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Pop Goes the Knee:
Rehabilitation of Complex Knee Injuries

By Richard Lebert, RMT

While many injuries can afflict the knee, the focus of this article is anterior cruciate ligament (ACL) injuries. This article will review ACL reconstruction and rehabilitation, in addition to clinical pearls related to this injury.

There is a wide spectrum when it comes to ACL injuries, from a minor tear to the dreaded O'Donoghue unhappy triad. Named after Dr. D.H. O'Donoghue, the American orthopedic surgeon who first described the injury in 1950,[1] the unhappy triad is as follows:

- ACL tear
- medial collateral ligament tear/sprain
- medial meniscus tear

Richard Lebert, RMT, works at The Fowler Kennedy Sport Medicine Clinic at Western University in London, Ontario. Richard has a clinical focus on sports injuries, concussion and postsurgical rehabilitation. Richard is also a continuing education instructor for massage therapists, chiropractors and physiotherapists. Twitter @AdaptiveTherapy

Epidemiology

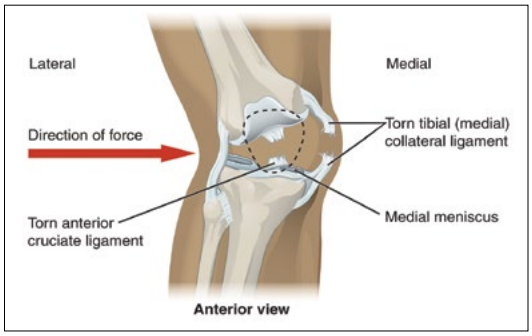
Some sports carry a higher risk of suffering a devastating ACL injury. Of the four sports with the highest ACL injury rates, three are women's gymnastics, women's basketball and women's soccer.[2] These are followed by American football, with running backs and wide receivers the most likely to suffer an ACL injury. Roughly 90% of elite athletes are able to return to their sport within a year or two of an ACL reconstruction. However, different sports have different return-to-play rates, with hockey players ranking highest on the return-to-play statistics and snowboarders the lowest.

To put a face to this injury, consider this list of notable athletes who have suffered an ACL injury: Georges St-Pierre, Robert Griffin III, Tom Brady, Lindsey Vonn and Tiger Woods.

Mechanism of injury

The ACL functions primarily as a stabilizer of the knee, limiting anterior movement of the tibia and excessive twisting at the knee. ACL injuries are most often the result of an awkward landing or "cutting"-type movement. There is often a popping sound at the time of the injury, followed by swelling within a couple of hours and severe pain when bending the knee.

Biomechanically, the mechanism of injury can be described as anterior tibial translation, internal tibial rotation and abduction. Whether you suspect a ruptured ACL either on the field or in your office, best practice dictates you refer the patient to a family physician, sports medicine physician or orthopedic surgeon for a definitive diagnosis.



The diagnosis

Orthopedic surgeons will use the Lachman, pivot-shift and anterior drawer tests to assess the severity of an ACL tear. The clinical examination is then backed up by magnetic resonance imaging to determine the extent of the damage. This imaging has greatly lessened the need for diagnostic arthroscopy and also has a higher accuracy than clinical examination. It can also permit the visualization of other structures that might have been coincidentally involved, such as a meniscus, collateral

ligament or the posterolateral corner of the knee joint.

Orthopedic surgeons recommend that once an ACL injury has been ruled in, you should limit the amount of orthopedic testing on the knee to avoid stressing the injured tissue.

Surgical considerations

Because of the associated swelling, patients might have to wait for four to six weeks after the initial injury before undergoing reconstructive surgery. That being said, not all ACL injuries will require surgery; surgeons use many factors to select surgical candidates. Some of the primary selection criteria are the severity of the tear and the patient's ability to follow through with the six to 12 months of postsurgical rehabilitation. Two alternative sources of replacement material for ACL reconstruction are commonly used:

Autografts - An accessory hamstring or part of the patellar tendon are the most common donor tissues used in autografts.[3] Hamstring autografts are made with the semitendinosus tendon, either alone or accompanied by the gracilis tendon for a stronger graft.

Allografts -The patellar tendon, tibialis anterior tendon or Achilles tendon may be recovered from a cadaver and used as an allograft in reconstruction. The Achilles tendon, due to its large size, must be shaved to fit within the joint cavity. There is a slight chance of rejection, which, if it occurs, will lead to more surgery to remove the graft and replace it.

