ACL injuries and the rehabilitation process

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ACL Injuries and the Rehabilitation Process

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Thesis Abstract:

The purpose of my capstone is to research Anterior Cruciate Ligament injuries and the physical therapeutic process to treat the injury. I have always been involved in sports and I have seen a lot of ACL injuries ranging from cheerleading, football, gymnastics, and soccer. This is why I chose to explore ACL injuries is because I want to become a sports physical therapist and work with athletes in the future. I will also be interviewing an NIU student who tore her ACL three years ago. ACL injuries are very common in nature to the fact that the knee is an unstable joint. The bigger and heavier femur sits on top of the smaller tibia. I will first research the anatomy of the knee and how one injures their ACL. Next I will describe the standard process that most physicians follow when treating a patient with an ACL injury. I will then interview a student who had injured her knee previously and compare her treatment to the standard. I am hoping to find that the standard process matches the case studies process.
**Basic Anatomy of the Knee Joint:**

The knee joint is one of the most unstable joints in the human body. The three bones that make up the knee joint are the femur, the patella, and tibia. The femur sits on top of the tibia to form a hinge joint. The knee is only capable of flexion and extension with some slight rotation. Since the larger femur bone sits on top of the smaller tibia bone, the knee joint by nature is unstable. The patella (knee cap) is the sesmoid bone that protects the front of the knee joint. A sesmoid bone is a bone that is not directly attached to another bone. The patella is held in place by the quadriceps femoris tendon and the patella ligament (Mayo Clinic, 2011).

There are four major ligaments that hold the knee in place. The two outer ligaments are the medial collateral ligament (MCL) and the lateral collateral ligament (LCL). The two ligaments located within the joint are the anterior cruciate ligament (ACL) and the posterior cruciate ligament (PCL). The ACL prevents the knee from hyper-extending and the PCL prevents the knee from hyper-flexing. Since hyper-extending the knee is much more common, we see ACL injuries more often (Mayo Clinic, 2011).

The cartilage between the femur and the tibia are called the lateral and medial meniscus. The medial meniscus is attached to the MCL, while the lateral meniscus is not attached to the LCL. Since the MCL is attached to the medial meniscus, tears to the medial meniscus are more likely in the case that the MCL is torn (Carlo, 2011).
Causes of ACL injuries:
The most common way to tear the ACL is by playing sports that involve a lot of stopping and pivoting in different directions. Examples are basketball, football, and soccer. The action of planting your foot and twisting your upper body in a different direction of your foot will tear a person’s ACL. The opposing forces are too much stress on the ligament, so it tears (Mayo Clinic, 2011).

Symptoms of an ACL Injury:
When a person tears their ACL, they tend to hear a “popping” noise. The person will feel intense pain, swelling, and will not be able to put their weight on it. The person should see a physician immediately, because they will need surgery to fix their knee (Mayo Clinic, 2011).
The Rehabilitation Process of an ACL Tear

Phase 1 (Preoperative stage)

This is immediately after the injury has occurred. The main goal during this stage is to reduce the swelling and regain the complete range of motion (ROM) to the knee. This can take 1 week to 2 months depending on the severity of the injury. The patient must also rebuild their strength in their thighs and legs as well. These exercises include some weight bearing activities such as leg presses, calf raises, and stationary bicycling (Outpatient Physical Therapy and Rehabilitation).

Range of Motion Exercises
Strengthening Exercises

Step-downs

mild squats

cycling
**ACL Reconstructive Surgery**

Each ACL injury is dealt with differently depending on the severity of the injury and the individual themselves. ACL reconstructive surgery is an arthroscopic surgery. There are multiple variations for this surgery depending on how the surgeon performs the operation. The basic overlay of the surgery is the surgeon will insert the arthroscope, which is a tiny pen-sized instrument with a light and camera attached to it, into the knee. The surgeon looks at the video image on the screen to perform the operation.

