

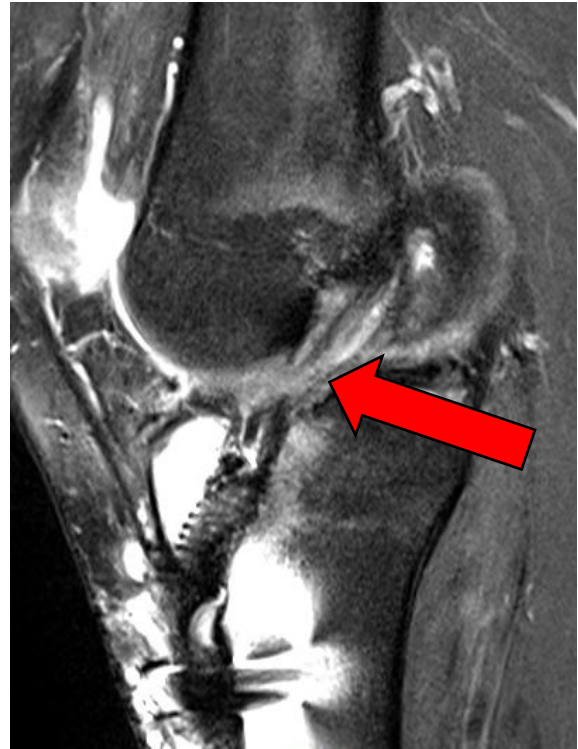
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Failed Anterior Cruciate Ligament (ACL) Reconstruction

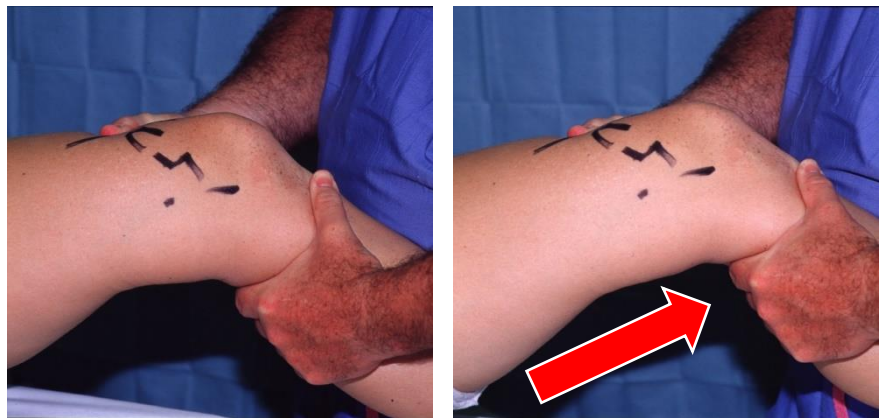
An anterior cruciate ligament (ACL) sprain is a tear of one of the four major ligaments of the knee. The ACL is a ropelike structure in the center of the knee that helps maintain the normal relationship of the femur (thigh bone) and the tibia (leg bone). When torn, the ACL does not heal and the knee 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 an MRI can be helpful, especially when the patient is too swollen or guarded to allow a thorough examination. The MRI also is needed to diagnose any associated meniscal or cartilage damage.

Following ACL reconstruction, the graft may fail due to technical errors from the initial surgery, incomplete rehabilitation, returning to sport too soon following reconstruction, graft biologic failure or rejection, failure to retrain good cutting, pivoting, landing mechanics and movement patterns and re-injury.



Sagittal (side) MRI of ruptured ACL graft



The photos above 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.



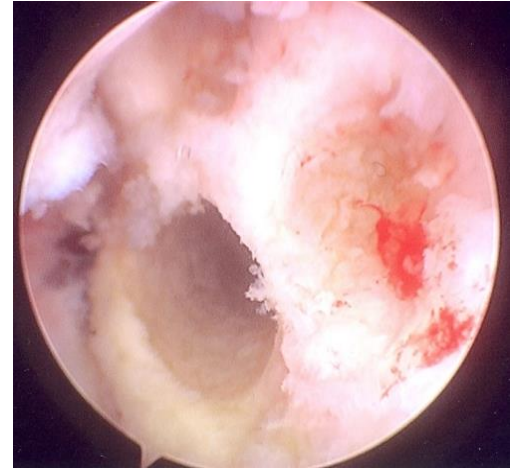
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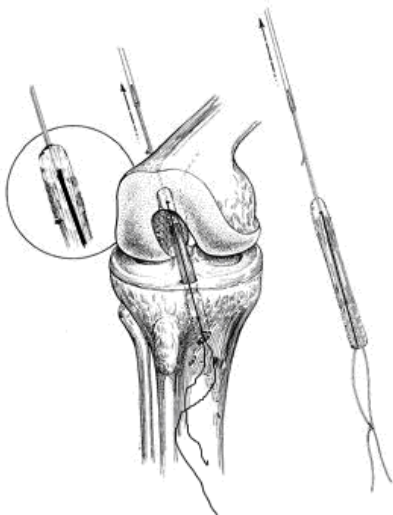
MRI, Failed ACL Surgery, poor tunnel placement



