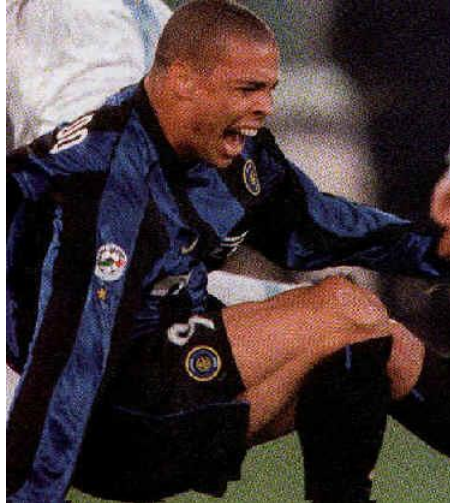


# Knee Injuries

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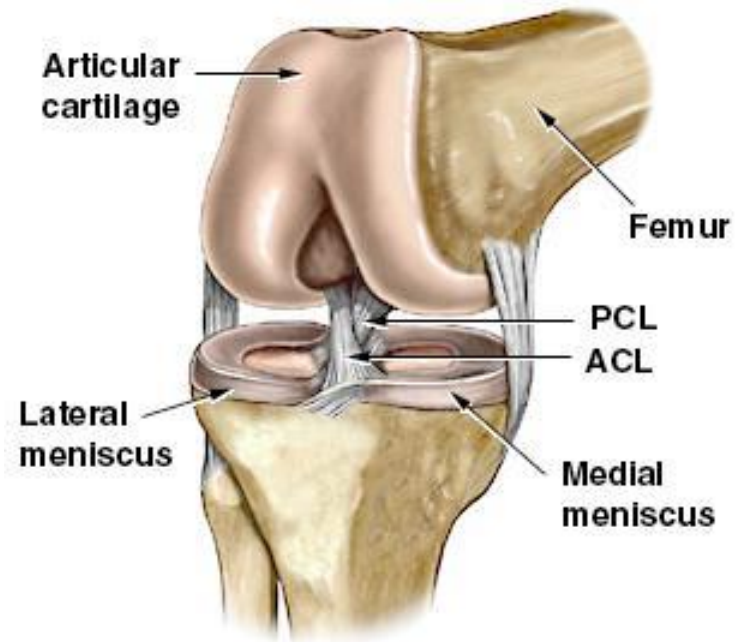
<https://www.youtube.com/watch?v=y0WDWZX9WLk>



# Important Structures

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- ❑ Cruciate ligaments
- ❑ Collateral ligaments
- ❑ Menisci
- ❑ Articular cartilage
- ❑ Patellar tendon

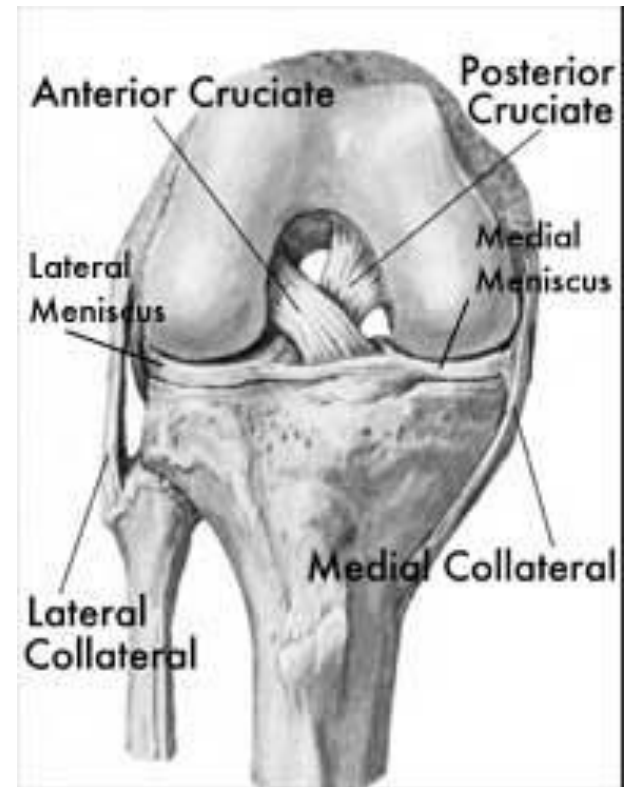


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# Cruciate ligaments

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- ❑ Control anterior and posterior movements
- ❑ Fit inside the intercondylar fossa



# Collateral ligaments

- Control lateral movement
- Exposed to valgus (MCL) and varus (LCL) forces

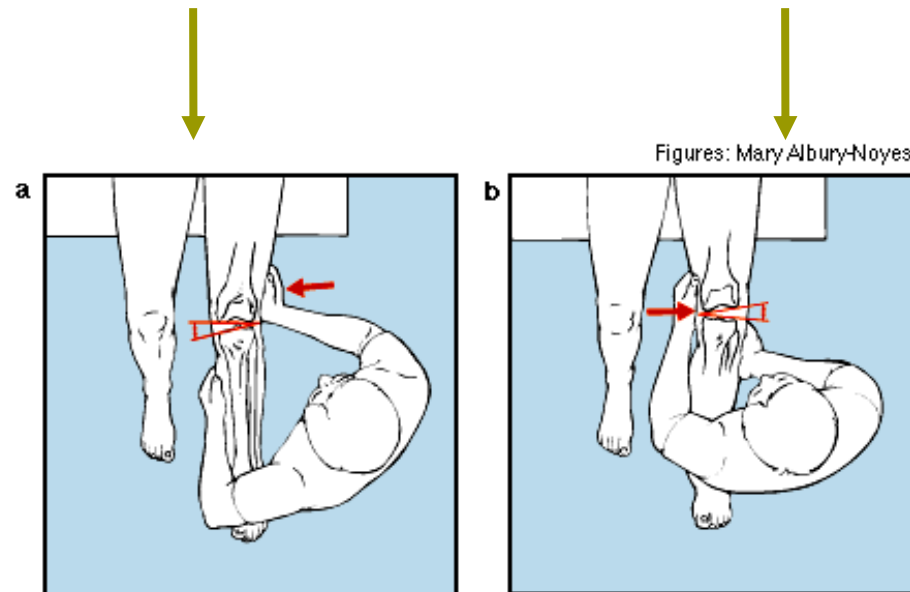
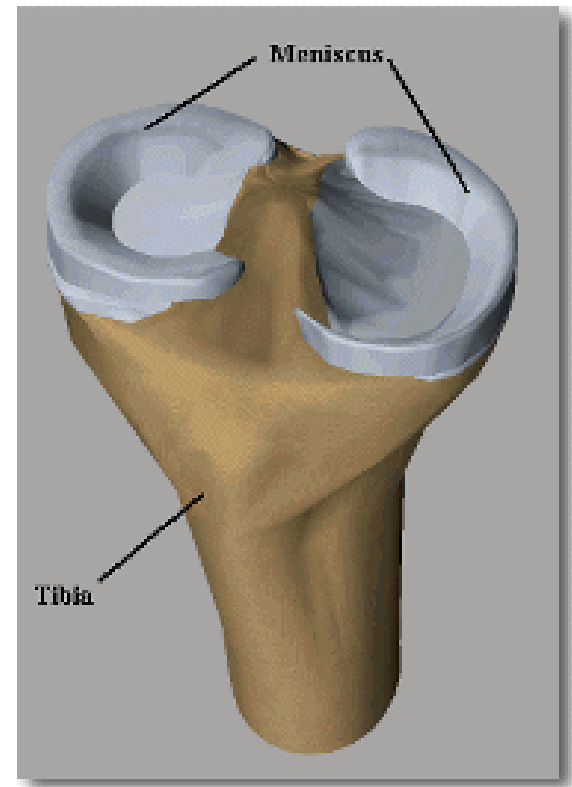