There are three different ways to harvest an ACL graft for the procedure, either the patellar tendon, hamstring, or an allograft. Each type of graft has its advantages and disadvantages. The advantage of using a patellar tendon graft is that it is very strong, and the disadvantage is that the normal patellar tendon has been weakened temporarily and the person may experience tension on the front of the knee while kneeling. The advantage to using a hamstring graft is that the incision to harvest the graft is far away from the patella, so they do not experience any discomfort. The disadvantage to using a hamstring graft is that unlike the patellar tendon, the hamstring does not grow back after surgery. The hamstring tends to be approximately 10 percent weaker after surgery. The advantages to using an allograft (tissue taken from a cadaver) are that there is no risk, pain, or scar for the patient to obtain the graft and the operative time is much shorter. The disadvantages are the low risk of disease and the demand for allografts is very high, while the availability for them is low (Millett, 2010).
Phase 2 (Immediate Postoperative)

The main goal during this stage is to get the swelling back down and obtain full passive knee extension and 110 degrees of flexion. The first 6 days the patient must wear a cuff around the knee. The cuff minimizes the swelling and should be worn all the time except when the patient is doing their exercises. The patient should have their leg in hyperextension as much as possible with breaks for practicing flexion six times a day. The patient should start seeing a physical therapist one week after surgery.

For the next week the patient will be evaluated by the physical therapist to see how they are progressing. The patient will be concentrating on the swelling, ROM, quadriceps leg control, and walking. The patient should do walking exercises with partial to full weigh bearing without crutches (NISMAT, 2007).

ROM exercises
ACL cuff after surgery
Phase 3 (Postoperative)

After the first two weeks, the patient should be progressing towards moderate weight lifting and strengthening exercises. Examples are heel lifts, step-downs, squats, and cycling. The patient can also do swimming and other hydrotherapy exercises. If the patient has reached full ROM then they can progress to jump roping and single leg hops (Outpatient Physical Therapy And Rehabilitation).
Phase 4 (Continuing Therapy)

The goal of stage four is to advance the patient’s strength and get sports specific with their exercises. For example if they are a football player, the physical therapist could start practicing passing drills with them. If they are a basketball player, have them do dribbling and shooting exercises. Running is the final step in the rehabilitation process because long distance running increases swelling. The patient should start off very slow and work their way up over time (Outpatient Physical Therapy And Rehabilitation).
CASE STUDY

After all of the basic research of ACL injuries and the rehabilitation process for ACL injuries, I wanted to compare what I have learned to an actual ACL injury. I could not actually observe a client with an ACL injury, so I interviewed a third year student named Melinda in NIU’s physical therapy program.

Question: How did you injure your ACL? Did you injury anything else from your incident?

Answer: “I initially injured my ACL while in a mosh pit at a Disturbed concert. There were about 10 of us that started to sway in the pit and then fell. I fell on one guy with my leg over his and then another guy landed on my left leg and pop! It was excruciating pain. Then I had to try and get out of the mosh pit without being trampled. I survived. I had no idea what I did. It was very swollen and painful. I could not fully extend or flex my knee. Two weeks later, my apartment building did not salt the ice after I asked several times since I was on crutches, and I ended up slipping and hurting my knee more.”

Questions: When did this happen?


Question: Did you have to get surgery to repair your ACL? And if so, could you describe the procedure?
**Answer:** “I went to Health Services and they recommended me to an orthopedic doctor. I went to MOI and they told me what was wrong with my knee. I had completely torn my ACL, severely sprained my MCL, torn my lateral meniscus, and had major bone bruising of the tibia and femur. I ended up opting to get surgery since I am young and will be more active than if I was an older individual. I ended up getting an allograft, which is where they take a cadaver’s ligament and use that as a reconstructed ACL. I ended up not getting a patellar tendon graft because I figured I would not want to use part of one my tendons for another.”

**Question:** What were your post surgery precautions?

**Answer:** “After surgery, I was in an immobilizer brace for 3 days. Then I was non-weight bearing for 2 weeks while in a hinge brace and moved to partial weight bearing and then full-weight bearing.”

**Question:** When did you first start seeing a physical therapist for your ACL?

**Answer:** “I began seeing a physical therapist in mid February since it was recommended for me to go through physical therapy before I go through surgery so I would have the best range of motion and strength as possible. This was a good idea especially since it is hard since the quad atrophies so quickly and the range of motion is less because of the swelling and stress to the joint.”

