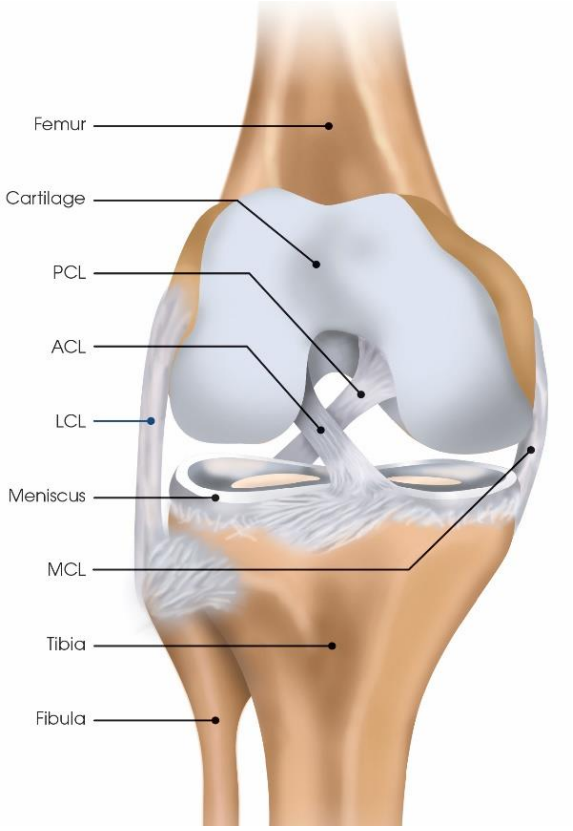
STEVEN CHUDIK MD

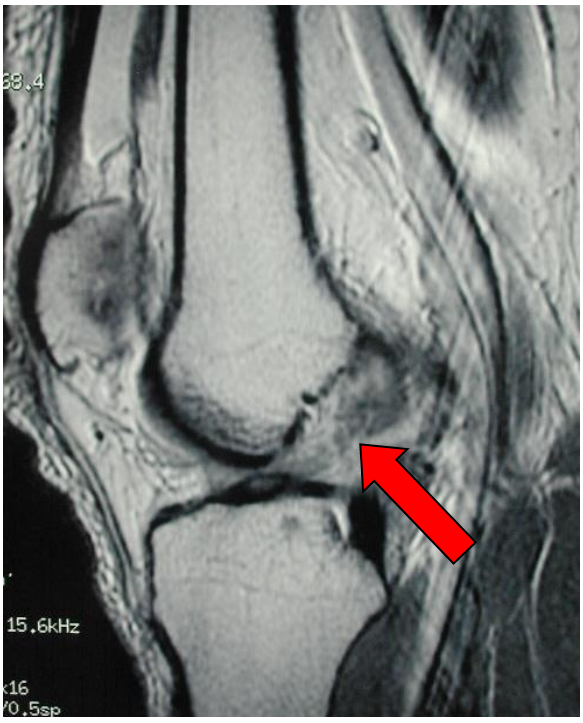
SHOULDER, KNEE & SPORTS MEDICINE

# Anterior Cruciate Ligament (ACL) Tear

An anterior cruciate ligament (ACL) sprain is a tear of one of the four major ligaments of the knee. The ACL is a ropelike structure in the center of the knee that helps maintain the normal relationship of the femur (thigh bone) and the tibia (leg bone). When torn, the ACL does not heal and the knee can be unstable (shifts or gives way) during sports that require pivoting, changing direction (cutting), jumping, or landing. About half the people who tear their ACL also tear their meniscus in their knee.

The diagnosis of an ACL tear is usually made on physical examination, but MRI can be helpful, especially when the patient is too swollen or guarded to allow a thorough examination. The MRI is also needed to diagnose any associated meniscal or cartilage damage.




Sagittal (side) view of an ACL tear on an MRI

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These photos show a Lachman maneuver on a knee before (left) and after (right) that reveals abnormal anterior (forward) shifting of the tibia (shinbone) on the femur (thigh bone) as depicted by the red arrow. This movement indicates a tear of the ACL.

## Frequent Signs and Symptoms

- Pop or tear heard or felt at the time of injury
- An inability to continue playing after the injury
- Large amount of swelling in the knee noticed within six to eight hours after the injury (often within three hours)
- Inability to straighten knee after an injury
- Knee instability, (shifting or giving way), particularly when trying to pivot, cut (rapidly change direction), or jump
- Swelling with repeated giving way
- Occasionally, locking (knee gets stuck intermittently) when there is concurrent injury to the meniscus.

## Etiology (Causes)

- 70 to 80 percent result from non-contact injury (landing awkwardly or cutting)
- Contact injury where the knee sustains a direct hit from another player such as getting tackled at the knee

## Risk Factors

- Sports that require pivoting, jumping, cutting, or changing direction (basketball, soccer, volleyball) or contact sports (football, rugby)
- Poor physical conditioning (strength and flexibility)
- Female gender (women have two and one-half to ten times higher risk than men)
- High playing surface to shoe friction coefficient or traction

## Prevention

- Appropriately warm up and stretch before practice and competition.
- Maintain appropriate conditioning:
  - Thigh, leg, and knee flexibility
  - Muscle strength and endurance
  - Cardiovascular fitness
- Train to use proper technique when cutting and landing.
  - There are specific ACL prevention programs that can lower the risk for injury.
- Use proper equipment (appropriate length of cleats for surface).