Figure 3. To examine a patient with a suspected medial collateral ligament (MCL) injury for instability (a) the physician supports the seated patient's leg with one hand, tucking the patient's foot under the examiner's arm. Valgus stress is then applied (arrows). To test for lateral collateral ligament (LCL) instability (b), the physician switches the position of the hands and applies varus stress (arrows). Both tests are performed at full extension and 25° flexion. MCL and LCL injuries are graded by the degree of joint space opening.

# Menisci

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- ❑ Weight distribution
- ❑ Without menisci the weight of the femur would be concentrated to one point on the tibia
- ❑ Converts the tibial surface into a shallow socket



# Other Important Structures

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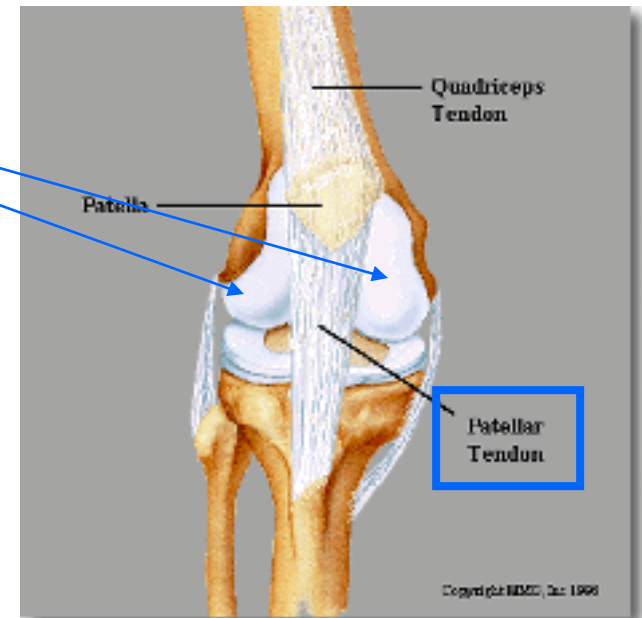
- Articular cartilage
  - 1/4 inch thick
  - tough and slick

## Patella and patellar tendon

Tibial tuberosity

Patellofemoral groove

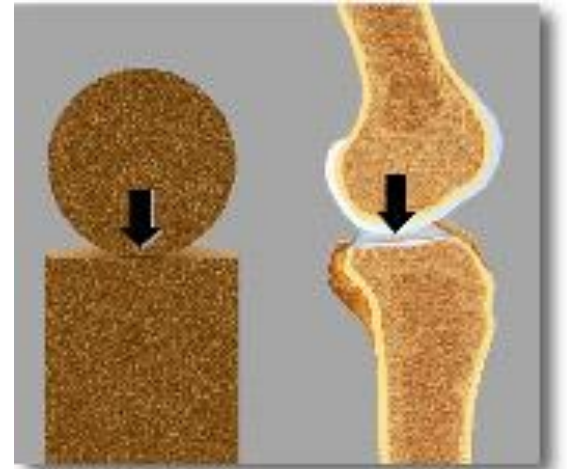
Patella acts like a fulcrum to increase the force of the quadriceps muscles



# Ligaments

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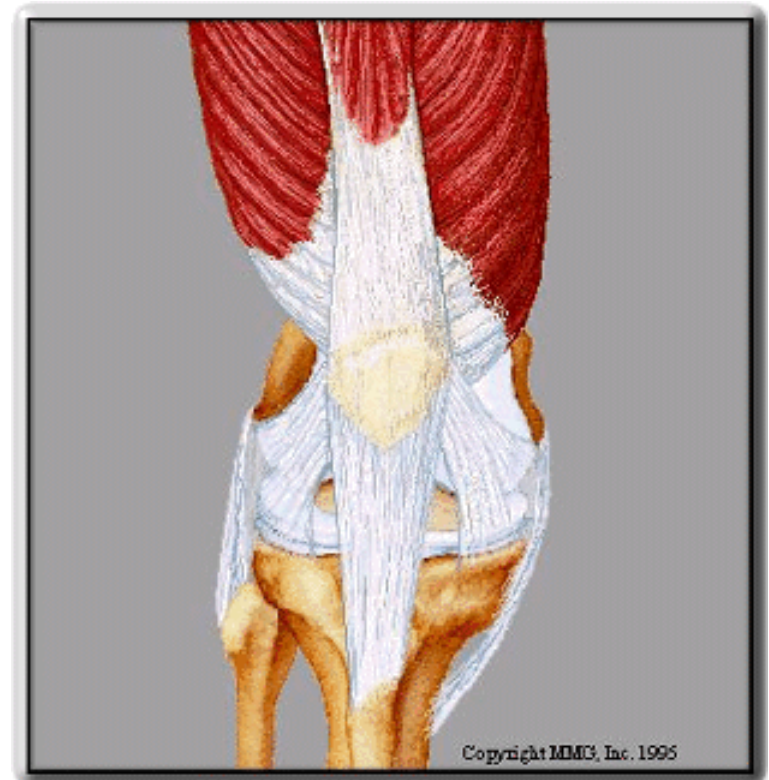
- ❑ Knee is like a round ball on a flat surface
- ❑ Ligaments provide most of the support to the knees
- ❑ Little structure or support from the bones



