1-1-2011

So You've Busted Your Knee: An Introduction to Physical Therapy for the New ACL Patient

Alejandro Jr. Ramos

Northern Illinois University

"So You've Busted Your Knee: An Introduction to Physical Therapy for the New ACL Patient"

A Thesis Submitted to the

University Honors Program

In Partial Fulfillment of the

Requirements of the Baccalaureate Degree

With Upper Division Honors

Department of

Health and Human Sciences

By

Alejandro Ramos Jr.

Dekalb, Illinois

December 2011

University Honors Program

Capstone Approval Page

Capstone Title (print or type):

"So You've Busted Your Knee: An Introduction to Physical Therapy for the New ACL Patient."

Student Name (print or type): Alejandro Ramos Jr.

Faculty Supervisor (print or type): MJ BLASCHAK

Faculty Approval Signature: MJ Blaschak

Department of (print or type): Allied Health and Communicative Disorder

Date of Approval (print or type): April 30, 2009

HONORS THESIS ABSTRACT
THESIS SUBMISSION FORM

AUTHOR: Alejandro Ramos Jr.

THESIS TITLE:

ADVISOR: M J Bhashak ADVISOR'S DEPT: Health / Human Sciences

DISCIPLINE: Physical Therapy YEAR: Sr.

PAGE LENGTH: 11

BIBLIOGRAPHY: Yes

ILLUSTRATED: Yes

PUBLISHED (YES OR NO): No LIST PUBLICATION: /

COPIES AVAILABLE (HARD COPY, MICROFILM, DISKETTE): 1

ABSTRACT (100 – 200 WORDS): Yes

"So You've Busted Your Knee: An Introduction to Physical Therapy for the New ACL Patient"

By Alex Ramos Jr.

Abstract

The anterior cruciate ligament tear is an injury to one of the stabilizing ligaments within the knee joint. It is an injury that is becoming more and more common. As sports evolve and athletes become bigger, stronger and faster, the incidence of injury continues to grow. This study was done in the style of an introductory manual, designed to clearly explain the process of ACL repair to a patient who knows nothing about it. It focuses on what occurs when the ACL is torn, the different types of surgeries there are and how they are performed, and the rehabilitation process at different weeks of progress. Research on this topic was done in several ways. Protocols by different physicians for ACL repair were studied. Medical websites and medical journal entries were referenced. An interview with a practicing physical therapist was conducted as well as drawing from my own experience dealing with the injury. This research shows how important it is to follow rehab protocols very closely in order to return to pre-injury performance and to avoid complications. It is my hope that the more knowledgeable people are on their injury, the more inclined they will be to follow procedure of rehabilitation.

"So You've Busted Your Knee: An Introduction to Physical Therapy for the New ACL Patient"

By Alex Ramos Jr.

Table of Contents

Introduction to Physical Therapy

Hello and welcome to the wonderful world of physical therapy! This manual is designed to aid first time physical therapy patients who have injured their ACL and may be unfamiliar to the process. In this manual, you can find a basic explanation of what exactly occurs when the ACL is torn. You can also find information such as what your surgery will be like, the different stages of therapy, and the length of time you will be in therapy.

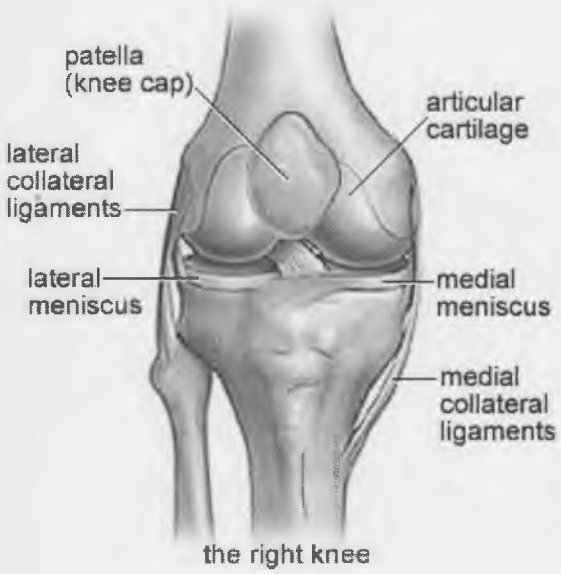
What is physical therapy?

