trochanter in several ways.

**Objective:** To look at a group of children followed to maturity and determine whether the articulotrochanteric relationship and gait can be optimized with trochanteric epiphyseodesis and to determine the upper limit of age for this effect.

**Participants/Methods:** Over a 9-year period, all children who had Perthe's disease and were followed to maturity were analyzed. There were 82 patients; 62 had femoral osteotomy and trochanteric epiphyseodesis. Twenty patients had nonoperative treatment because they presented in the revascularization stage; these patients were used as controls. The mean age of participants at the time and surgery was 8.4 years; at follow-up, the mean age was 16 years. The surgical procedure consisted of performing a varus osteotomy and, at the same time, performing 3 steps to close the trochanteric growth plate. First was removing a sliver of bone from the lateral trochanter and physis, second was drilling the physis, and third was placing a screw perpendicular to the trochanteric physis through the top hole of the plate. Assessment at maturity included measurement of the center-trochanteric distance, abductor lever arm, gait, and sphericity.

**Results:** Optimal radiographic center-trochanteric distance and lever arm were achieved in 60% of operated patients; 30% had little effect, and 10% had overcorrection. The overcorrection did not seem to have any clinical consequence. Operated patients had no greater limb shortening than nonoperative patients. The final range of motion was similar in both the operative and nonoperative group. The abductor strength was weak in 3 nonoperative patients and none of the operated ones. The probability of an adequate correction of center-trochanteric distance was 80% in those <8 years old and 50% in those 8 to 10 years of age. One patient as old as 11 years at surgery had an improvement in the parameters.

**Conclusions:** Trochanteric epiphyseodesis is effective in a high proportion of patients with Perthe's disease who are undergoing femoral osteotomy. An age of 8 years should not be a deterrent. The authors state that very young children, especially under age 6, probably should not undergo the epiphyseodesis since they may develop overcorrection.

**Reviewer's Comments:** This is a worthwhile study for all who see patients with Perthe's disease. Femoral osteotomy is still probably the most widely-accepted procedure of the numerous things often done for Perthe's disease. The follow-up to maturity was convincing in this series. It is a good idea to have this in the armamentarium of the surgeon who feels that there is some growth remaining in the trochanteric physis at the time that varus is produced. The method described here is very comprehensive and may contribute to the large number of patients who demonstrated an effect. (Reviewer-Paul D. Sponseller, MS, MD).

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Keywords: Prophylactic Trochanteric Epiphyseodesis, Perthe's Disease

Print Tag: Refer to original journal article
There is some disagreement on the value of derotation during treatment of DDH.

**Objective:** To determine the degree and range of femoral anteversion in a large series of patients with developmental dysplasia of the hip (DDH).

**Participants/Methods:** Consecutive patients requiring surgical procedures for DDH were studied. All patients had standardized AP radiographs with the knee flexed 90º and the tibia hanging vertically, and lateral ones with the knee flexed and the whole limb resting on the cassette. The distance between the center of the femoral head and the midline of the femoral shaft was measured. Trigonometry was used to calculate the femoral version.

**Results:** 37 patients were included in the study and ranged from 6 months to 8 years of age (mean age, 3 years). Most were girls. The mean femoral anteversion was indeed increased, at 50º. The normal for this age is 7º to 40º. There was significant variability, however, in that the standard deviation was 17º, and there was 1 patient who had 0º of measured anteversion.

**Conclusions:** The authors conclude that anteversion is often, but not always, a component of the dysplasia seen in DDH. They advocate not a uniform performance of derotation, but measuring it intraoperatively before deciding whether or not to derotate. They illustrate a common-sense method for determining anteversion. They externally rotate the limb until the femoral head is in a vertical line with the femoral shaft. Then they subtract the degree of external rotation needed from 90º to arrive at the value of femoral anteversion. They recommend performing derotation if the anteversion exceeds approximately 50º. If derotation is performed, they try to achieve a final version angle of 20º to 30º.

**Reviewer’s Comments:** This was an instructional article, as one would expect from Dr Moseley and his team. They had a large number of older DDH patients to study, not seen in all communities. The reliability of their trigonometric method is probably only approximate and could be validated. However, the findings suggest that anteversion is usually, but not always, part of the pathoanatomy of DDH. This makes sense, since other aspects of the disorder are also variable, including the proximal and lateral migration and the reducibility. Femoral anteversion is widely, though not universally, acknowledged to be part of the pathology of DDH. However, no one has quantified this aspect before; therefore, there is some disagreement on the value of derotation during treatment. (Reviewer-Paul D. Sponseller, MS, MD).