**Question:** During your first week of physical therapy what did the therapist do and work with you on?
**Answer:** "I did basic strengthening and pain control. I focused on quad strengthening especially, doing quad sets and straight leg raises. I also did heel slides for range of motion. The PT did ice massage and e-stim on my knee for the pain management."

**Question:** Could you describe your overall physical therapy process and how you progressed over time? (wound care, exercises, stretches, more advanced treatments)

**Answer:** "I began doing whatever I could do after surgery. It started slowly. Stretches and the basic strengthening that I did prior (#6) was what I began with. Then I progressed to mini-squats, bike, steps, therabands in multiple directions. I hated the bike at first because I could not flex my knee enough at first to go all the way around. Mini-squats were hell too because my knee had become so weak so fast due to the atrophy of the quad. I also continued to stretch my hamstrings to help keep my extension range good."

**Question:** Were you ever frustrated or overwhelmed during your treatment?

**Answer:** "I actually became quite depressed during and especially after surgery. I could not hang out and do what I wanted with my friends and the pain was so bad, I never thought I would walk or do stairs normally again. I became frustrated because I did not think I was recovering quick enough. I did not have problems with extension since I had PT before the surgery, but my flexion was limited."

**Question:** How long did it take to come back from your injury?
Answer: “It took a while, probably about a year or so of therapy (before and after)…the
surgeon had to go back into my knee a year after I got the surgery since one of the screws
to hold in the ligament could be felt through my skin.”

Question: How is your knee currently?

Answer: “I should probably continue specific quad exercises because I can tell my right leg is
still stronger than my left leg. It definitely does not feel the same. It never will feel like it
did before the surgery. It still gets sore. Even though the surgery was on my left leg, my
right leg suffered. I had to put all my weight on my right leg due to my left leg injury,
which caused my right knee to wear down more quickly so I can tell my right knee is not
the best right now either. I cannot kneel because it is still tender to put weight onto it. I
was scared for a long time to jump because I thought I would reinjure my knee, but
finally I am ok to cautiously jump. Overall, my knee is better from when I initially
injured it. Thanks to surgery and especially PT!! “
Conclusion

After interviewing Melinda, I compared Melinda’s ACL rehabilitation process to the standard ACL rehabilitation process. Melinda’s treatment followed the standard pretty closely. After she tore her ACL she went to physical therapy to decrease the swelling and improve her ROM and strength in her knee. Her pre-surgical phase lasted about 4 months, which is slightly above the average amount of time. The physical therapy and treatment before surgery are very vital to the healing process. The stronger your leg is before surgery, the better off you are after the surgery. It can even quicken one’s healing time post-operation, which means you’ll be back on your feet before you know it. She received an allograft to reconstruct her ACL and had to wear an ACL cuff for 3 days after her surgery. She was limited to non-weight bearing activities at first and eventually working her way up to full weight bearing with a hinged-joint brace.

One outcome that was never mentioned by any of the references I researched was the possibility of running down the good knee from overuse. Melinda stated that she notices a difference between her left and right knee. Even though she tore the ACL in her left knee, it is her right knee that feels slightly weaker than the left because she had to use her right leg more to compensate for her injured left leg. I thought this was interesting because I would have thought most of her future problems would come from the left leg because it was the one that she injured. It opened my eyes that you have to focus on both sides of the body when it comes to physical therapy. You always want both sides to be as equally strong as the other side. Overall Melinda’s rehabilitation process matches the standard process; her timeline was just a little more stretched out.
This is very common because everyone’s bodies are different and heal at different rates. There is no “normal” to the healing process. There are always variables such the biology, genetics, medications, and the environment that can help or hinder the treatment process. The best treatment to any injury is a good preventative program. By eating a healthy diet, exercising regularly, stretching properly, and get the recommended amount of sleep you can prevent yourself from getting injured. One of the most common ways an athlete becomes injured is from poor training or lack of training. ACL injuries can be prevented to an extent but there are always those freak accidents that no one can prevent. The medical field has come a long way in treating ACL tears and they are much easier to repair than ten years ago.
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<http://www.mayoclinic.com/health/acl-injury/DS00898>


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