

Sports-Related Traumatic Injury

Case #1

One of the most common injuries of the knee is a tear of the anterior cruciate ligament (ACL). Currently, the estimated incidence of ACL injuries is approximately 200,000 each year. Reconstructions of the ACL occur in about half of these cases. High risk sports for an ACL injury include basketball, football, skiing, and soccer. Through this case we'll look at the process of diagnosing and repairing an ACL tear.

Case Objectives

- 1) Review the [anatomy of the knee](#).
 - a. Define the following:
 - i. Femur
 - ii. Tibia
 - iii. Patella
 - iv. Meniscus
 - v. Collateral ligaments
 - vi. Anterior Cruciate ligament
 - vii. Posterior Cruciate ligament
 - b. Define the function of knee ligaments.
 - c. Differentiate the functions of the anterior cruciate ligament, posterior cruciate ligament, and collateral ligaments.
- 2) Define the purpose of a [field exam](#) by an athletic trainer.
 - a. List the steps an athletic trainer would take in a field exam of an injured athlete to include:
 - i. Evaluation an unconscious athlete.
 - ii. Evaluating a conscious athlete
 - iii. Define criteria to be met before an athlete may be moved to the sidelines.
- 3) Define the purpose of the following diagnostic tests in establishing an ACL tear: Lachman, Anterior Drawer, Pivot Shift, and MRI imaging.
- 4) Define the following medical terms: hemarthrosis, hemorrhage, knee flexion, varus, valgus.
- 5) Pertaining to the treatment of an ACL tear:
 - a. Define what an arthroscope is, how it works, and when it might be used.
 - b. Define the procedure for [surgically reconstructing](#) an ACL tear.
 - c. Define [3 graft options](#) for replacing a torn ACL.
- 6) Define the roles of the following health care professionals in diagnosing and treating an ACL tear: athletic trainer, radiology technician, radiologist, physical therapist, and operating team including orthopedic surgeon, OR nurse, OR technician and anesthesiologist.

Derrick Williams was living out his dream, playing college football as a receiver. He had just caught a 35 yard pass, and was running between the defenders, heading for the goal line. As he turned sharply to avoid being tackled, he felt a pop in his knee and fell sharply to the ground in pain.



The team athletic trainer ran to the field to assess the situation. The trainer started with a routine [field exam](#) to rule out injuries that would prevent the athlete from being moved, such as back, head injuries or fractures. After deciding the injury was isolated to the knee, Derrick was able to stand with help and be assisted from the field.

Although the above web site discusses a medical doctor's responsibilities evaluating an injured athlete, an athletic trainer would follow the same guidelines.

- 1) *What are the steps to evaluating an unconscious athlete?*
- 2) *What are the steps to evaluating a conscious athlete?*
- 3) *What are the responsibilities of a first responder at the scene of an athletic injury?*

[Review Basic Anatomy of the Knee](#)

Identify the ACL and PCL. Review basic knee motion.

The trainer continued to work on assessing the injury. After ruling out other knee injuries, the trainer performed testing to confirm his suspicions of a tear in the [anterior cruciate ligament](#).

- 4) *Be familiar with the anterior cruciate ligaments (ACL) location list 2 functions.*

Testing consisted of an anterior drawer, Lachman and pivot shift tests.

See [Examination of the Anterior Cruciate Ligament](#)

See ["The ACL Tear: Making the Diagnosis"](#)

Instructor's Note: The above testing may be difficult for the non-trainer to understand. The important points the student needs to understand are.

- 1) *The testing is done to assess the proper movement of the knee.*
- 2) *An athletic trainer can diagnose an ACL tear through this testing. The definitions of the following terms may be useful as the student studies the links pertaining to testing.*
 - a. [valgus](#)
 - b. [varus](#)

The testing confirmed the trainer's suspicion of a tear in the ACL (anterior cruciate ligament). Derrick was referred to an orthopedic surgeon. Physical exam showed swelling in the knee and [hemarthrosis](#). The physician ordered an [MRI](#) (magnetic resonance imaging) on the knee to confirm the diagnosis and assess the extent of the injury.

