

Thomas J. Nordstrom, M.D.

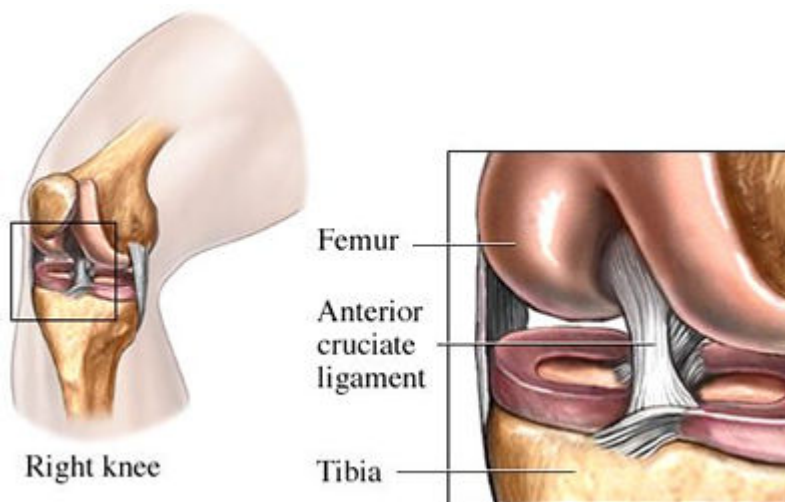
David A. Abrutyn, M.D.

Anterior Cruciate Ligament Injuries: Surgery & Rehabilitation

A torn anterior cruciate ligament (ACL) is one of the most common knee ligament injuries. Our understanding of the anterior cruciate ligament and its importance to knee stability has increased greatly over the past fifteen years. Techniques for diagnosing the injury and performing surgical reconstruction have become more reliable.

Anatomy

The normal anatomy of the human knee is depicted in Figures 1 and 2 below. There are four major ligaments which provide knee stability. The anterior cruciate ligament is located inside the knee joint next to the posterior cruciate ligament. The medial collateral ligament (MCL) and lateral collateral ligament (LCL) are on the outside of the knee joint. There are also two meniscal cartilages which act as shock absorbers and provide a small amount of stability. Articular cartilage lines the knee joint and allows for its smooth, nearly frictionless motion. A torn anterior cruciate ligament is commonly associated with injury to one or more of these other structures.



Mechanism of Injury

Injuries to the ACL occur most often in athletic activities. The injury typically does not require a blow to the knee, but instead may involve a rapid change in direction or deceleration maneuver. The individual will often hear a “pop” inside the knee. This is usually followed by increasing pain and swelling, as well as, progressive inability to bear weight on the leg.

Initial Management

The initial management of a patient with an ACL injury is highly individualized, but some general principles exist. Assuming no fractures are present, the patient is often allowed to bear weight on the extremity as soon as pain and swelling allow. Your doctor may advise you to wear a brace and/or use crutches depending on the severity of the injury. Application of ice to the knee, usually for 20 minutes 4-5 times per day may aid in minimizing swelling for the first 3 days after the injury. Physical therapy is usually started to help restore knee motion, maintain muscle strength, and reduce swelling. If surgery is to be performed, it should be done after the acute inflammation (swelling) and restriction of motion that accompanies the injury have subsided, which generally takes about 2 weeks.

Your physician may obtain a magnetic resonance imaging (MRI) scan of your knee. This test allows us to visualize the structures within the knee and is helpful in clarifying the nature and extent of the injury.

Definitive Management

Approximately one-third of patients who injure the anterior cruciate ligament will experience relatively few problems and lead a fairly normal lifestyle. Another one-third will have problems with the knee with various athletic activities. These people could live with their knee satisfactorily if they are willing to give up those activities which cause problems. The remaining one-third of patients will have problems with their knee even with simple activities of daily livings, such as stepping off a curb or changing direction while walking or jogging.

The decision to undergo reconstructive surgery for a torn ACL is highly individualized. Patients who should consider undergoing ACL reconstruction are those who plan to continue an active lifestyle which places demand on the injured knee. Activities which require frequent changes in direction or speed (ie., tennis, skiing, basketball, volleyball, soccer) will generally result in episodes where the knee gives way. These episodes may cause further injury to the menisci and articular cartilages of the knee and are thought to eventually result in degenerative arthritis. Patients who lead a more sedentary lifestyle or those who participate in “straight ahead” sports (ie., jogging, swimming, cycling) may have little, if any, difficulty with their knee. They might prefer to treat their injury with a rehabilitation program alone. We advise patients to strongly

consider ACL surgery if they plan to engage in activities which would place the knee at risk for recurrent instability episodes.