Physical Therapy, also known as Physiotherapy, is the process of providing rehabilitation services to patients whose movement and functionality has been impaired due to aging, injury, disease, or other environmental factors. The aim of physical therapy is to restore and maintain that lost movement and functionality.

What are some reasons that people go to physical therapy?

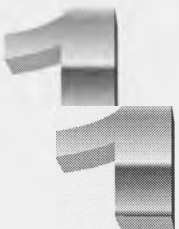
There are many reasons that people go to physical therapy. Injuries occurring in sports, impairments associated with neurological conditions such as multiple sclerosis, or conditions associated with aging are just a few things that can punch your ticket to a physical therapy office.

The injury that we'll be exploring in this manual is a tear in the Anterior Cruciate Ligament (ACL). The ACL is one of 4 ligaments in the knee and is perhaps one of the most commonly occurring injuries to the knee.



Anatomy of the Knee

The joint of the knee consists of 3 bones: the femur, tibia, and patella. There are also 4 ligaments within the joint that function to stabilize the knee during normal and athletic activity. The medical collateral ligament (MCL) and lateral collateral ligament (LCL) stabilize the knee from side to side. At the center of the knee joint, the anterior cruciate ligament (ACL) and the posterior cruciate ligament (PCL) form a cross. This is where the term "cruciate" comes from.



These ligaments stabilize the knee from front to back. Also located within the knee joint are the medial and lateral meniscus. These serve as shock absorbers in the joint in order to minimize the stress put on the articular cartilage, which cover the weight bearing surfaces of the knee

Causes of an ACL tear

An ACL injury occurs when the ligament suffers a partial tear, a complete tear, or a separation from the lower leg bone. Usually, the injury when occurs due to one of two things. The first is hyperextension of the knee. When the leg is straightened beyond its normal boundaries, excess stress is put on the ACL, which can potentially cause a tear in the ligament. An example of this is a basketball that went up for a rebound and lands with his leg completely straight. Upon landing, the leg is hyper extended and the ACL tears. The second common cause of injury is related to pivoting. This type of ACL injury can occur when there is excessive internal rotation of the leg. An example of this type of tear is a football player that plants his leg while making a cut. His foot is planted in one direction, while the rest of his body is cutting in the other. This puts stress on the ACL and can sometimes cause it to tear. This type of tear is most commonly seen on Astroturf where the ground does not give way.

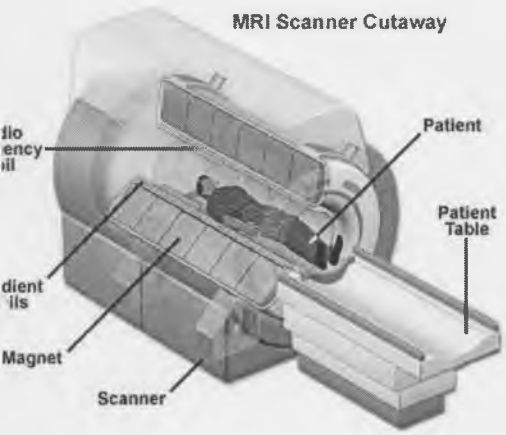
The Nature of the Tear

The first sign of an ACL injury is a pop. A pop in the knee will either be felt or heard when an ACL injury occurs, followed by swelling in the joint. The knee may buckle and give out, and you may not be able to get up. The swelling in the joint is caused by broken blood vessels that break when the ligament tears. The knee joint fills with blood which makes the initial diagnosis so hard to determine. The ACL injury is often concurrent with other knee injuries as well. Tears to the meniscus and to the lateral or medial collateral ligaments are common partners in crime with the ACL tear.

Diagnosis of the Injury

If you believe you have torn your ACL, you're probably wondering what to do next.

X-Ray: Upon visiting a doctor, you will most likely be sent to radiology to get an X-ray done on the injured knee. Fresh knee injuries almost always warrant an X-ray. An X-ray can't directly show you if the ACL has been torn, but it can show you signs that it's been torn. An X-ray will show loose bone fragments or any possible tearing away of bone where the ligaments attach.



MRI: An MRI is perhaps the best method of determining if the ACL has been torn. MRI stands for magnetic resonance imaging. The patient lies in a large hollow tube while powerful magnets vibrate molecules in the joint. This vibration creates a 3D image that doctors can use to not only see if the ACL has been torn, but if other structures in the knee joint have been injured as well.