- 5) *What is an MRI scan?*
- 6) *What health professional would perform an MRI scan?*

[MRI imaging results](#)

After evaluating the MRI results, the orthopedic surgeon recommended surgery to reconstruct the ACL tendon. Derrick was a young athlete who had dreams of playing professionally, and would need the full function of his knee. Derrick would definitely not return to play this season, but if all went well, would return the following season.

Instructor's Note: A conservative, non-surgical approach of treating an ACL tear is also an option. The patient undergoes extensive physical therapy to strengthen the knee. Although the knee will not function as well as it once did, this is often the best approach for an older or nonathletic patient.

The surgery would not take place for 3-6 weeks. The swelling in the knee would need to subside as well as the hemarthrosis for the surgery to be successful. The pre-surgery goal would be to reduce swelling and pain and restore a full range of motion. Derrick would begin physical therapy as soon as possible. The goals of the first phase of physical therapy were to minimize swelling, pain, and [hemorrhage](#) after surgery; establish and maintain full knee extension; achieve good quadriceps control; and to begin working on regaining [knee flexion](#) and neuromuscular control.*

The orthopedic surgeon performed surgery one month after the initial injury. At this point the swelling and hemarthrosis had subsided and Derrick's knee was stronger due to physical therapy. The surgeon explained that he would perform the surgery [arthroscopically](#). The surgeon would use a graft from Derrick's [patellar tendon](#) to replace the torn ACL ligament.

- 7) *What is an arthroscope?*
- 8) *What are some advantages of arthroscopic surgery?*

Instructor's Note: The student may wonder why the torn ACL ligament is replaced, and simply not sutured together. Surgeons have found that attempting to repair a torn ligament by stitching is ineffective. The ligaments do not heal or function as they should. Ligaments are replaced by an autograft (using tendons from the patient's own body), or an allograft (using donated tendons from another body). A patellar tendon autograft is the most common repair.

[ACL reconstruction by arthroscopic surgery](#)

- 9) *Describe the surgical method used to replace a torn ACL.*

* *Principles of Athletic Training, Ninth Edition, Arnheim and Prentice, pg. 496.*

Although Derrick's surgery was a success, he still had a long road of physical therapy in front of him. The reconstructed ligament would take at least 6 months to regain adequate strength. He began Phase 2, or the repair phase of physical therapy. Goals of this phase included achieving a normal gait

pattern; maintaining full extension; strengthening quadriceps and hamstrings; increasing knee flexion; maintaining cardio respiratory endurance; and improving neuromuscular control.*

At 4 months Derrick began Phase 3 of physical therapy in which concentration was placed on functional progressions and return to high-demand activity.* Therapy consisted of [electrical muscle stimulation](#), ultrasound massage (massage using sound waves), and incorporating sport-specific activities.

10) *What is electrical muscle stimulation (EMS)?*

11) *How can EMS prevent or reduce muscle atrophy?*

At 6 months Derrick was released to full activity, but still maintained his weight lifting exercises to keep his knee healthy. Next football season was definitely looking up!

* *Principles of Athletic Training, Ninth Edition, Arnhem and Prentice, pg. 496.*