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Keywords: Developmental Dysplasia of the Hip, Femoral Anteversion

Print Tag: Refer to original journal article
Posterior Capsular Stretching Treats Internal Impingement

Correction of Posterior Shoulder Tightness Is Associated With Symptom Resolution in Patients With Internal Impingement.

Tyler TF, Nicholas SJ, et al:


Improving the posterior shoulder tightness appears to be more important than decreasing the glenohumeral internal rotation deficit when treating patients with internal impingement.

**Background:** Although both glenohumeral internal rotation deficit (GIRD) and posterior shoulder tightness are found in patients with internal impingement, the treatment of these patients has traditionally focused on resolving GIRD, with less attention paid to posterior shoulder tightness.

**Objective:** To determine if improvements in GIRD and/or decreased posterior shoulder tightness after a course of physical therapy are associated with resolution of symptoms in patients with internal impingement.

**Methods:** 22 patients (11 men, 11 women; mean age, 41 years) with a diagnosis of internal impingement were included in this study. Range of motion, including passive internal rotation (IR) at 90° of shoulder abduction, passive external rotation (ER) at 90° of shoulder abduction, and posterior shoulder tightness (cross-chest adduction in side lying), was assessed in all patients before treatment. Patients also completed the Simple Shoulder Test (SST) questionnaire. All patients then underwent a physical therapy protocol and a home exercise program that included stretching and mobilization of the posterior shoulder. Physical therapy was continued until symptom relief and return to full activities or until a plateauing effect was apparent. After a course of physical therapy, all range of motion measures were repeated, and a post-treatment SST score was obtained.

**Results:** Before treatment, patients had significant limitations in range of motion compared to the contralateral side. The mean GIRD was 35° (P < 0.01); the mean loss of ER was 23° (P < 0.01); and the mean posterior shoulder tightness was 35° (P < 0.01). The average duration of physical therapy was 7 weeks (range, 3 to 12 weeks). After completion of a course of physical therapy, the GIRD decreased by 26° (P < 0.01); ER improved by 14° (P = 0.06); and posterior shoulder tightness decreased by 27° (P < 0.05). In addition, there was significant improvement in the SST score (11 vs 5; P < 0.01). Twelve patients had complete resolution of symptoms, and 10 had some mild residual symptoms. The asymptomatic patients had a greater improvement in posterior shoulder tightness than did patients with residual symptoms (35° vs 18°; P < 0.05). Improvements in GIRD and external rotation were no different between symptomatic and asymptomatic patients (P > 0.05).

**Conclusions:** Improving the posterior shoulder tightness appears to be more important than decreasing the glenohumeral internal rotation deficit when treating patients with internal impingement.

**Reviewer’s Comments:** This study is limited by its lack of a control group. Future controlled studies are needed to validate these findings. In addition, none of the patients in this study were baseball pitchers; future studies including these athletes would be interesting. (Reviewer-Adam J. Farber, MD).

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Keywords: Internal Impingement, Posterior Shoulder, GIRD

Print Tag: Refer to original journal article
The suture-anchor and PITT techniques for biceps tenodesis have similar biomechanical properties and modes of failure.

**Background:** Many biceps tenodesis techniques have been described. Some of these procedures rely on bone fixation, while others, such as the percutaneous intra-articular transtendon (PITT) technique, rely on soft-tissue fixation. The biomechanical properties of soft-tissue biceps tenodesis are relatively unknown.

**Objective:** To evaluate the biomechanical properties of 2 different arthroscopic biceps tenodesis techniques: the PITT technique and the suture-anchor technique.

**Design:** Controlled laboratory study.

**Methods:** 15 fresh-frozen cadaveric specimens (mean age, 50 years; range, 42 to 61 years) were used in this study. In all specimens, the biceps tendon was inspected, and none of these evidenced any type of pathologic abnormalities. Specimens were randomly allocated to 1 of 2 different biceps tenodesis techniques: the suture-anchor (n=7) or the PITT technique (n=8). The sutureAnchor tenodesis was performed using 2 suture anchors, each double-loaded with #2 non-absorbable sutures placed 6 mm apart in the bicipital groove. The PITT technique was performed using spinal needles to shuttle 2 free #2 non-absorbable sutures through the tendon in a mattress-type fashion to tenodese the biceps tendon to the transverse humeral ligament. After the tenodesis was performed, the humerus was mounted on a materials testing machine to perform a load to failure test. The structural properties of the tenodesis construct, including ultimate load to failure and stiffness, were measured. The mode of failure was also recorded.