Lachmans Test: This is a hands-on test that is run by the physician in order to analyze the integrity of the potentially torn ACL. The patient is sitting/laying on the examination table with the injured knee bent to about 30 degrees. The physician will put one of his hands behind the tibia, and the other hand on the thigh. The physician will then gently pull on the tibia to check for forward motion of the lower leg in relation to the upper leg. A healthy knee should only have slight movement forward (2-4 millimeters) with a firm stopping felt when the knee cannot move any further. A knee with a torn ACL will have excessive forward motion, and the endpoint will feel "soft" in comparison to a normal knee.

Surgery

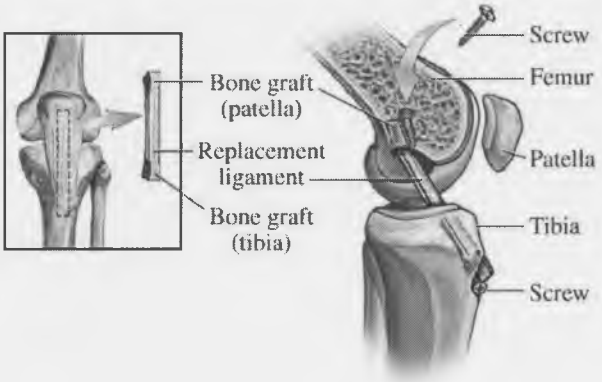
Do I need it?

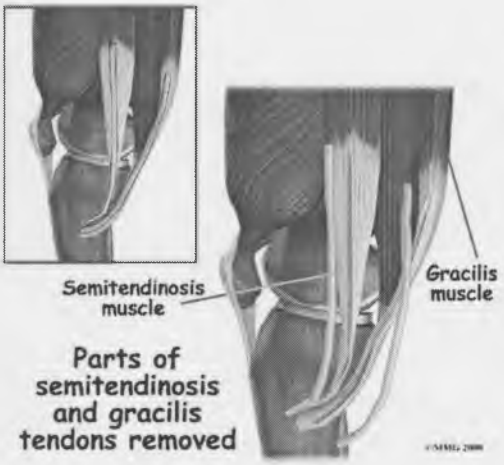
If the ACL is torn, surgery is not always a necessity. There are many factors that go into deciding whether or not to have ACL reconstruction surgery performed. Does your job require a lot of physical activity? Are you an avid sports player? Do your daily recreational activities require a lot of physical activity? If the answer to one or more of those questions was yes, getting the surgery would probably be a good choice. Generally, younger patients opt to get the surgery because they are still very active and having a torn ACL would prevent them from doing the things that young people do. The question more frequently comes up with older, less active patients who do not need to return to their pre-injury level of function. Simply put, there is no set rule that says you either need surgery or you don't. The decision comes down to the individual patient. Both options require extensive rehab work.

Surgical options

So you've elected to go the surgical route. What are your options now?

- **Patellar graft – The Patellar graft has become the most widely used procedure for ACL repair. In this procedure, the middle one-third of the patellar tendon will be removed and used as the new ACL. The part of the tendon is removed with a small bit of bone on both ends. Two holes a drilled into the joint where the ACL used to be located. The graft is then placed in the joint in a similar location as the old ACL. The bone pieces on the graft are placed into the holes that were drilled to facilitate further healing. The new ACL is then secured with a screw in each of the drilled holes. The new patellar graft heals quickly and is just as strong, if not stronger, than the old ACL. A disadvantage to having this procedure is that a healthy patellar tendon is cut into, which can cause discomfort while kneeling.**





- **Hamstring graft – This method is similar to the patellar graft, with one key difference being that a tendon from the patient's hamstring is used in place of the patellar tendon. This procedure is preferred for younger patients who are still growing because there is less chance of damaging the "growth plates" – the area responsible for growth of the bone. With this procedure, the healing is slower because soft tissue-to-bone healing occurs at a slower rate than bone-to-bone healing. Also, the thigh tendons used as a graft will NOT grow back, as opposed to the patellar tendons, which results in a loss of strength in the thigh. However, this typically goes unnoticed.**

- **Allograft – The last option is to use the tissue from a cadaver. This option is the least common of the three. Generally, either the patella, hamstring, or Achilles tendon can be used from the cadaver. An allograft is a good choice if the patient's own tissues cannot be used for whatever reason. An advantage to this option is that you will not have to use your own tissue as a graft, which can decrease the amount of pain and scarring that occurs as a result of harvesting a graft. This also decreases surgery time. However, there is also a risk of contracting a serious infection (albeit a very low chance) from the cadaver.**

Post-Surgery Care

Typically, most ACL surgeries are done as outpatient procedures, meaning that you will be able to go home a few hours after the surgery. However, you will not be able to drive yourself home. If it has not been done already, the staff will provide you with information and training on how to care for the wound and manage pain. You will also be trained on how to use the crutches if you don't already know.

