

Once the diagnosis is made, the indications for surgery must be considered

Managing ACL tears: When to treat, when to refer

ABSTRACT: *In making an accurate diagnosis of anterior cruciate ligament (ACL) tears, primary care physicians help determine whether patients should receive nonoperative treatment or surgery. Nonoperative management has less chance of success in younger, active patients than in older, low-demand patients. Bracing provides mechanical stability when small forces are applied to the knee. Patients who require ACL reconstruction should be referred to an orthopedic surgeon who has sports medicine fellowship training. Initial preoperative treatment includes splinting in a knee immobilizer. ACL reconstruction should be delayed until normal or nearly normal range of motion is achieved with full knee extension. Currently, several surgical techniques are used. Postoperatively, the patient is sent for physical therapy. Oral anti-inflammatory and narcotic pain medications are provided. (J Musculoskel Med. 2004;21:520-526)*

Advances in surgical techniques and physical therapy have helped reduce operative morbidity and improve outcomes in patients who have anterior cruciate ligament (ACL) tears. In many cases, however, nonoperative treatment is still an option. Primary care physicians, athletic trainers, and physical therapists, who are often first to see injured patients, need to make an accurate diagnosis of an ACL tear and associated injuries (Figure 1). Then they can help determine whether nonoperative treatment is merited or whether patients should be referred to a specialist for possible surgery.

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In this 2-part article, we describe the overall evaluation and management of ACL tears. In the first part ("Managing ACL tears: Evaluation and diagnosis," *The Journal of Musculoskeletal Medicine*, July 2004, page 381), we reviewed the normal anatomy of the ACL; its biomechanics and function; the common injury patterns; and proper evaluation, including tests and imaging, leading to diagnosis. In this second part, we describe nonoperative management of ACL tears, the indications for referral to a sports medicine specialist, preoperative management, the various techniques used for ACL reconstruction surgery, and the components of proper postoperative care.

Nonoperative treatment

In the population of active patients, young or old, nonoperative

management of an ACL-deficient knee has a poor likelihood of success. In older, low-demand patients or those who are willing and able to modify their activity level to avoid cutting, jumping, and pivoting activities, nonoperative management of ACL tears is a viable option.

Even in patients who have a moderately active lifestyle, however, the ACL-deficient knee has been associated with decreased performance and an increase in secondary knee injuries. Active persons who persist in high-risk activities following an ACL tear have been shown to have not only a higher incidence of symptomatic meniscal tears but also lower knee function rating scores and early radiographically perceived changes of osteoarthritis.¹

Although nonoperative management of ACL-deficient knees may

lead to meniscal tears and meniscectomy could lead to Fairbanks changes, the study conducted by Fink and colleagues followed patients with ACL-deficient knees who had not had any surgery.¹ These investigators found that patients who continued to engage in high-demand athletic activity had a greater risk of osteoarthritic changes at between 10 and 13 years of follow-up.

If left unmanaged, an ACL tear can lead to anterior laxity, rotatory instabilities, and meniscal

tears. The extent of cartilage damage correlates with length of time since injury; the medial compartment often shows more damage than the lateral compartment.² For all of these reasons, ACL tears in healthy, active persons usually are reconstructed surgically. Although there are several gender differences related to ACL injury rates, properly performed ACL reconstruction is equally successful in men and women.³

Meyers and McKeever⁴ classified tibial avulsion fractures (the pediatric equivalent of an ACL tear) in terms of the amount of displacement of the avulsed bone fragment from the tibial eminence. Management of these uncommon injuries is linked to their classification. Type I is a nondisplaced fracture; typically, it is managed nonoperatively. Types II, III, and IV are displaced fractures; generally, they require surgical treatment.⁵

Bracing provides mechanical stability when small forces are applied to the knee. However, this