# Muscles

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- ❑ Quadriceps - extension
- ❑ Hamstrings - flexion
- ❑ IT band from the gluteus maximus and tensor fascia latae





# Acute Knee Injuries

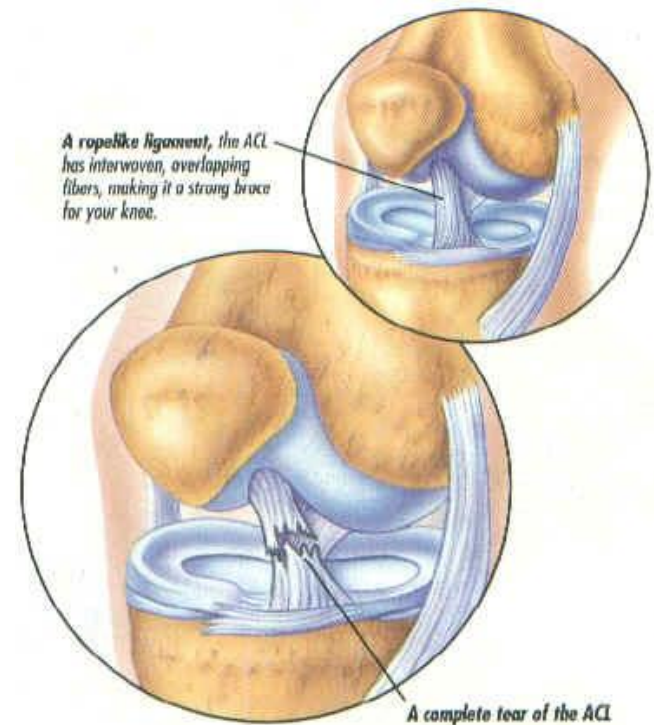
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# Anterior Cruciate Ligament Tears

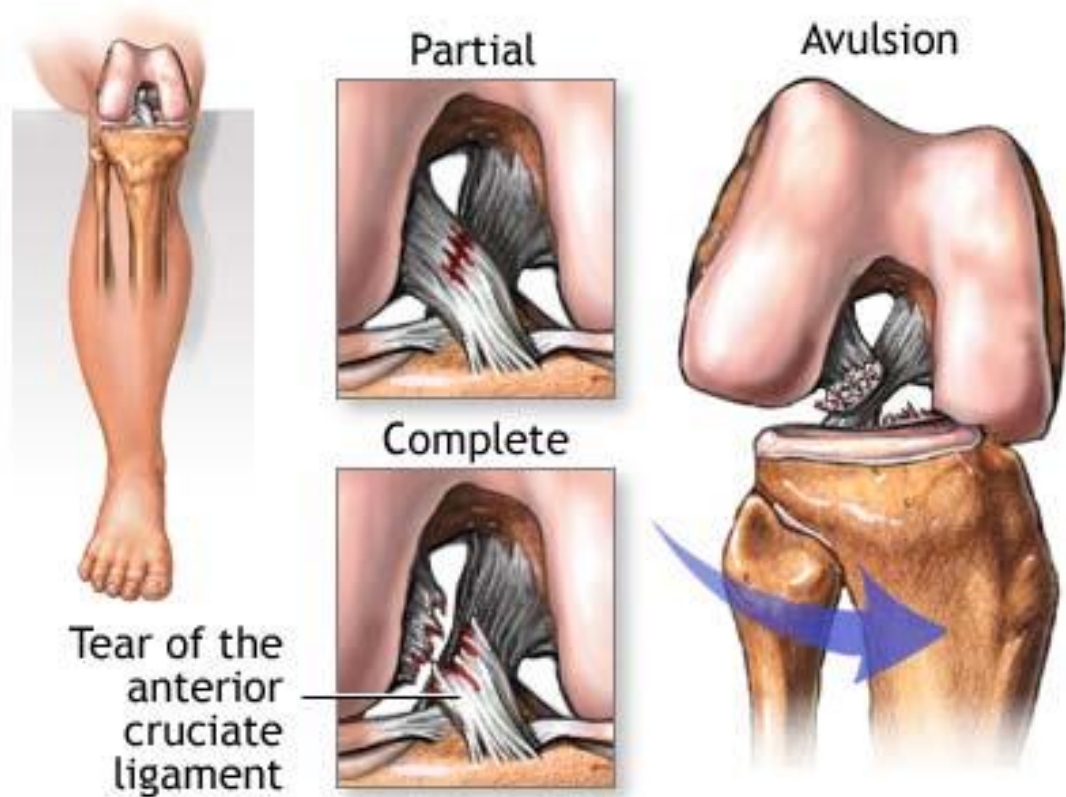
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- ❑ Can withstand approximately 400 pounds of force
- ❑ Common injury particularly in sports (3% of all athletic injuries)
- ❑ May hear a 'pop' sound and feel the knee give away



# Types of ACL Tears

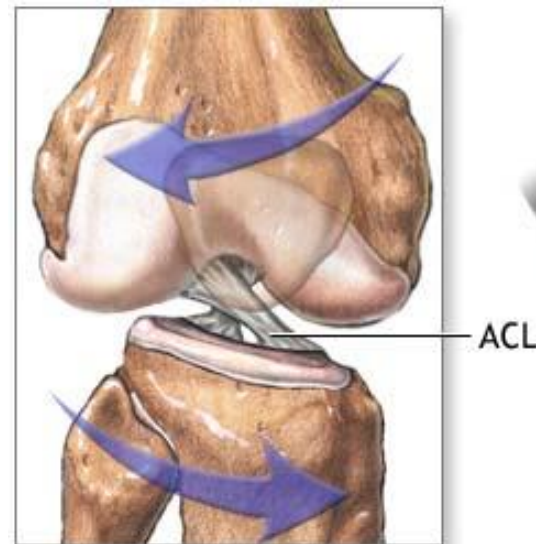
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# Causes of ACL Injuries