Immediately post-surgery there will be pain for several days for which medication is normally given. When first starting therapy, there will be pain because the therapist will be attempting to initiate motion in a joint that is swollen and very sore. Also due to muscle weakness it will require a lot of effort to exercise the knee thus putting a lot of stress on the joint. As swelling decreases and strength increases there is less effort needed and thus less pain.

Most surgeons choose to use a large, stabilizing brace, which is adjustable and lockable to control the degree of movement and to lock the leg in a straight, extended position. Ensure that the brace is worn for the recommended amount of time so that the graft can heal in a shortened position. Do not remove the brace until recommended by the doctor because insufficient muscle strength can cause knee instability and further injury. This also applies to the use of crutches etc. As with any surgical procedure, always be aware of signs of infection. Wound care is very important! Avoid twisting/lateral motions until recommended to do so during your rehab.

Also, don't forget to make yourself comfortable! The weeks after the surgery are anything but pleasant, so be sure to use RICE. RICE stands for rest, ice, compression, and elevation. Getting off the leg and letting it rest, icing the knee, wrapping the knee with an ace for compression, and elevating the knee with pillows all help to reduce the swelling and keep the level of pain under control.

Phases of Rehabilitation

Depending on your surgeon and therapist, there can be many different phases to the rehabilitation process. There are many different varieties of plans, but it basically boils down to preoperative rehabilitation and postoperative rehabilitation, with postoperative rehabilitation broken down into many different phases. Before getting surgery, it is important to go through rehab in order to regain normal range of motion (ROM), normal strength, and to reduce the swelling in the knee. Doing this prior to having the surgery decreases the risk of complications such as postoperative knee joint and muscles stiffness.

Physical Therapy

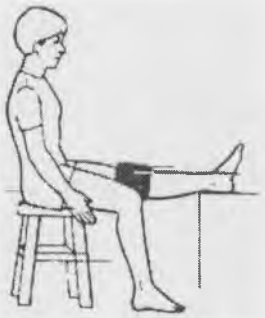
Prior to and after the surgery, you will be admitted to a physical therapy office to perform the rehab mentioned above. Immediately post-surgery there will be pain for several days for which medication is normally given. When first starting therapy, there will be pain because the therapist will be attempting to initiate motion in a joint that is swollen and very sore. Also due to muscle weakness it will require a lot of effort to exercise the knee thus putting a lot of stress on the joint. As swelling decreases and strength increases there is less effort needed and thus less pain.

Frequency of therapy is determined by the doctor and/or the therapist. This may be determined by the type of graft that the patient has received. Rehab may begin at 2 times a week and after 3-4 weeks down to once a week but a lot of this has to do with the individual's compliance with home exercises and attendance to his or her appointments. Time spent in each session varies and depends upon the facility and the condition of the patient. Usually it may be 45 minutes to an hour with ice or modalities after if needed.

<u>Preoperative Rehabilitation</u>
Goals: Restore ROM, strength, and reduce swelling to avoid postoperative complications.

Directions: Perform the following exercises daily as directed by your physician.

Exercises: Extension
1. Passive Knee Extension:
- **Sit in a chair and place your heel on the edge of a stool or chair**
- **Let your thigh muscles relax**
- **Let the knee hang under its own weight until fully extended**



2. Heel Props:
- **Very similar to passive knee extension**
- **Place a large towel underneath the heel**
- **Relax the leg allowing for extension**

3. Prone Hang:
- **Lie on a table face down with your legs hanging off the table**
- **Allow the legs to hang off the table into full extension**

Exercises: Flexion
1. Passive knee bend:
- **Sit on the edge of a high surface (bed, table, chair) and let gravity passively bend your leg**

2. Wall slides:

- **With a sock on, or a towel under your shoe, place the foot of the leg with the bad knee on the wall**
- **Slide the foot down with your other foot sitting on top of your bad leg to apply pressure**

3. Heel Slides:

- **Sitting on a table, keep the good leg extended**
- **Slide the heel towards the buttocks**
- **Return to starting position by sliding heel back downward**
- **Later on, perform heel slides while grasping the leg and pulling it towards you**

The use of a stationary bike and swimming can also be used to increase strength and work on range of motion. Elliptical machines, leg press, and leg curl machines can also be used to further strengthen the leg.