## Outcomes

The ACL will not heal on its own, but most people can return to normal daily activities after an appropriate rehabilitation program. Despite this return to normal daily function, ACL deficient knees are at risk for progressive meniscus and cartilage damage from abnormal knee mechanics. For those who want to return to sports that require pivoting, cutting, jumping, and landing, surgery is usually required especially in athletes and younger children. Surgery is also recommended for ACL injuries combined with other ligament, meniscus, or cartilage injuries.

## Potential Complications

- Recurrent episodes of instability (shifting or giving way)
- Further injury to the meniscus resulting from recurrent instability episodes (shifting or giving way) which can change the loading of the articular cartilage of the knee and cause premature arthritis
- Injury to other structures of the knee including the articular cartilage which results in the development of knee arthritis
- Injury to other ligaments of the knee
- Knee stiffness (loss of knee motion)

## Treatment Considerations

Initial treatment is focused on returning the knee back to its pre-injury status by reducing the pain and swelling and restoring the range of motion, strength, and gait. Walking with crutches until you walk without a limp is often recommended. Range-of-motion, stretching, and strengthening exercises may be carried out at home, although a referral to a physical therapist or athletic trainer is often recommended. If other ligaments are injured along with the ACL, Dr. Chudik may recommend a brace to help support the knee.

For those patients who do not perform sports that require frequent pivoting, cutting, jumping and landing, surgery is not always required and nonoperative rehabilitation is attempted. Individuals usually can continue to jog, cycle, lift weights, and swim without ACL surgery; however, they are at a greater risk for progressive damage to their meniscus and cartilage from abnormal knee mechanics. Rehabilitation of ACL tears usually focuses on reducing knee swelling, restoring knee range of motion, muscle control and strength, functional training, and education to avoid risky sports/activities that require pivoting, cutting, changing direction, jumping, and landing.

For those who participate in sports that require frequent pivoting, cutting, jumping, and landing, surgery to reconstruct the ACL is usually recommended to allow safe return to these sports. Surgery is also recommended for ACL injuries in young active children and in people who have combined injuries to other ligaments, the meniscus, or the articular cartilage.

## Possible Medications

- Nonsteroidal anti-inflammatory medications, such as aspirin and ibuprofen (do not take within seven days before surgery), or other minor pain relievers, such as acetaminophen, are sometimes recommended. Take these as directed by your physician. Contact your physician immediately if any bleeding, stomach upset, or signs of an allergic reaction occur.
- Pain relievers are usually not prescribed for this condition.

## Modalities

- Cold is used to relieve pain and reduce inflammation. Cold should be applied for 15 to 20 minutes every two to three hours for inflammation and pain and immediately after any activity that aggravates your symptoms. Use ice packs or an ice massage with a cloth between the ice and your skin to prevent burning /freezing your skin.

## Notify My Office if

- The knee continues to shift or give way and swell
- The knee locks (gets stuck intermittently)
- New, unexplained symptoms develop

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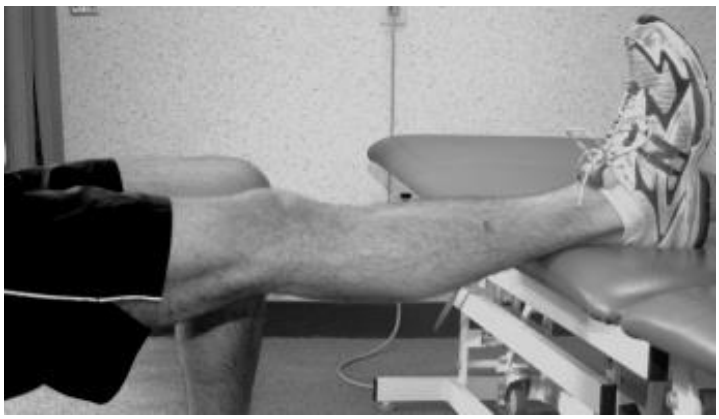
# Simple Knee Exercises

## **Knee Extension** (Straightening)



1. Sit with affected leg propped and the knee unsupported as shown. (A couch with a coffee table will work.)
2. Straighten your knee by contracting your quadriceps (front of thigh) muscles and by placing your hand on your thigh just above the knee and pushing down.
3. Hold this position for five to 10 seconds then repeat 15-20 times, two to three times per day.

## **Knee Flexion** (Bending)

1. Lie on your back on the floor with your knee straight.
2. Place a medium sized ball under your leg. This exercise can be performed without a ball if not available or too difficult. (Wall or table slide with towel under foot)
3. Slowly bend your leg towards your buttocks. Gently bend until you feel a good stretch in the knee. You may support assist your knee by grasping your thigh with your hands.
4. Hold the stretch for three to five seconds then return to the starting position.
5. Repeat this exercise 10-15 times, two to three times daily.