- ❑ Cutting (rotation)
- ❑ Hyperextension
  - Straight knee landing
  - When the knee is extended, the ACL is at its maximal length putting it at an increased risk of tearing



ACL injuries occur when bones of the leg twist in opposite directions under full body weight



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# External factors

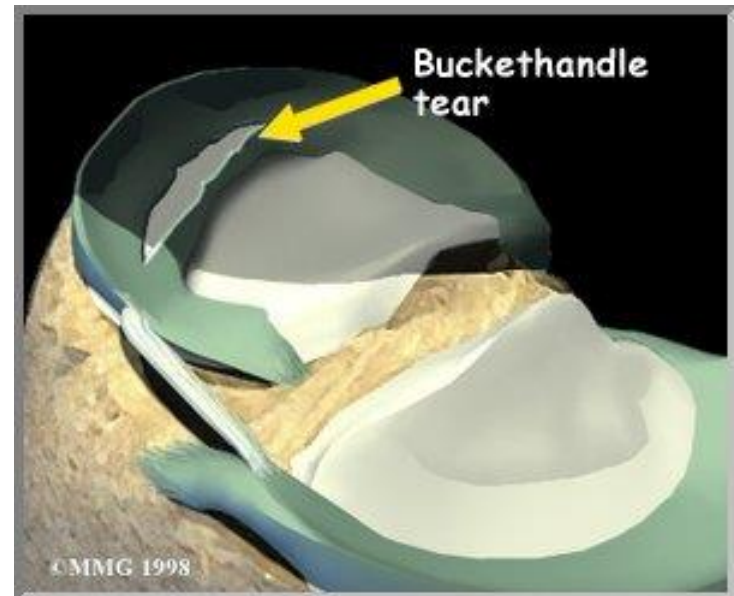
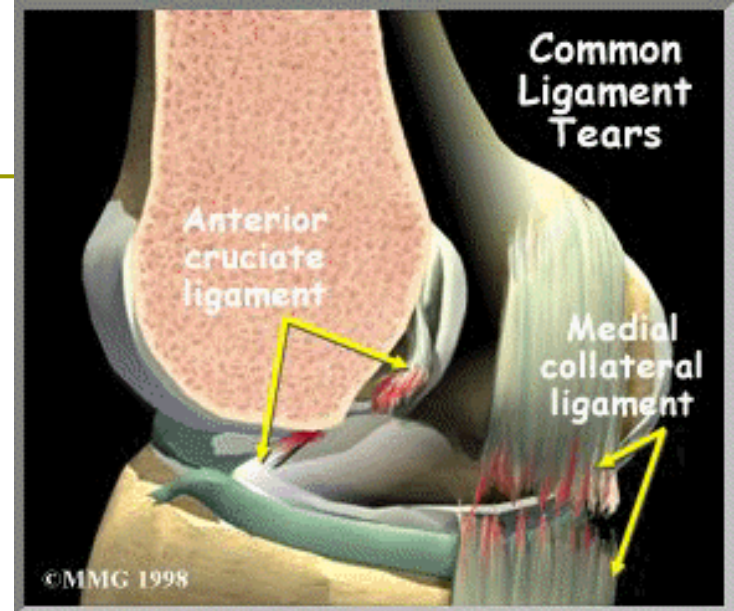
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- Amount of lower body strength
- Footwear and surface interaction

# Unhappy Triad

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1. ACL
2. Medial collateral ligament
3. Medial meniscus



# Lachman Test and Anterior Drawer Test

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- ❑ Normal knees have 2-4 mm of anterior translation and a solid end point
- ❑ ACL injury will have increased translation and a soft end point

Figure 2: Mary Albury-Noyes

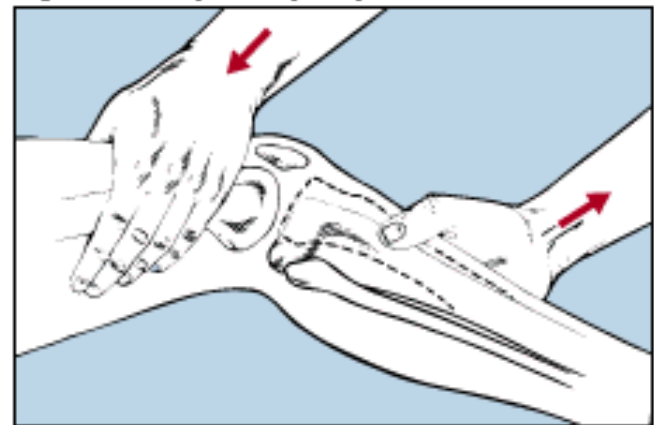


Figure 2. The Lachman test is used to evaluate the integrity of the ACL. Flex the patient's knee 20° to 30°, grasp the proximal tibia with one hand and the femur with the other, and, keeping the knee in neutral alignment, apply a gentle anterior force to the tibia. A translation of more than 4 mm and no firm end point indicates a torn ACL.

# Women and ACL Tears

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**Anterior Cruciate Ligament Injuries in Female Athletes: Why Are Women More Susceptible?**

**James L. Moeller, MD; Mary M. Lamb, MD**

**THE PHYSICIAN AND SPORTSMEDICINE - VOL  
25 - NO. 4 - APRIL 97**



# NCAA

---

- ❑ Four times more ACL tears in women than men basketball players.
- ❑ Three times more in gymnasts
- ❑ 2.4 times more in soccer
- ❑ Higher rates are also found among women in team handball, volleyball and alpine skiing

# Factors

- ❑ Smaller size of ACL
- ❑ Smaller intercondylar notch
- ❑ Larger Q-angle (doubtful)
  - normal = 17 degrees in women
  - Normal = 14 degrees in men

Figure: Mary Albury-Noyes

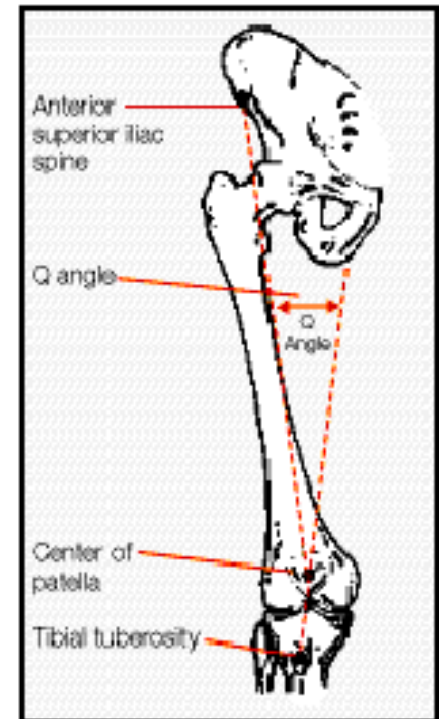


Figure 2. Anatomic landmarks for establishing the quadriceps angle (Q angle). There is no apparent relationship between Q-angle and ACL injury.