A new ligament in the knee?

In late 2013, CBS, NPR, ScienceDaily and the BBC all reported on a "new" ligament that had been discovered in the human knee. This ligament is now called the anterolateral ligament (ALL). The ALL is thought to control internal tibial rotation, thereby affecting the sensation of "giving out" during activity, often referred to as the pivot-shift phenomenon. Anatomical research has shown that a tear in

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Key points

- The ACL is a ligament in the knee with a primary role in knee stability. It prevents the shinbone from sliding forward and the knee from twisting excessively.
- Female athletes involved in basketball and soccer are two to eight times more likely to suffer an ACL injury than their male counterparts.
- Athletes who have suffered an ACL injury are at increased risk of developing osteoarthritis later in life. There is evidence to suggest that anywhere from 50% to 100% of patients who sustain an ACL rupture go on to develop osteoarthritis of the knee.[4]

the ALL increases the amount of pivot shift present with an ACL tear. Surgical techniques are now being developed using the ALL to augment ACL reconstruction in patients with complicated or recurrent ACL injuries.

Rehabilitation and return to sport

The type of treatment is determined based on the severity of the tear in the ligament. Small tears in the ACL might only require several months of rehabilitation in order to strengthen the surrounding muscles—the hamstring and quadriceps—so that these muscles can compensate for the torn ligament.

The ACL ligament has relatively poor vascularization so, whether or not there is surgery, recovery will take a while. Six months of rehabilitation is generally required, with an athlete returning to play after 12 months. Although early activity is encouraged, returning to sports too early will often result in pain, swelling and a risk of re-injury. The risk of re-injury of the ACL ligament is high; it is best to be cautious while progressing through rehab. Ultimately, a proper balance of commitment and patience will greatly improve chances of a successful and timely recovery.

The more proactive a patient can be immediately following ACL surgery, the better the results. Patients should start walking, weight bearing and performing safe quadriceps exercises several times a day soon after surgery.

Massage therapy considerations

Most musculoskeletal dysfunctions are complex biomechanical dysfunctions requiring multiple interventions and individualized treatments. In an integrated multidisciplinary program, massage therapy may be used as a hands-on technique to promote tissue healing and restore normal movement patterns.

An important part of the assessment process is to determine the patient's goals.

The main early focus is to improve range of motion in the knee joint. Later, therapy shifts toward regaining strength in the weakened muscles around the knee, which will have atrophied from disuse since the surgery. Patients who are active soon after surgery typically develop less atrophy than those who try to "baby" their leg. Postsurgical muscle atrophy is common, and patients who engage in dedicated physical therapy will generally regain postsurgical quadriceps strength before 12 months. There is evidence to suggest that anywhere from 50% to 100% of patients who sustain an ACL rupture go on to develop osteoarthritis of the knee.[4]

Athletes can encounter several speed bumps including patellofemoral pain syndrome[5], infrapatellar saphenous neuralgia, and joint swelling.

In the book *Anatomy Trains*, Tom Myers introduced the concept of "myofascial meridians" that run from head to toe. It is important to keep this concept of soft tissue continuity in mind when developing a treatment plan. Hamstrings and their antagonists, the quadriceps, function as a good foundation for any treatment plan. Building on that, you can move up the kinetic chain to work on the tensor fascia latae and gluteus maximus, medius and minimus. Progress medially to work on the adductors and their fascial attachments, to the hamstrings and quads.

Within the adductor group, the adductor magnus is a high-value muscle—contemporary anatomy texts now describe the adductor magnus as having a hamstring portion (described as the fourth hamstring) and an adductor portion. Other soft tissue structures that can be included in treatment plans are the popliteus, gastrocnemius and soleus.

In terms of bony articulations, joint mobilizations at the proximal tibiofibular joint and the ankle joint (the talocrural, subtalar and inferior tibiofibular joints) will strengthen the therapeutic input.

During the first four weeks, patients will rely on crutches so patients may complain of headaches, as well as neck and shoulder discomfort. It's important to address these active-release treatments.

Whether the injury is acute or chronic, massage therapy is a valuable addition to any ACL rehabilitation plan. MT

References available upon request.