Anterior Cruciate Ligament Reconstruction: Options

Reconstruction of the ACL is a surgical procedure performed in an operating room, typically, under general anesthesia. Frequently, the anesthesiologist will also give a single shot femoral nerve block for post-operative pain relief. In addition, we inject long active “numbing” medicine (marcaine & morphine) into the knee for pain relief. The technique for this surgery is referred to as “arthroscopically assisted ligament reconstruction”. That is, an incision is made to obtain the tissue to be used in the reconstruction (ie., bone patellar tendon bone or hamstring), but the actual ligament reconstruction surgery is done with the arthroscope.

The choice of graft used to reconstruct the ligament is also highly customized to the patient. There are two types of grafts: 1) autologous (your own tissue) or 2) allograft (tissue taken from a cadaver). Autograft choices include the central third of your patellar tendon versus two (of four) hamstring tendons. Again, the choice for the graft reconstruction is highly individualized and the decision about which graft source to use should be made in conjunction with your surgeon.

The Day of Surgery

During your pre-operative visit in the office you will be told the time you should arrive at Somerset Medical Center. This scheduled time will allow you to complete all of the necessary administrative details required by the hospital. When you arrive in the pre-operative holding area, you will be asked to change into a hospital gown and make yourself comfortable in a reclining chair. Most patients prefer to leave their underwear on during the procedure and this is fine. You will meet your anesthesiologist in the pre-operative holding area and options for anesthesia will be discussed.

From the pre-operative holding area, you will be taken to the operating room. Your knee will be prepared for surgery first by shaving the hair from around the knee and then by scrubbing it with anti-bacterial soap. You will also be hooked up to monitors by the anesthesiologist and given oxygen, as well. A tourniquet will be placed around your thigh and it is occasionally inflated for a portion of the surgery. Your extremity will be draped in a sterile manner that allows us to work in a completely sterile field.

The surgical time is approximately 90 minutes. If one or both of the menisci are torn, the surgery will take longer in order to remove and/or repair the damaged structures. At the conclusion of your surgery, the knee joint is instilled with anesthetics to reduce postoperative discomfort. Your incisions will be closed and a light dressing will be applied. An ice pack will be placed over your dressing—you will be instructed on its use prior to your discharge from the hospital. Finally, your leg will be placed in a knee immobilizer.

From the operating room you will be transferred to the recovery room for approximately one to two hours. Pain medicine, as needed, is available. You will also be taught crutch walking.

Your first night home may not be a comfortable one. We have found, however, that people are happier at home than in the hospital. A prescription for pain medicine will be given at your pre-operative visit. We encourage taking your pain medicine every 4 to 6 hours for the first 48 hours. Knee surgery hurts and it does your recovery no good to be in pain!

During the first 24 hours you should limit your walking as much as possible. The leg should be elevated on 2 or 3 pillows, above the level of your heart. The leg does not need to be elevated during sleep. We suggest using the ice machine during the first 48 to 72 hours after surgery. We encourage you wear the knee immobilizer during the first week except when doing your exercises. You can weight bear on your leg as much as pain allows. **Keep your incision and dressing dry.** It is common to experience some bloody drainage in the first 24-36 hours. If this occurs, simply reinforce the dressing with gauze pads.

Another common occurrence after general anesthesia is a low-grade fever during the first 72 hours post-operatively. The fever is usually below 101 degrees and slowly abates. Tylenol works quite well, if necessary. It is also important to cough and take deep breaths regularly during the first 24 hours after surgery. If the fever is greater than 101 degrees and associated with shaking chills and increasing knee pain, please call us as this may be an early indicator of infection.

If you have any other problems or questions after your surgery we can be reached at any time. Just call the office at 908-685-8500.

Rehabilitation

Goals 0 to 2 weeks after surgery

- Full knee range of motion
- **High priority to achieve full extension!**
- Full weight bearing
- Normal gait without assistance of crutches or cane
- Pain reduction/edema reduction
- Normalize balance/proprioception abilities
- Begin and enhance normalization of quadriceps recruitment

Protocol:

1 to 3 days post op

- Modalities as needed
- Brace 0 to 90 degrees, range of motion advanced daily as tolerated by ATC or PT
- Begin patella mobilizations
- Scar management
- Quad sets/hamstring co-contractions at multiple angles, 10x10 2 to 3 times daily
- SLR in brace at 0 degrees until quad control sufficient to prevent distal tibia from dropping 10x10 2 to 3 times daily
- Obtain full passive extension with bolster under heel or prone with leg off table
- Time Modulated AC (aka Russian stim)

4 to 7 days post op

- Continue as above
- Stationary bike to increase ROM, start with high seat and progress to normal seat height when able, resistance as tolerated
- NK table leg curls, standing leg curls with cuff weights or prone leg curls if tolerated (wait 2 to 3 weeks if hamstring graft used)
- Leg press with both legs
- Closed chain exercises with tubing, etc.
- Treadmill walking-forward and retro
- Single leg stands for balance/proprioception on Airex pad or trampoline