Case Summary

- 1) A rupture or tear of the anterior cruciate ligament is one of the most common sports related injuries. Usually a non-contact injury, the tear occurs from turning or changing direction on a weight-bearing leg. Usually the injured person feels a snap or a pop in the knee.
- 2) Symptoms include swelling that is immediate or within 4 hours of the injury. The athlete may feel they can return to the sport shortly after the injury, only to have the leg collapse again. The patient will not be able to fully extend the knee.
- 3) Diagnosis can be made by the [Anterior Drawer, Lachman, and Pivot Shift Tests](#). An MRI may be necessary if the knee is too swollen to perform the field tests or if the clinician wishes to obtain further information as to the extent of the injury.
- 4) Treatment may consist of a conservative or non-conservative approach. The conservative approach consists of extensive physical therapy to strengthen the knee, but no surgery is performed. This approach is often best for an older or non-athletic patient. If surgery is not performed, the patient runs the risk of arthritis and further knee injury. The non-conservative approach requires surgery to replace the ACL ligament. The ligament is often replaced with a graft from the patellar tendon. Surgery is followed by extensive physical therapy. See [Operative and Non-operative treatment of ACL tears](#)
- 5) With sufficient time, prognosis for a surgically repaired ACL tear is good. Most patients can return to full activity 6-9 months after surgery. In most patients the knee does not reach maximum strength for 1-2 years following surgery.
- 6) Any athlete that participates in a sport requiring sudden twisting and turning of the knees is at risk for an ACL tear. This injury is common in sports such as football, basketball, skiing, soccer, and gymnastics.
- 7) A team approach to medicine is very evident in this case. The athletic trainer was responsible for the initial diagnosis and treatment. An MRI of the knee was performed by a radiology

technician. The radiologist interpreted the MRI and sent the results to the orthopedic surgeon. This physician confirmed the diagnosis and performed surgery with the help of an operating team consisting of the surgeon, surgical nurses, operating room technicians, and an anesthesiologist. The physical therapist played a key role in this case. Responsibilities of the therapist included a pre-surgical strengthening program, and a rehabilitative, post-surgical program to strengthen the knee and restore full function. The physical therapist worked with Derrick for over a year.

Answers to Case Questions

Question 1

- a) Do not move the athlete.
- b) Do not remove the helmet.
- c) Do not use ammonia inhalants, which may cause the head to jerk from the noxious stimulus.
- d) Do not give liquids or food.
- e) Do not rush the evaluation.
- f) Do not worry about delaying the game.
- g) If the athlete is unresponsive, alert other medical personnel and coaches, and call for an ambulance. The medical staff should then proceed with CPR steps as necessary. If the athlete is not breathing, start rescue breathing.

Question 2

Evaluate mental status, symptoms, mechanism of injury, rule out neck injury, give a physical exam of injured area, slowly have athlete sit up, reevaluate, help athlete walk to sidelines.

Question 3

The first responder at the scene of an athletic injury needs to be able to recognize a life-threatening condition, provide emergency care, and facilitate transportation to a medical facility when indicated. An orderly, logical primary assessment on the field can help identify serious conditions promptly and guide further evaluation and treatment.

Question 4

- a) Functions of ACL:
- b) Prevents tibia from sliding forward on femur
- c) Prevents undue internal rotation of the tibia related to the femur.

Question 5

An MRI scan is a radiology technique using magnetism, radio waves, and a computer to produce images of body structures.

Question 6

A radiology technician with a specialty in magnetic resonance imaging would perform the scan.

Question 7

The arthroscope is a small fiber-optic viewing instrument made up of a tiny lens, light source and video camera.

Question 8

Arthroscopic surgery makes it easier to examine, diagnose, and treat joint problems. Surgery is less extensive, enables small incisions, shorter recovery time, and shorter hospital time.

Question 9

Reconstruction of the ACL begins with a small incision in the leg where small tunnels are drilled in the bone. Next the new ACL is brought through these tunnels, and then secured. As healing occurs, the bone tunnels fill in to secure the tendon.

Question 10

Electronic impulses stimulate the nerve axons signaling muscles to contract and relax.

Question 11

EMS increases blood flow to muscles, increases range of motion, increases muscle strength, as well as enhances muscle endurance.

Health Professionals Introduced in this Case

[Nursing](#)

[Operating Room Nurse](#)

[Surgical Technologist \(OR Technician\)](#)

[Athletic Trainer](#)

[Physical Therapist](#)

[Physician](#)

[Orthopaedic Surgeon](#)

[Anesthesiologist](#)

[Radiology](#)

[Radiology Technician](#)

Additional links of Interest

[ACL-Reconstruction using Patellar Tendon](#)

[Weber State University Nursing](#)

[Weber State University Radiologic Sciences](#)

[Weber State University Athletic Training](#)