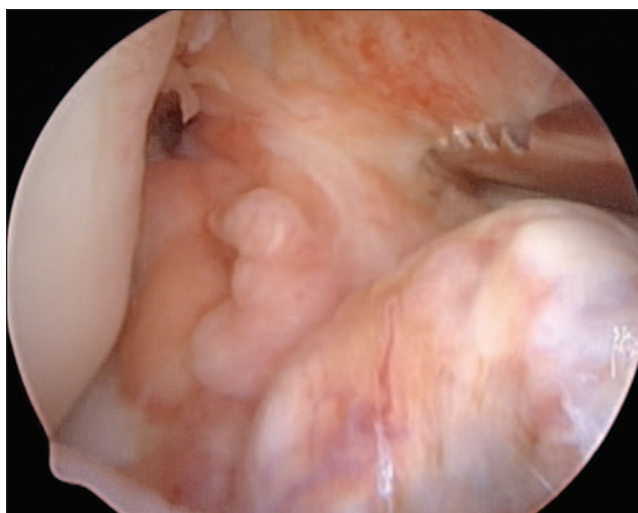


Figure 1 – This arthroscopic image shows a torn anterior cruciate ligament.

protection has not been demonstrated at physiologic levels of force on the knee. Bracing of an ACL-deficient knee does not reproduce the stability lost when an ACL is torn, and the ability of functional bracing to provide protective proprioception, or joint position sense, has not been demonstrated consistently.

Application of a functional brace or neoprene sleeve to an ACL-deficient limb does not improve the threshold for detection of passive knee motion; however, application of an elastic bandage to a knee that has an ACL tear improves proprioception. In addition, there is evidence suggesting that a neoprene sleeve can improve joint position sense for a year after ACL reconstruction.⁶

Despite inconsistency in data regarding the benefit of bracing or wrapping an ACL-deficient knee in active persons, there are anecdotal reports of athletes feeling “more confident” about their ACL-deficient knee when wearing a knee

brace or wrap and, as a result, having improved sports performance. Characteristically, these reports are from populations of low-demand recreational enthusiasts participating in low-risk activities. However, protective effects also have been reported in high-demand athletes who continue to compete with a deficient ACL. In a cohort of 180 professional skiers who had ACL-deficient knees as documented by KT-1000-instrumented

ligament testing, subsequent knee injury was more likely in patients who did not wear a functional brace while skiing.⁷

Several areas of controversy surround the treatment of patients with ACL tears. Considerable disagreement among orthopedic surgeons regarding the ability of patients with ACL-deficient knees to participate in all recreational sports and regarding the use of braces in the postoperative period has appeared in recent surveys.⁸ In addition, issues involved in treatment strategies for patients older than 40 years, the presence of knee pain in association with instability, what constitutes an irreparable meniscal tear, and the influence of a workers’ compensation claim are subject to differing opinions.

Patients in these categories must be evaluated carefully, and treatment decisions should be based on characteristics specific to individual patients. In these situations, it should be recommended that the patient seek the advice

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Indications for surgical reconstruction

Our indications for recommending surgical reconstruction of a torn anterior cruciate ligament (ACL) take into consideration the patient's age, current and projected functional level, and associated injuries:

- Age. We do not use advanced age as a specific contraindication. However, the younger a patient is, the more likely we are to recommend ACL reconstruction, provided that degenerative joint disease is not present.
- High-risk sport selection (sports involving cutting and pivoting; eg, football, basketball, tennis).
- Participation in sports activity 4 to 5 hours per week.
- KT-1000-instrumented laxity testing shows a side-to-side difference of 3 mm or greater, indicating a complete ACL tear.¹⁹
- The patient desires to continue competitive athletic participation at the club, collegiate, or professional level.
- Lack of success with conservative treatment.
- Workers' compensation patient with hard labor demands: the "industrial athlete."
- The presence of a coexisting repairable meniscal tear.

of an ACL reconstruction surgeon who has considerable experience.

There is little evidence that the precipitating cause of arthritis following an ACL injury is the tearing of the ACL, but an ACL tear constitutes a severe knee injury that—in isolation or combined with associated chondral or meniscal injuries—can increase the likelihood of the future development of OA.⁹⁻¹¹ Chondral and meniscal injuries, which occur in the ACL-deficient knee both at the time of index injury and secondarily over time, result in several related pathways culminating in OA.¹²

Successful ACL reconstruction does not reverse arthritic changes, but it is likely to slow the progression toward OA by increasing the possibility of a successful meniscal re-

pair in the acute setting and by decreasing the likelihood of future meniscal or chondral injuries in chronically ACL-deficient knees. When considering an ACL reconstruction in a patient with a

chronically ACL-deficient knee, it is important for the surgeon to provide appropriate activity level expectations and to evaluate coexisting arthritis risk factors, such as varus alignment, obesity, and previous injuries or surgical procedures (eg, meniscectomy).