# Factors

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- Weaker hamstrings
  - Ratio of 10 (quadriceps) to 7 (hamstrings)
- Hormones
  - Estrogen – reduces collagen strength
  - Relaxin

# ACL Reconstruction

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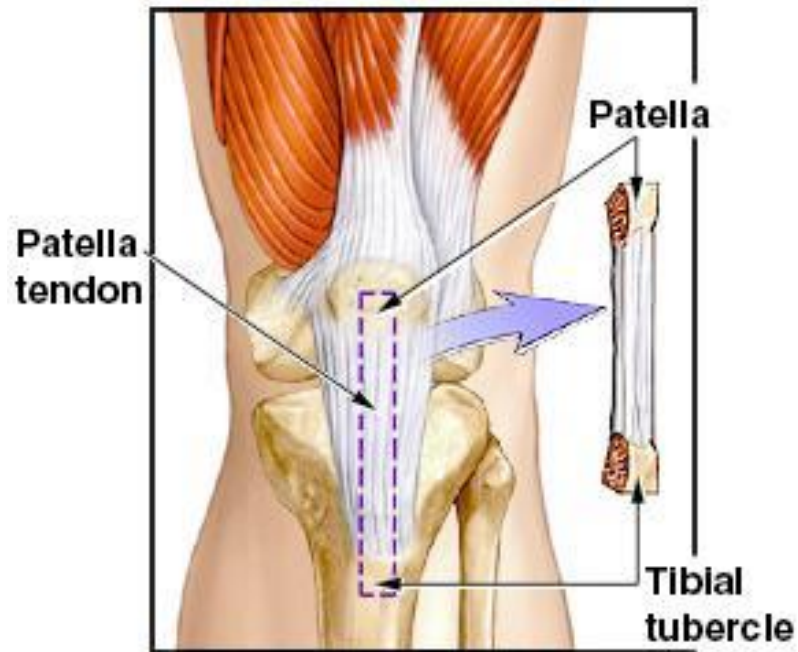
**Torn ACL  
(Arthroscopic View)**



Shockwave

# Graft Harvest

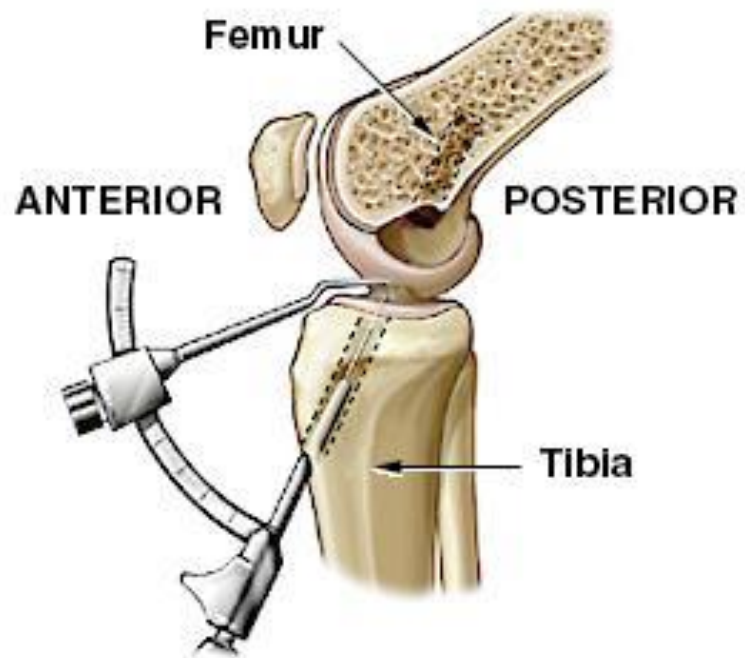
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# Drill

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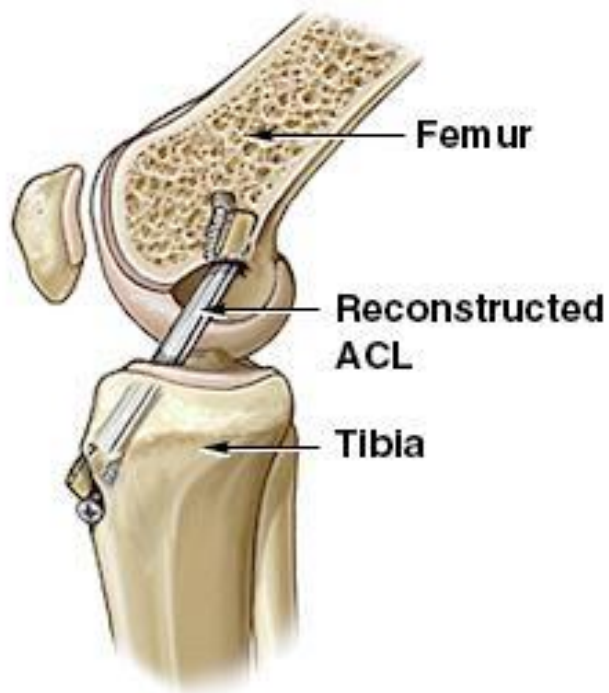