<u>Postoperative Weeks 1 and 2</u>

Goals: Decrease swelling due to surgery, obtain complete passive extension, obtain flexion of at least 110 degrees.

Directions: Many of the exercises from before will be used again here. The following exercises should be done without the stabilizer brace on (except straight leg raises). Again, these should be done as directed by your doctor.

1. Quadriceps isometric contraction:

- **Isometric means that no joint is moving**
- **With the leg fully extended, contract the quadriceps muscle. Hold for about 5 seconds and release.**
- **Prevents shutdown of quadriceps muscle and squeezes blood out of the joint.**

2. Passive Knee Extension:

- **Sit in a chair and place your heel on the edge of a stool or chair**
- **Let your thigh muscles relax**
- **Let the knee hang under its own weight until fully extended**
- **Can also be done in same manner as heel props**

3. Active-assisted extension

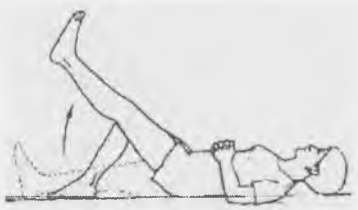
- Sitting on the edge of the bed with the repaired leg bent to about 90 degrees
- Place your healthy leg under your repaired leg and assist the repaired leg to full extension.
- Be sure to avoid hyperextension in this exercise.

4. Passive flexion:

- Sit on the edge of a bed or table and let gravity bend the knee
- Use the opposite leg to control the amount of bend.
- Try to attain about a 90 degree bend

5. Straight Leg Raises (SLR)

- Start off by contracting the quadriceps on the injured leg
- Keep leg straight and lift to about 45-60 degrees and hold for about 5 seconds.
- Slowly lower leg back down and relax the muscle.



6. Ankle Pumps/Ankle Circles:

- Pumps: With toes pointed up, pump your foot as if you were pushing the gas pedal of a car.
- Circles: With toes pointed up, rotate your ankle in a big circle.
- Helps to prevent Circulation Problems.

<u>Postoperative Weeks 3 and 4</u>

Goals: Continue to reduce swelling, maintain extension, obtain a higher degree of flexion, and gradually become less dependent on stabilizer brace.

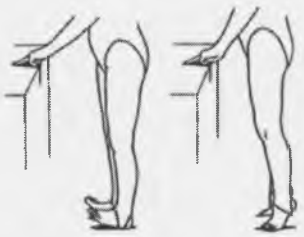
In addition to the previous exercises, begin to perform:

1. Partial Squats:

- Spread feet about shoulder width apart
- Using a table for stability, gently squat down and hold

2. Toe Raises:

- **Raise your heel off the floor and balance on the balls of your feet**
- **Use a table for stability**



- Continue to use the knee brace even if muscle control of the leg is good. Continue to use crutches until you have a normal heel-toe walk. Continue to use the stationary bike elliptical. Introduce the leg press machine to work on quadriceps strength.

<u>Postoperative Weeks 4 through 6</u>

Goals: Aim shifts to rebuilding strength and achieving full flexion

Continue all previous exercises while introducing balance exercises and more difficult strengthening exercises.

1. Single Leg Squats:

- **Similar to partial squats, except with only the operative leg**
- **Using a table for stability, squat down with the operative leg**

2. Stepping:

- **Using boxes of varying sizes, step up on the box and step down off of the box**
- **Performed going backwards, forwards, and side to side on the box**
- **Increase box size as balance becomes better**

3. Foam Roller Balance Exercises:

- **Throw and catch a ball with your therapist while maintaining balance on the roller**
- **Reaching in the 12, 3, 6, and 9 o'clock directions while maintaining balance**
- **Stacking and unstacking cones while balancing on the foam roller**

<u>Postoperative Weeks 6 through 10</u>

Goals: Continue strengthening, balance, and mobility exercises with an emphasis on combining strength and balance activities.

Continue exercises started at week 3 of rehabilitation while adding lunges if the knee is able to bend in a pain free manner. Weights may be added to already existing exercises in order to increase difficulty and resistance. Treadmill training may begin to develop normal walking motion. Flat Road biking may begin again as well. Do not go uphill or in a mountainous path!