2 weeks post op

- Continue as above
- D/C crutches and brace after post op visit with doctor
- Encourage full ROM
- Begin aquatic therapy with approval from doctor. Start with functional AROM, marching forward/backwards, lateral stepping, flutter kicks from hips

3 weeks post op

- Continue as above
- Cable Column exercises-if good quad control present; retro-walking, lateral walking/stepping, shuffling, no crossover stepping
- Stairmaster-start with shallow steps with feet flat on steps and weight on heels, progress depth as tolerated to normal step depth
- All exercises should move to affected leg only at this time except for squat
- Monitor closely for patellofemoral signs and symptoms, manage them accordingly

4 to 7 weeks post op

- Chair/Wall squats-keep tibia perpendicular to floor
- Unilateral stepup-start with 2-inch step and progress to normal step height, emphasize control during the decent phase of stepup

5 weeks post op

- Continue as above
- May begin lunges, lunge walks, lunge squats while maintaining tibia perpendicular to floor
- Leg extensions with Anti-shear device or with 5 pound cuff weights, progress weight as tolerated and keep resistance proximal on tibia
- Single leg squats
- Slide board-start with short distance and progress as tolerated
- Versa Climber
- Fitter
- Nordic Track and Elliptical trainers, etc.

6 weeks post op

- Continue as above
- D/C time Modulated AC

8 weeks post op

- Continue as above
- Lateral movements-stepping, shuffling, hopping, carioca
- Isokinetic exercises: 180, 150, 120, 90, 60 degrees/sec 8 to 10 reps each up and down spectrum
- Initiate eccentric quad exercises with manual resistance
- Begin use of conventional weight-lifting equipment (ie, Leg extension machines, smith machines, squat racks, etc). Start with light weight and high reps and sets and progress towards shorter sets and reps and high weight if hamstring graft or allograft used wait until 8 weeks post op before using leg extension machines

10 weeks post op

- Continue as above
- Assessment of jogging on treadmill (wait for 4 months for this if hamstring or allograft used)
- Plyometrics (wait for 4 months for this if hamstring or allograft used)
 - Low-intensity vertical and lateral hopping to begin with, use both feet and move to one foot ASAP
 - Volume for plyometrics (this is not conditioning exercise but a strengthening one) for rehabilitation
 - 40 to 60 foot contacts/session for beginners
 - 60 to 80 foot contacts/session for intermediate
 - 80 to 100 + foot contacts/session for advanced
- If plyometric exercise intensity is high, the volume must be decreased, give ample recovery time between sets
- 2 to 3 sessions a week preferably on weight-lifting days
- Initiate sport-specific activities under supervision of ATC or PT
- Emphasize plyometrics on single leg for speed and power

Return to Sport:

- Doctor OK
- Typically, 6-8 months (allografts may take longer)
- Isokinetic testing results-quad difference less than or equal to 15 percent
- Power difference less than or equal to 15 percent
- Peak torque/BW ratio greater than or equal to 80 percent (if possible)
- Hamstring/quadriceps ratio greater than or equal to 60 percent
- 85 percent or better on scores of functional tests
- No pain/PTF signs and symptoms
- No swelling
- Able to perform desired activities at full speed

ACL Reconstruction

Frequently Asked Questions

1. When can I shower?

You may shower as long as you cover the incision/dressing with plastic within the first 2 weeks following surgery. After 2 weeks, you may immerse the incision in water.

2. How many incisions will I have?

The answer to this question depends on the type of graft and method of fixation. This will be discussed in your pre-operative evaluation.

3. How long do I use crutches?

We like you to use crutches for the first week and as long as necessary for balance. Most patients are off crutches in 2-4 weeks.

4. Can I put weight on my leg?

You are permitted to weightbear as tolerated on your leg from the first day after surgery, as long as you have your knee immobilizer on. We prefer that you use the knee immobilizer until you have full extension and are able to straight leg raise (usually 1 month), and use the crutches as described above.

5. When can I drive?

Driving depends on which leg is operated upon and whether your car is an automatic or manual transmission. If it is your left leg and you have an automatic, you may drive as soon as you are comfortable. If it is your right leg or a manual transmission, it takes longer, perhaps two weeks depending on the individual. We ask that you practice in a vacant area to be sure you are safe before driving on the main road.

6. Will I always need a brace?

When returning to your sport, some patients wear a sports brace for the first year if it is a high risk sports (ie, basketball, football, tennis). However, most are brace free after they have completed their rehabilitation.

7. When can I remove the dressing?

You can remove the dressing after 72 hours or leave it on until your first postoperative visit.

8. May I remove my knee immobilizer?

In the first week, your knee immobilizer remains on for both ambulation and sleeping. As your quadriceps strength returns the immobilizer will be removed for walking and physical therapy. However, we prefer you wear the knee immobilizer for the first month while sleeping.