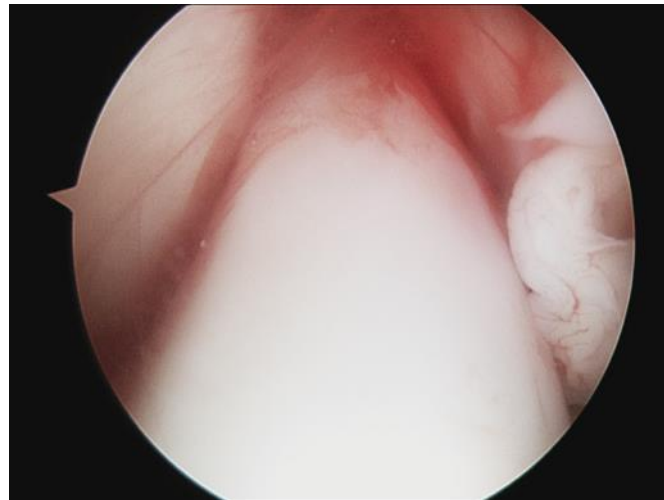
CT Scan, Bone loss from failed ACL Surgery



Arthroscopic picture, New accurate ACL Tunnel adjacent two previous erroneously placed tunnels



Schematic of ACL Reconstruction



Arthroscopic Picture of ACL Reconstruction



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Frequent Signs and Symptoms

- Pop or tear heard or felt at the time of re-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.
- Knee giving way, swelling, pain.

Etiology (Causes)

- Seventy 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.
- Failure to complete the rehabilitation or train proper running, cutting, landing mechanics which increases risk for re-injury.
- Failure to pass a validated post-ACL surgery functional testing program.
- Technical errors from initial surgery
- Infection may also require revision ACL surgery.

Risk Factors

- Return to high-risk sports that require pivoting, jumping, cutting, or changing direction (basketball, soccer, volleyball) or contact sports (football, rugby)
- Too early return to sport
- 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



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- 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).
- Do not return to athletics before completing a proper rehabilitation, ACL prevention training, and ACL functional return to sport.

Outcomes

For those who want to return to sports that require pivoting, cutting, and jumping and landing, revision surgery is usually required. Surgery also is recommended for ACL injuries combined with other ligament, meniscus, or cartilage injuries. Outcomes for revision ACL surgery depend on the ability to address the cause of the failure, i.e., technical problems with the first surgery, infection, incomplete rehabilitation, poor pivoting, cutting, landing mechanics, etc.

Potential Complications

- Recurrent instability 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, resulting in arthritis of the knee.
- Injury to other ligaments of the knee
- Knee stiffness (loss of knee motion)
- Injection from surgery
- Re-injury. Patients who have injured their ACL grafts may be at higher risk for a failure of revision surgery.

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 hold the knee stable.

After a failed ACL surgery, it is important to determine the cause for the failure so that the ACL reconstruction can be successfully revised. Revision surgery often is more complex because it must address other issues such as limited graft options, scar tissue, old hardware, bone loss or infection. For this reason, most orthopedic surgeons who perform revision ACL surgery do it in two stages, requiring two surgeries and two rehabilitations. Because to recover from two



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staged surgeries could be career ending for many athletes, Dr. Chudik has developed techniques to perform ACL revision reconstruction in one stage with one surgery and one recovery.

For those patients who do not perform sports requiring frequent pivoting, cutting, jumping and landing, surgery may not be required, and rehabilitation is recommended. 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 concentrates on reducing knee swelling, regaining knee range of motion, regaining muscle control and strength, functional training and education to avoid sports/activities that require pivoting, cutting, changing direction, jumping and landing.

For those who perform sports that require frequent pivoting, cutting, jumping, and landing, surgery to reconstruct the ACL is usually recommended to allow return to these sports. Surgery also is appropriate for ACL injuries in young active children and in people who have combined injuries to other ligaments, the meniscus, or the articular cartilage. Most patients elect to undergo revision ACL reconstruction to obtain a stable knee, return activities without restriction and protect the remaining cartilage and meniscus from injury.

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.

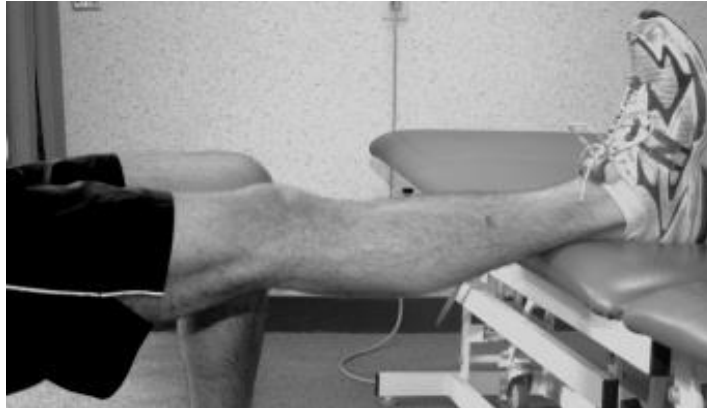
Notify My Office if Symptoms Worsen



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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. 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 or 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



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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.**



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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

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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.



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