**Results:** The suture-anchor tenodesis had an ultimate load to failure of 175.4 N and a stiffness of 15.9 N/mm. The PITT technique had an ultimate load to failure of 142.7 N and stiffness of 13.3 N/mm. There were no significant differences in load to failure or stiffness between the 2 techniques (P >0.05). All of the tenodesis constructs in both groups failed in the tendon site by sutures pulling through the substance of the tendon.

**Conclusions:** The suture-anchor and PITT techniques for biceps tenodesis have similar biomechanical properties and modes of failure. These findings suggest that the fixation strength of biceps tenodesis is more dependent on the quality of the biceps tendon than on the method of tenodesis.

**Reviewer's Comments:** This study is limited by the fact that it is a biomechanical cadaveric study with small sample sizes and no in vivo data. Nevertheless, this study provides biomechanical support to soft-tissue tenodesis. As the authors note, "the PITT technique has the benefit of avoiding hardware complications and cost." It is important to assess the quality of the transverse humeral ligamentous tissue, just as it is important to evaluate the quality of the biceps tendon; if the transverse humeral ligamentous tissue is of poor quality, an anchor or interference screw should be considered to perform the tenodesis. (Reviewer-Adam J. Farber, MD).
Arthroscopic revision rotator cuff repair can result in significant improvements in both pain and shoulder function. Results are worse in female patients and in those who have undergone multiple prior shoulder surgeries.

**Background:** Few studies have documented the results of arthroscopic revision rotator cuff repair. **Objective:** "To report functional outcomes after arthroscopic revision rotator cuff repair and to identify prognostic factors that may predict attributes associated with failure of arthroscopic revision rotator cuff repair."

**Design:** Retrospective review.

**Methods:** 54 patients (mean age, 54.9 years; range, 22.7 to 82.5 years) who underwent arthroscopic revision rotator cuff repair of full-thickness cuff tears from 2004 to 2006 were included. Thirty-one patients (57.4%) had undergone 1 prior rotator cuff repair, and 23 (42.6%) had undergone multiple previous operations. The decision to use single-row or double-row fixation depended largely on the tissue quality and tension on the repair. Thirty-three tears (61.1%) were treated with single-row configuration, while 21 tears (38.9%) were revised with a double-row construct. Postoperatively, all patients completed a standardized rehabilitation protocol. Demographic data, the number of prior ipsilateral shoulder surgeries, and intraoperative findings were recorded from chart review. All patients completed validated, clinical outcome instruments including the American Shoulder and Elbow Surgeons (ASES) score, Simple Shoulder Test (SST), and visual analog score (VAS). In addition, shoulder strength and range of motion were recorded both preoperatively and after revision surgery.

**Results:** Mean final follow-up was 31.1 months (range, 12.4 to 78.5 months). All validated, clinical outcome instruments showed significant improvement after revision surgery. The mean ASES score improved from 43.8 preoperatively to 68.1 at final follow-up ($P=0.0039$). The SST increased from 3.56 before revision to 7.5 at final follow-up ($P<0.0001$). VAS pain scores decreased from 5.17 to 2.75 ($P=0.03$). In addition, there was a significant improvement in forward elevation after revision surgery (from 121.0° to 136°; $P=0.025$). Six patients (11.1%) required additional surgery. Patients who had undergone multiple prior shoulder surgeries before revision were at increased risk for needing additional surgery ($P=0.031$). Failures after revision (defined as ASES scores <50) were seen more commonly in women than in men ($P=0.007$) and in patients with preoperative abduction <90° ($P=0.009$).

**Conclusions:** Arthroscopic revision rotator cuff repair can result in significant improvements in both pain and shoulder function. Results are worse in female patients and in those who have undergone multiple prior shoulder surgeries.

**Reviewer's Comments:** This study is limited by its retrospective nature, the lack of a control group, and the lack of postoperative imaging data to assess the integrity of the rotator cuff repair. Despite these limitations, this study is the largest to date to report the results of arthroscopic revision rotator cuff repair and provides useful information to shoulder surgeons. (Reviewer-Adam J. Farber, MD).