Despite these areas of controversy, the consensus is that an active person who does not have degenerative joint disease and who desires to continue jumping, cutting, and pivoting activities should have surgical treatment for an isolated ACL tear (see Box, "Indications for surgical reconstruction," on this page). We strongly recommend that patients who require ACL reconstruction be referred to an orthopedic surgeon who has sports medicine fellowship training.

Preoperative management

Initial treatment of a patient with an acutely injured ACL includes splinting with a knee immobilizer, use of crutches for comfort, and ice and elevation to reduce swelling. After the diagnosis of an ACL injury is made, the patient should be provided information regarding ACL injuries. The surgeon should commit ample time to answering questions from the patient and family members. Information packets regarding ACL injuries and future rehabilitation protocols are readily available and helpful in patient education. At our institution, patients are provided copies of review

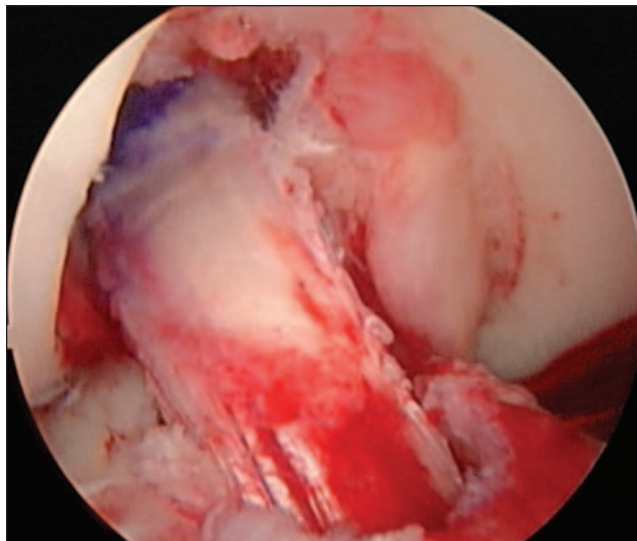


Figure 2 – An anterior cruciate ligament reconstructed with use of a patellar tendon graft is shown in this arthroscopic image.

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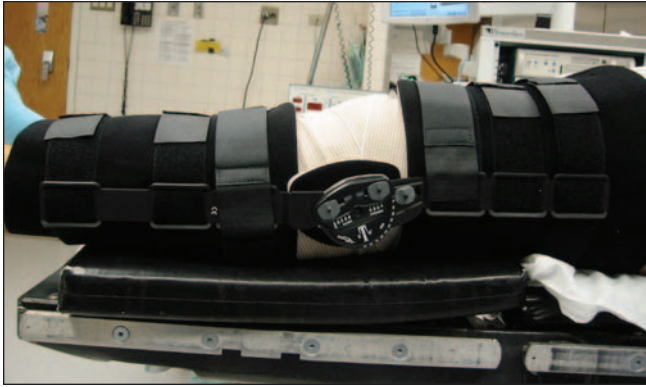


Figure 3 – Immediately following surgery, the leg is placed in a knee extension brace to maintain extension. In the immediate postoperative period, the brace is removed only for hygiene and physical therapy.

articles that we have had published.

Within a week of the injury, the patient is sent to a physical therapist to regain motion and to maximize quadriceps and hamstring strength. Early active range of motion is initiated; emphasis is placed on maintaining full extension. Quadriceps and hamstring strengthening is achieved by using closed-chain weight-bearing exercises (the foot is fixed and remains in constant contact with the surface; eg, squat, leg press); the goal is regaining the strength of the hamstring and quadriceps muscles to within 90% of that of the contralateral limb.