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# Attach

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# Rehab

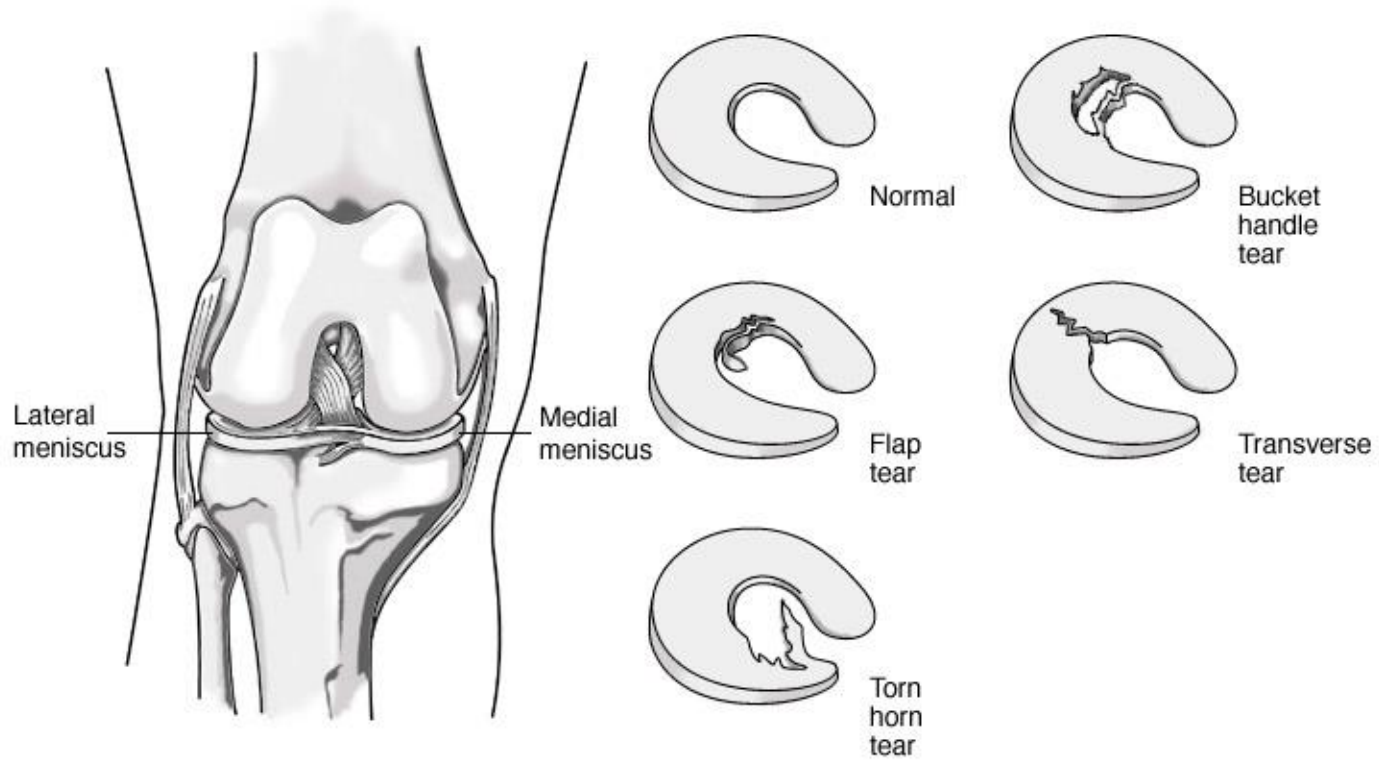
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# Meniscal Tears

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# Meniscal Tears

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- ❑ One of the most commonly injured parts of the knee.
- ❑ Symptoms include pain, catching and buckling
- ❑ Signs include tenderness and possible clicking
- ❑ Meniscal tears occur during twisting motions with the knee flexed
- ❑ Also, they can occur in combination with other injuries such as a torn ACL (anterior cruciate ligament).
- ❑ Older people can injure the meniscus without any trauma as the cartilage weakens and wears thin over time, setting the stage for a degenerative tear.

# PCL Injuries

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Figure: Mary Albury-Noyes

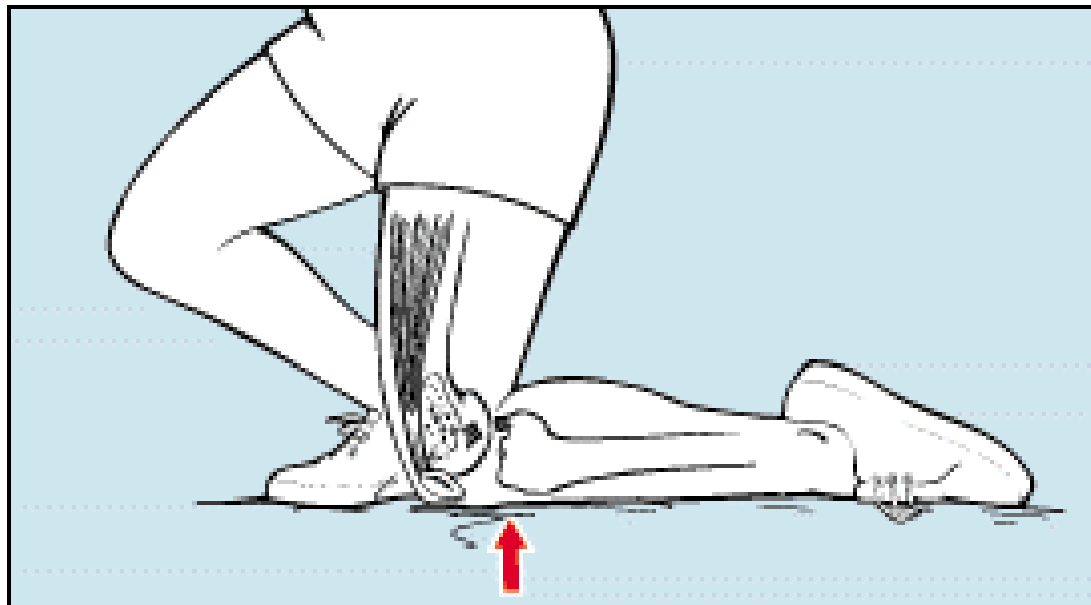


Figure 1. One of the mechanisms of injury for a posterior cruciate ligament (PCL) tear is a fall onto a flexed knee with the foot plantar flexed, which applies posterior force to the proximal tibia.