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Keywords: Revision Arthroscopic Rotator Cuff Repair, Shoulder, Failure

Print Tag: Refer to original journal article
The MRI findings of ACL morphology, joint effusion, PCL angle, and bone bruising correlate well with the chronicity of an ACL injury.

**Background:** There are no published studies to document the sequential changes in MRI appearance of the ruptured anterior cruciate ligament (ACL) that occur over time.

**Objective:** To quantitatively correlate 4 specific MRI findings with the chronicity of ACL injury over time in a large population.

**Methods:** 145 patients (124 males, 21 females; mean age, 31 years) with arthroscopically proven complete ACL tears were studied. All patients had preoperative MRI of the knee. In addition, all patients could reliably attribute their injury to one single event and could recall the precise date of that event. MRI scans were retrospectively reviewed to assess ACL morphology, joint effusion, posterior cruciate ligament (PCL) angle, and bone marrow edema. Patients were divided into 4 different groups based on the time from injury until the time of MRI: (1) acute – MRI was obtained <6 weeks from the time of injury; (2) subacute – MRI was obtained 6 weeks to 3 months from time of injury; (3) intermediate – MRI was obtained 3 to 12 months from time of injury; or (4) chronic – MRI was obtained >12 months from time of injury. Correlations were made between MRI findings and the known chronicity of the injury.

**Results:** There were 67 patients in the acute group, 19 in the subacute group, 23 in the intermediate group, and 36 in the chronic group. Strong correlations were found between all 4 findings assessed on MRI and the chronicity of the ACL tear. ACL morphology showed characteristic changes with time ($P<0.001$); the edema in the ACL gradually decreased, and the shape changed from edematous to band-like and fragmented over time. The PCL angle gradually decreased over time ($P<0.001$). The presence of a joint effusion was significantly different between the acute and subacute groups ($P<0.001$), and the presence of bone marrow edema was significantly different between the subacute and intermediate groups ($P=0.049$).

**Conclusions:** MRI findings correlate with the chronicity of ACL injury. By evaluating the ACL morphology, size and presence of a joint effusion, and bone marrow edema, and by measuring the PCL angle, one may be able to estimate the age of an ACL injury.

**Reviewer's Comments:** These findings are limited by the fact that this was a retrospective study. Future studies in which the chronicity of ACL injury is estimated by blinded examiners who review MRIs and in which the estimates are compared to the known chronicity of the injury would be interesting. Despite this, it remains unclear how these findings will alter the clinical management of patients with ACL injuries. (Reviewer-Adam J. Farber, MD).

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Keywords: MRI, ACL Injury, PCL Angle, Bone Marrow Edema Effusion

Print Tag: Refer to original journal article
Is Graft Selection Associated With Infection in ACL Reconstruction?


Barker JU, Drakos MC, et al:


ACL reconstructions performed with autograft hamstring tendons have an increased rate of infection compared to allografts or bone-patellar tendon-bone autografts.

Background: Allografts are becoming increasingly more popular for anterior cruciate ligament (ACL) reconstruction. Although clinical results are good, it is controversial as to whether allografts are associated with an increased risk of postoperative infection.

Objective: To review one institution’s “experience with infection after ACL reconstructions and to determine the effect of graft selection on both incidence of infection and ability to perform graft salvage.”

Methods: 3126 ACL reconstructions performed at one institution from 2002 through 2006 were retrospectively reviewed. All patients underwent ACL reconstruction with allograft, autograft hamstring tendons, or autograft bone-patellar tendon-bone (BPTB). All allograft tissue was obtained from the Musculoskeletal Transplant Foundation, American Red Cross Tissue Services, or Community Tissue Services; >95% of the allografts used were Achilles tendon allografts with calcaneal bone plugs. Patients who developed a postoperative infection were identified in a database. Chart reviews were then undertaken to determine the graft utilized during surgery, the incidence of postoperative knee infection, the organisms involved, the treatment, and the need for graft removal.