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## Quadriceps Sets


1. Sit or lie on your back with the affected leg straight.
2. Tighten the muscles on the front of your thigh and push your knee down into the table.
3. Hold this position for five seconds then relax. Repeat exercise 10-15 times, two to three times daily.

## Quadriceps Short Arc Sets


1. Sit of lie on your back with the affected leg straight.
2. Place a rolled up towel or pillow under your knee allowing it to bend.
3. Tighten the muscles on the front of your thigh and lift your heel off the table.
4. Hold this position for three to five seconds then repeat 10-15 times, two to three times per day.

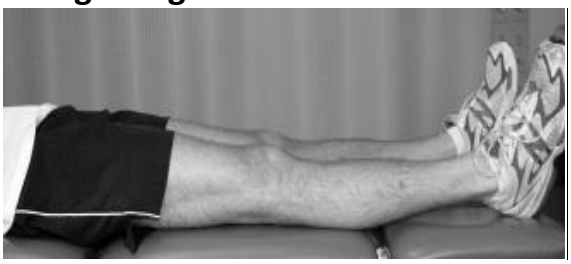
## **Isometric Hamstrings** (Heel Digs)

1. Lie on your back and bend your knee to where you feel a stretch.
2. Contract your hamstrings (back of thigh) muscles, attempting to bend the knee while forcefully dig your heel into the floor or bed.
3. Hold this position for three to four seconds then relax.
4. Repeat this exercise 10-15 times, two to three times daily.

## **Standing Calf Raises**

1. While standing with the ball of your foot on the flat of a low stair, slowly raise both heels.
2. Hold this position for two to three seconds then return to the starting position.
3. Repeat this exercise 10-15 times, two to three times per day.
4. **Hold on to a railing for support and balance as necessary. If you are concerned about balance, you can perform these exercises on the floor while you sit in a chair or stand with your hands on a nearby wall.**
5. **Perform this exercise in your brace if provided**

## Straight Leg Lifts




1. Lie on your back while keeping the affected leg straight.
2. Tighten the muscles on top of your thigh then raise the leg 12-18 inches off the floor.
3. Hold for three to five seconds then lower the leg to the starting position.
4. Repeat this exercise 10-15 times, two to three times per day.
5. **Perform this exercise in your brace if provided**

## **Straight Leg Abduction** (Side) Lifts

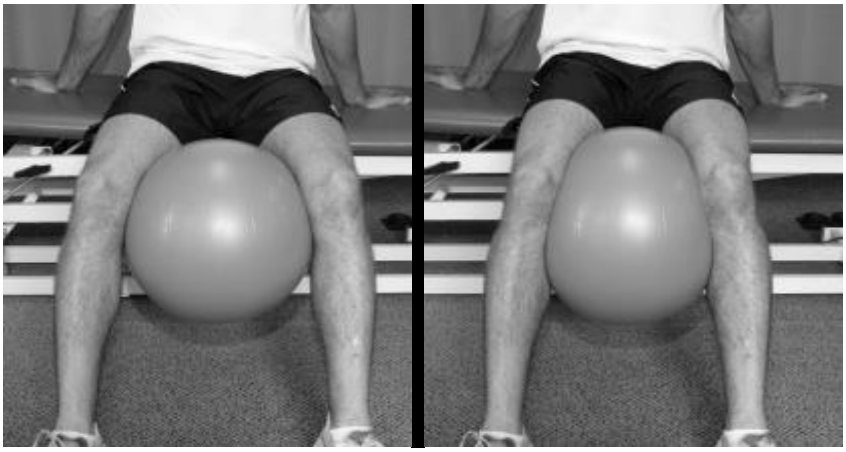

1. Lie on your side with the affected leg on top.
2. While keeping the leg straight slowly raise it 12-18 inches.
3. Hold this position for three to five seconds then lower the leg to the starting position.
4. Repeat this exercise 10-15 times, two to three times per day.
5. **Perform this exercise in your brace if provided**

**Acknowledgements**
Thanks to Larana Stropus, MS, ATC/L and Carmine Van Deven for their assistance in developing these post-operative instructions for Steven Chudik MD Shoulder, Knee and Sports Medicine Injury Clinic patients.

## Straight Leg Extension Lifts

1. Lie on your stomach as shown.
2. While keeping the affected leg straight raise it 12-18 inches
3. Hold this position for three to five seconds then lower the leg to the starting position.
4. Repeat this exercise 10-15 times, two to three times per day.
5. **Perform this exercise in your brace if provided**

## Hip Abduction (Ball Squeezes)



1. While sitting or lying on your back, place a medium sized ball or large pillow between your legs.
2. Squeeze the ball.
3. Hold this position for three to five seconds then relax.
4. Repeat this exercise 10-15 times, two to three times per day.