# PCL Injuries

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- ❑ The posterior cruciate ligament, or PCL, is not injured as frequently as the ACL.
- ❑ PCL sprains usually occur because the ligament was pulled or stretched too far, anterior force to the knee, or a simple misstep.
- ❑ PCL injuries disrupt knee joint stability because the tibia can sag posteriorly.
- ❑ The ends of the femur and tibia rub directly against each other, causing wear and tear to the thin, smooth articular cartilage.
- ❑ This abrasion may lead to arthritis in the knee.

# Treating PCL Injuries

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- ❑ Patients with PCL tears often do not have symptoms of instability in their knees, so surgery is not always needed.
- ❑ Many athletes return to activity without significant impairment after completing a prescribed rehabilitation program.
- ❑ However, if the PCL injury results in an avulsion fracture, surgery is needed to reattach the ligament.
- ❑ Knee function after this surgery is often quite good

# Collateral Ligament Injuries

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Figure: Mary Albury-Noyes

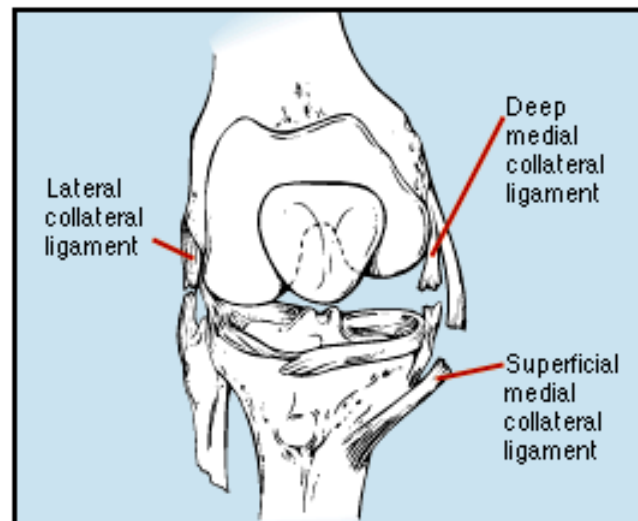


Figure 1. An anterior view of the flexed knee demonstrates tears of the medial collateral ligament (MCL) and lateral collateral ligament (LCL). The superficial layer of the MCL, approximately 11 cm long and 1.5 cm wide, originates from the medial femoral epicondyle and inserts 5 to 7 cm distal to the medial joint line. The deep MCL or middle capsular ligament is composed of the meniscotibial and meniscofemoral ligaments. The LCL arises from the lateral femoral epicondyle and inserts on the lateral fibular head.

# Collateral Ligament Injuries

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- ❑ Injuries to the medial collateral ligament are usually caused by contact on the lateral side of the knee
- ❑ Accompanied by sharp pain on the inside of the knee.
- ❑ If the medial collateral ligament has a small partial tear, conservative treatment usually works.
- ❑ If the medial collateral ligament is completely torn or torn in such a way that ligament fibers cannot heal, surgery may be needed.
- ❑ The lateral collateral ligament is rarely injured.

# Chronic Injuries

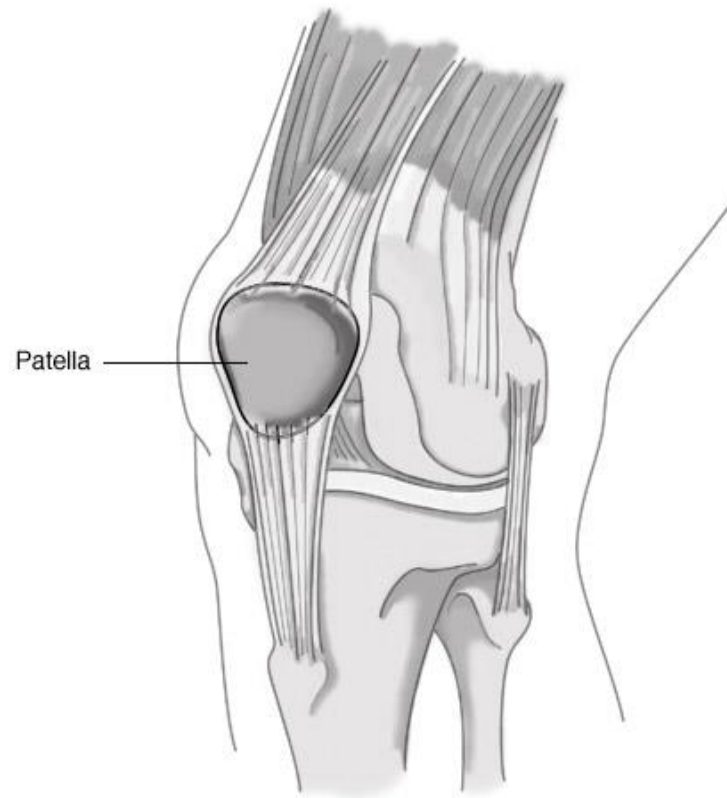
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1. Patellar Tendonitis
2. Patellofemoral Pain Syndrome
3. Subluxation of Patella
4. Chondromalacia
5. Osgood-Schlatters Disease
6. IT Band Syndrome



# 1. Patellar Tendonitis

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# Patellar Tendonitis

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- ❑ Due to high deceleration or eccentric forces of the quadriceps at the knee during landing
- ❑ As you land the hamstrings cause your knee to flex to absorb the shock of impact
- ❑ In order to control or decelerate the flexion produced by the hamstrings, the quadriceps muscles contract eccentricly
- ❑ Eccentric contractions occur as the muscle is being lengthened or stretch
- ❑ Eccentric contractions produces high amounts of force, and therefore stress to the patellar tendon

# Patellar Tendonitis

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- ▣ Prevention: strong quadriceps muscles