Results: In this cohort, 1777 ACL reconstructions were performed with autografts, and 1349 were performed using allografts. The overall incidence of infection was 0.58% (18 of 3126). The rate of infection varied by graft selection. There was a 1.44% infection rate in hamstring autografts versus a 0.44% infection rate in allografts and a 0.49% infection rate in BPTB autografts; this difference was statistically significant ($P <0.05$). Overall, the incidence of hamstring autograft infection was 3.34 times higher than the rate of the rest of the study population ($P =0.02$). Time after surgery until presentation of symptoms of infection varied from 5 to 205 days (mean, 32 days). Ten of the 18 patients had Staphylococcus aureus infections. All patients were treated with intravenous antibiotics, surgical irrigation, and debridement; the decision to retain the graft was made by the attending surgeon. Graft retention occurred in 72% of patients. There was a trend toward increased need for graft removal with hamstring tendon autograft compared with BPTB autograft and allograft ($P =0.09$).

Conclusions: In this series of primary ACL reconstructions, there is no increased risk of postoperative infection when an allograft tissue is utilized. In fact, the risk of infection when an allograft was used was similar to that when BPTB autografts were used and was significantly less than the infection rate when hamstring tendon autografts were used.

Reviewer’s Comments: This large-scale study validates the safety of allograft use for ACL reconstructions in terms of postoperative knee infections. I wonder why the rate of infection is higher in the autograft hamstring tendon group; perhaps future studies will delineate the reasons for this. (Reviewer-Adam J. Farber, MD).

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Keywords: ACL Infection, Allograft Complications

Print Tag: Refer to original journal article
When performing MPFL reconstruction surgery, radiographic landmarks determined by a true lateral fluoroscopic image can be used to accurately localize the femoral insertion of the MPFL with percutaneous techniques.

**Background:** Determining the medial patellofemoral ligament (MPFL) femoral insertion after ligament rupture can be difficult secondary to tissue injury, scar formation, and inability to accurately identify osseous landmarks. Radiographic landmarks for proper femoral insertion of the MPFL have been described. According to these studies, the MPFL insertion can be found approximately 1 mm anterior to the posterior cortex extension line and 2.5 mm distal to the posterior origin of the medial femoral condyle. The applicability of these landmarks in the clinical scenario of surgical MPFL reconstruction has not been confirmed.

**Objective:** (1) To verify the accuracy of the previously defined radiographic landmarks for femoral insertion of the MPFL; and (2) to apply this knowledge to a surgical approach and determine the feasibility of a percutaneous technique for MPFL reconstruction.

**Design:** Cadaveric anatomic study.

**Methods:** 8 fresh-frozen human cadaveric knees were utilized in this study. Using the above-described known radiographic landmarks, the femoral insertion of the MPFL was estimated using fluoroscopic imaging with a true lateral view; a guide-pin was placed percutaneously into the estimated area of the MPFL femoral insertion. With the guide-pin in place, all knees were then dissected to expose the MPFL and its anatomic femoral insertion. The true insertion was marked with a radiographic marker, the guide-pin was removed and replaced by a radiographic marker, and repeat fluoroscopic images were obtained. Computerized measurements were made of the distance between the true insertion and the estimated insertion of the MPFL on the femur.

**Results:** Using radiographic landmarks to estimate the MPFL insertion consistently placed the insertion approximately 2.5 mm anterior and 0.6 mm distal to the true anatomical insertion of the MPFL. The total distance between these 2 points was 3.6 ± 1.1 mm (range, 1.3 to 5.6 mm). Inter-observer and intra-observer reliability were both >0.95.

**Conclusions:** When performing MPFL reconstruction surgery, radiographic landmarks determined by a true lateral fluoroscopic image can be used to accurately localize the femoral insertion of the MPFL with percutaneous techniques. Based on the findings of this study, the authors propose that the MPFL insertion should be placed at a point slightly anterior (0.5 mm) to the distal posterior cortex and just proximal (3 mm) to the apex where it meets the Blumensaat's line.

**Reviewer's Comments:** This study confirms the utility of using fluoroscopy to determine the femoral insertion of the MPFL during MPFL reconstruction. As the authors note, it is essential to have a perfect true lateral image; otherwise, the measurements are not accurate. In addition, it is important to note that the posterior femoral extension line is defined by the posterior border of the posterior femoral cortex. (Reviewer-Adam J. Farber, MD).

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**Keywords:** Medial Patellofemoral Ligament, Patellar Instability, Anatomy Tunnel Placement

**Print Tag:** Refer to original journal article
Injections of PRP are safe and provide more pain relief and functional improvement than a corticosteroid injection in the treatment of chronic lateral epicondylitis.