ACL reconstruction should be delayed until normal or nearly normal range of motion is achieved with full knee

extension. Occasionally, full extension is limited by the torn ACL stump, which causes a mechanical block in the femoral notch. Arrangements are made before the surgery for durable medical items, including crutches, cryotherapy devices, and a postoperative drop-lock hinged knee arthrosis. These preoperative activities initiate active patient participation in recovery and establish a relationship with therapists that will contin-

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Figure 4 – Early motion is emphasized in postoperative rehabilitation. This patient is performing an exercise to reestablish full knee extension.

ue in the postoperative period.

Surgery risks are discussed with the patient when the surgery is scheduled. Specific rates of risks are less than 1% for infection, thrombophlebitis, pulmonary embolus, and post-traumatic patellar tendon rupture or patellar fracture; less than 2% for reoperation for scar tissue; and less than 10% for recurrent laxity.^{13,14}

Surgery

Currently, several techniques are used for ACL reconstruction surgery.^{15,16} The graft most commonly used for ACL reconstruction in the middle third of the patient's patellar tendon is autograft with attached bone blocks from the tibia and patella (Figure 2). This technique allows for immediate rigid bone-to-bone fixation of the graft. Another popular graft source is the medial hamstrings; the semitendinosus and gracilis tendons are harvested through a small incision and secured to the femur and tibia using various methods of soft tissue fixation.

Allograft tissue (cadaveric patellar tendon) is a good option for patients who engage in frequent, prolonged kneeling or who desire a slightly faster rehabilitation. The disadvantages of allograft tissue are added cost, a potential graft length mismatch, and the small potential for bacterial or viral transmission. In properly handled allografts harvested from properly screened donors, the risk of HIV infection is exceedingly low, estimated at 1 in 8 million.¹⁷ Bacterial contamination has been reported but is also rare; rates are estimated at 2 in 25,000.¹⁸ Synthetic grafts for ACL reconstruction have fallen

Practice Points

- Data on the benefit of bracing or wrapping of an anterior cruciate ligament (ACL)-deficient knee in active persons are inconsistent. In anecdotal reports, athletes say they feel more confident and perform better.
- For patients with an acutely injured ACL, initial treatment includes splinting, use of crutches, and ice and elevation. The patient should be provided information regarding ACL injuries and rehabilitation protocols.
- Closed-chain weight-bearing exercises, such as squats and leg presses, are used for quadriceps and hamstring strengthening. The goal is regaining at least 90% of their strength in the contralateral limb.

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out of use because of graft failure, sterile effusions, and infection rates.

Typically, ACL reconstruction is performed as an arthroscopically assisted procedure; if autograft hamstring or patellar tendon is chosen, small incisions are made for graft harvest. Most patients receive a general anesthetic as well as injection of a local anesthetic, which allows for an easier recovery than do excessive inhalational agents. Typically, the surgery time is 1.5 hours and the procedure is performed on an outpatient basis. At our institution, more than 900 consecutive ACL reconstructions have been performed on an outpatient basis with no hospital admissions by the senior surgeon.

Postoperative care

Postoperative care and the use of braces vary among surgeons. At our institution, the patient's leg is placed in a drop-lock brace held in extension over a compressive cryotherapy device (Figure 3). The patient is allowed full weight bearing in extension with crutches, even if a meniscal repair is performed. He or she is monitored in the post-anesthesia care unit for 1 hour. Before discharge, he is sent to physical therapy for education regarding crutch walking, use of the postoperative brace, straight leg raising, active and passive range of motion, and prone extension hangs. Postoperative rehabilitation emphasizes early motion, specifically with regard to re-establishing full knee extension (Figure 4).

Oral anti-inflammatory and narcotic pain medications are pro-

vided for 1 week postoperatively. Typically, patients who take oral anti-inflammatory medication require supplemental narcotic pain control for only 2 to 3 days; some patients do not require any narcotic medication.

When patellar tendon grafts are used, we advance our patients

through a rehabilitation protocol rapidly. The patient is permitted use of a stationary bicycle at 10 days, use of a stair step machine at 4 to 6 weeks, and straight-line running at 3 months. Return to sports is expected at approximately 4 months, provided rehabilitation goals are achieved. □

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