Postoperative Weeks 10 and beyond

During this last phase, the goal is to have completely restored the lost range of motion, have no swelling, be able to run without any problems, and returned to nearly the preoperative strength in the quadriceps and hamstring muscles. Agility activities such as shuffling, crossovers, and backwards running begin here. Therapists also introduce cone drills to build agility as well. The therapist will also start the patient on a light running program and will gradually increase to a more vigorous running program. The patient also begins to work on sport specific skills in preparation for returning to the desired sports. The duration of therapy required to be discharged and returned to sports differs.

Conclusion

Physical therapy is something that most people generally don't want to have to go through, especially with an ACL injury. It is a 7 to 8 month ordeal just to get back into sports, a job and even longer until you can finally feel completely comfortable and back to full strength. Physical therapy does not have to be a negative experience though. Going in with a positive attitude and doing everything the therapist asks of you will help the process go a lot more smoothly and enjoyably. Trust them; they know what they're doing.

Every individual person is different. The length of rehabilitation varies from person to person, it all depends how fast you heal and how closely you follow the exercise regime put together by your physical therapist. You can expect to return to sports in about 4 to 6 months. Most doctors will advise the use of a functional brace to wear while playing sports or performing tasks at work that could put the ACL at risk. This is done as a precaution because the months following therapy the knee is still healing and getting back to 100 percent.

This is not the be all, end all guide to ACL rehabilitation. Every doctor and therapist has their own beliefs and methods that they feel work best. Certain doctors/therapists like certain exercises and dislike others. It comes down the experiences they have had while working in the field. Rest assured though, that they all share one common goal of helping the patient heal as quickly as possible. Good luck on your ACL rehabilitation!

Works Cited

"Anterior Cruciate Ligament Tears." Anterior Cruciate Ligament Tears. 2004. EHealthMD. Apr. 2009 <http://www.ehealthmd.com/library/acltears/ACL_whatis.html>.

Bach Jr. MD, Bernard R. "ACL Reconstruction PT." BackMD.com. Midwest Orthopaedics at Rush. Apr. 2009 <http://www.bachmd.com/>.

Bach MD, Bernard R., Patrice M. Moore RN BSN, and Bernice R. Ross CST. "Anterior Cruciate Ligament: History, Anatomy, and Reconstruction." The Surgical Technologist (1992): 14-19. Mar. 1992. Midwest Orthopaedics. Apr. 2009 <http://www.bachmd.com/>.

Davies PT, Claire. "Physical Therapy Rehab Questions." E-mail interview. 20 Apr. 2009.

De Carlo PT, Mark. "Accelerated ACL Reconstruction Rehabilitation Program." Accelerated ACL Reconstruction Rehabilitation Program. 16 Oct. 2008. Chester knee Clinic. Apr. 2009 <http://www.kneeclinic.info/rehab_markdecarlo.php>.

Erstad MBA/MPH, Shannon. Anterior Cruciate Ligament Injuries. Ed. Kathleen M. Arriss MS. 16 May 2008. WebMD. Apr. 2009 <http://www.webmd.com/a-to-z-guides/anterior-cruciate-ligament-acl-injuries-topic-overview>.

Flik MD, Kyle R., and Bernard R. Bach Jr. MD. "Anterior Cruciate Ligament Reconstruction Using a Two-Incision Arthroscopy-Assisted Technique With Patellar Tendon Autograft." Techniques in Orthopaedics 20 (2005): 372-76. BackMD. 2005. Midwest Orthopaedics at Rush. Apr. 2009 <www.bachMD.com>.

Gollogly MD, Sohrob, John T. Smith MD, and Hugh S. West Jr. MD. "ACL Injury, Knee pain, and ACL knee surgery explained." ACL solutions. 2001. Medical Internet Solutions. Apr. 2009 <http://www.aclsolutions.com/default.php>.

Millet MD MSc, Peter J. "ACL Reconstruction Rehabilitation Protocol." ACL Reconstruction Rehabilitation Protocol. Steadman Hawkins Clinic. Apr. 2009 <http://www.drmillett.com/rehab.asp>.

Millett MD MSc, Peter J. "Exercises for Knee Rehabilitation." Exercises for Knee Rehabilitation. Steadman Hawkins Clinic. Apr. 2009 <http://www.drmillett.com/rehab.asp>.