Objective: To investigate whether injection of concentrated autologous platelets (ie, platelet-rich plasma [PRP]) improves the outcome of patients with lateral epicondylitis more so than corticosteroid injection.

Design: Prospective, randomized, double-blind, controlled clinical trial.

Participants/Methods: 100 consecutive patients (48 men, 52 women; mean age, 47 years) with chronic lateral epicondylitis scheduled for injection therapy were included. All patients failed a 6-month course of conservative treatment. No patients had received a prior injection or had undergone surgery. Patients were randomized by a computer to receive either an injection of PRP (n=51) or corticosteroid (n=49). Peripheral blood was collected from all patients. Injections were prepared by an investigator who did not perform the injections and were disguised with opaque tape to blind both patients and physicians. Patients in the PRP group received a 3-mL injection of PRP through a peppering technique. Patients in the corticosteroid group received an injection of kenacort 40 mg/mL triamcinolone acetonide performed in a similar fashion. All patients completed both a visual analog scale (VAS) and the Disabilities of the Arm, Shoulder, and Hand (DASH) Outcome Measure score before treatment and at follow-up (at 4 weeks, 8 weeks, 12 weeks, 6 months, and 1 year). Success was defined as a 25% reduction in the VAS scores and DASH score without a re-intervention.

Results: In total, 18 patients required re-intervention (13 in the steroid group versus 5 in the PRP group; \( P >0.05 \)). At the 4-week visit, patients in the steroid group had more improvement in the VAS and DASH scores. However, these results were not statistically significant, and this improvement declined over time. At the 6-month and 1-year follow-up, however, patients in the PRP group had statistically more improvement in both VAS and DASH scores than did patients in the steroid group (\( P <0.05 \)). At 1 year, 49% of patients in the corticosteroid group versus 73% of patients in the PRP group had VAS score improvements >25% (\( P <0.001 \)). Furthermore, 51% of patients in the corticosteroid group versus 73% of those in the PRP group had DASH score improvements >25% (\( P =0.005 \)). There were no systemic or local reactions to any of the injections.

Conclusions: Injections of PRP are safe and provide more pain relief and functional improvement than a corticosteroid injection in the treatment of chronic lateral epicondylitis.

Reviewer's Comments: This well-done prospective, randomized study shows superior results for PRP over steroids in the treatment of chronic lateral epicondylitis. Hopefully, the results of this study will affect changes in reimbursement policies for PRP by insurance companies and Medicare. (Reviewer-Adam J. Farber, MD).

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Keywords: Lateral Epicondylitis, Platelet-Rich Plasma, Corticosteroids, Pain Function

Print Tag: Refer to original journal article
Arthroscopic Bankart Repair With Suture Anchors

Prospective Evaluation of Arthroscopic Bankart Repairs for Anterior Instability.
Voos JE, Livermore RW. et al:


In this study of patients who underwent arthroscopic Bankart repair using suture anchors, young age and the presence of ligamentous laxity or a large Hill-Sachs lesion were the most significant predictors of recurrent instability.

**Objective:** To evaluate surgical outcomes of arthroscopic repair of anterior capsulolabral lesions with the use of suture anchors.

**Design:** Prospective case series.

**Participants/Methods:** At one institution, 73 patients (61 males, 12 females) underwent arthroscopic Bankart repair with suture anchors from 2003 to 2004. Mean age was 32.6 years (range, 15 to 55 years). No patient had posterior or multi-directional instability, full-thickness rotator cuff tearing, or previous shoulder surgery. Patients had a standard preoperative history and physical exam, x-rays, and MRI. All patients underwent arthroscopic Bankart repair with suture anchors and some degree of capsular plication, along with a standardized postoperative rehabilitation protocol. Outcome measures included rate of recurrent instability, range of motion, patient satisfaction, pain measured by a visual analog scale (VAS), and shoulder function (measured by the American Shoulder and Elbow Surgeons [ASES] and L'Insalata scores).

**Results:** Mean final follow-up was 33 months (range, 24 to 49). There was an 18% recurrence rate after surgery; 10% of patients suffered a dislocation event, 5.5% suffered a subluxation event, and 3% had apprehension on follow-up exam. Two patients (3%) required revision stabilization surgery. No significant difference was found in preoperative versus postoperative forward flexion (P =0.06) or external rotation (P =0.65). The ASES scores improved significantly from 75.4 preoperatively to 94.9 postoperatively (P <0.0001); L'Insalata scores improved from 66.5 preoperatively to 90.9 postoperatively (P <0.001); and VAS scores improved from 2.4 to 0.4 postoperatively (P <0.001). Overall satisfaction was 7.98 out of 10. On multi-variate analysis, young age, ligamentous laxity, and the presence of a large (>250 mm3) Hill-Sachs lesion were associated with recurrence after anterior stabilization (P <0.05), but the number of anchors used during surgery, the number of instability episodes before surgery, type of sport (contact vs non-contact), and the presence of a SLAP tear did not affect the recurrence rate (P >0.05). Of patients aged <20 years, 37.5% suffered a recurrence versus 25% in those aged 20 to 30 years and 8% of those aged >30 years.

**Conclusions:** "In this study consisting of patients who underwent arthroscopic Bankart repair using suture anchors, a postoperative recurrent instability rate of 18% was noted at a minimum follow-up of 2 years." Young age, ligamentous laxity, and a large Hill-Sachs lesion were the most significant predictors of recurrent instability.

**Reviewer's Comments:** This well-done study provides useful information for counseling patients undergoing Bankart repair surgery. Although the rate of recurrence seems high, this is likely due to the broad definition of recurrence, which includes the presence of apprehension on exam. Despite this, the rate of recurrence in young patients is concerning. Future studies are needed to identify strategies (whether intraoperative or postoperative) that are effective at decreasing the rate of recurrence. (Reviewer-Adam J. Farber, MD).

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Keywords: Bankart Shoulder Instability, Dislocation, Arthroscopy

Print Tag: Refer to original journal article
The posterolateral knee reconstruction technique significantly improves objective stability in patients with a chronic posterolateral knee injury.

**Background:** The primary repair of posterolateral knee injuries has been reported to yield good results if performed acutely within the first 3 weeks after injury. The authors describe an anatomic posterolateral reconstruction based on the quantitative attachment anatomy of the fibular collateral ligament, the popliteus tendon, and the popliteofibular ligament.

**Objective:** To report the subjective and objective outcomes in a series of knees treated with an anatomic posterolateral reconstruction technique.

**Design:** Clinical outcome study (therapeutic level IV).

**Methods:** Patients with a chronic unilateral grade 3 (complete) posterolateral knee injury were included. The inclusion criteria were combined varus and posterolateral rotatory instability in a patient who reported, or had findings of, functional instability, pain, a varus thrust gait, or a failed previous ligament reconstruction. Modified Cincinnati and subjective International Knee Documentation Committee (IKDC) patient outcome questionnaires were administered to patients at the time of follow-up.

**Results:** 64 patients underwent a posterolateral knee reconstruction for the treatment of chronic posterolateral knee instability and pain. The time interval between the initial injury and the posterolateral knee reconstruction was 4.4 years. Fifty-four (84%) patients were available for follow-up at an average of 4.3 years (range, 2 to 7.2 years) postoperatively. Two patients had a previous posterolateral knee repair that had failed, and 5 had a previous nonanatomic posterolateral reconstruction that had failed. The total modified Cincinnati score averaged 65.7 points (range, 20 to 100 points) at the time of follow-up. The IKDC subjective score averaged 62.6 points (range, 20 to 100 points) at follow-up. No significant difference was found between patients who had an isolated posterolateral knee reconstruction and those treated with multiple ligament reconstructions. There was also no significant difference between patients who had not had a osteotomy prior to the posterolateral knee reconstruction and those who had required an osteotomy. Chi-square analysis demonstrated a significant postoperative improvement in the scores for varus opening at 20°, external rotation at 30°, reverse pivot shift, and single-leg hop (all \(P < 0.001\)).

**Conclusions:** The posterolateral knee reconstruction technique significantly improved objective stability in patients with a chronic posterolateral knee injury.

**Reviewer's Comments:** Although the patients in this study had a heterogenous mix of concomitant ligament injuries and previous high tibial osteotomy, all had chronic posterolateral instability. There was a low rate of failure, <8%, and a high success rate of regained stability to both rotatory and varus stress. This is a nice capstone to the authors' previous anatomical and biomechanical studies on this topic. (Reviewer-Carl H. Wierks, MD).

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Keywords: Posterolateral Corner, Knee Reconstruction

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