Squats



Lunges

# More Quadriceps Exercises

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Leg Extension



Leg Press

# More Quadriceps Exercises

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Plyometric or Jump Training

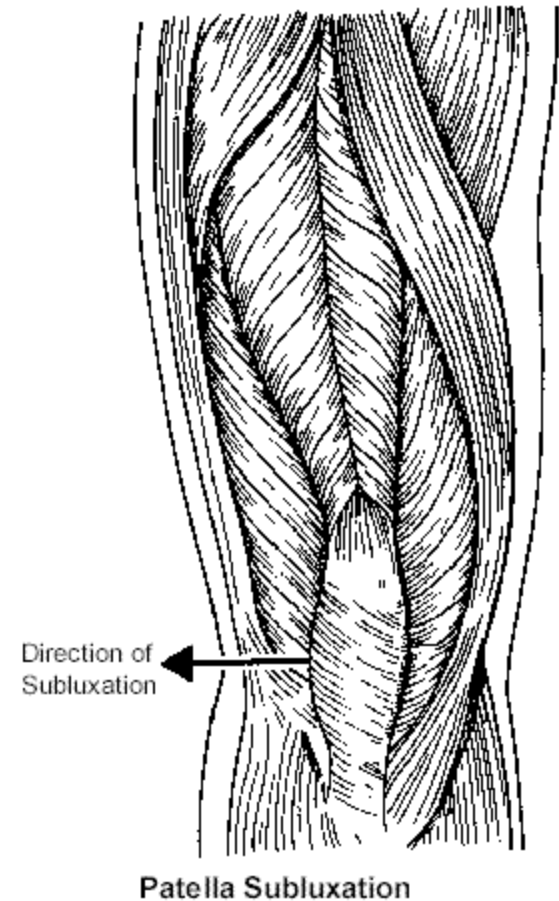


Uphill Running

## 2. Subluxation of the Patella

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- ❑ Partial dislocation of the patella
- ❑ Complete dislocation is rare and is due to sudden (acute) trauma
- ❑ Weak vastus medialis muscle may contribute



# 3. Chondromalacia

- A softening & fissuring of the articular cartilage of the patella
- Causes
  - 1. Aging
  - 2. Mechanical defects  
*slide)*

Figure 3: Mary Albury-Noyes

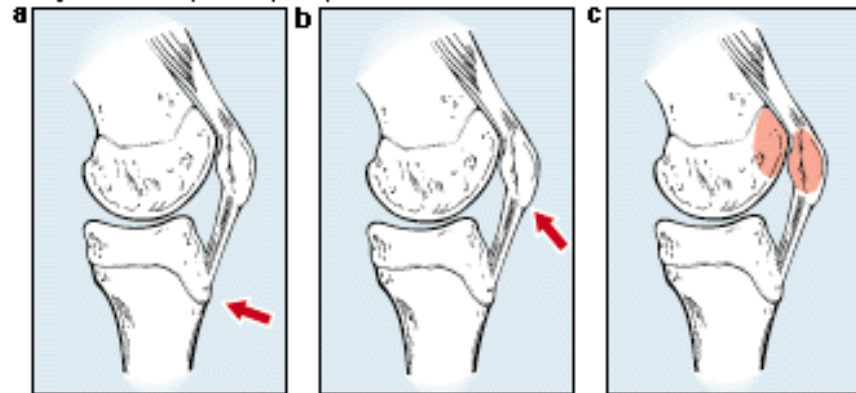
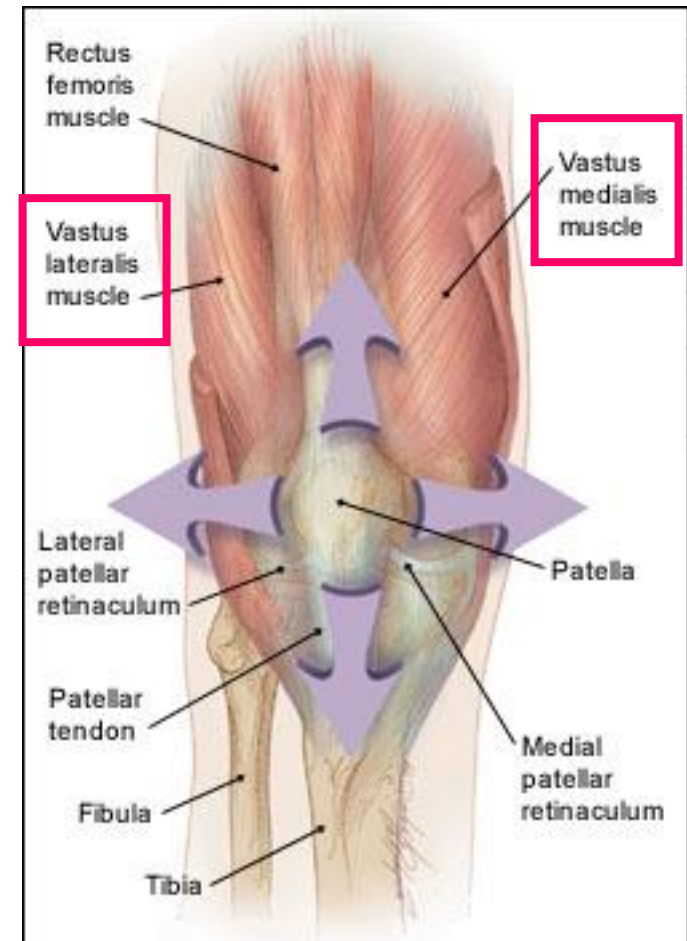


Figure 3. Chronic anterior knee pain in adolescents may be a result of OSD or other conditions. OSD is a disturbance at the junction of the patellar tendon and the tibial tubercle apophysis (a, arrow). Sinding-Larsen-Johansson disease involves pain, swelling, and tenderness of the inferior patellar pole at the origin of the patellar tendon (b, arrow). Patients who have patellofemoral syndrome (c, shaded areas) have poorly localized peripatellar pain.

# Risk Factors: Subluxation and Chondromalacia

1. Training errors
  - Increasing intensity too soon
2. Weak vastus medialis muscle
3. Large Q angle
  - Greater than 25 for women and 20 for men
4. Pronation of the foot causing the tibia to medial rotate
5. Gender - more common in women
6. Poor footwear and/or surface

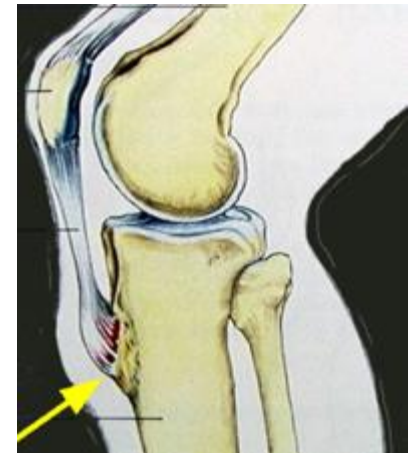




# 4. Osgood- Schlatter Disease

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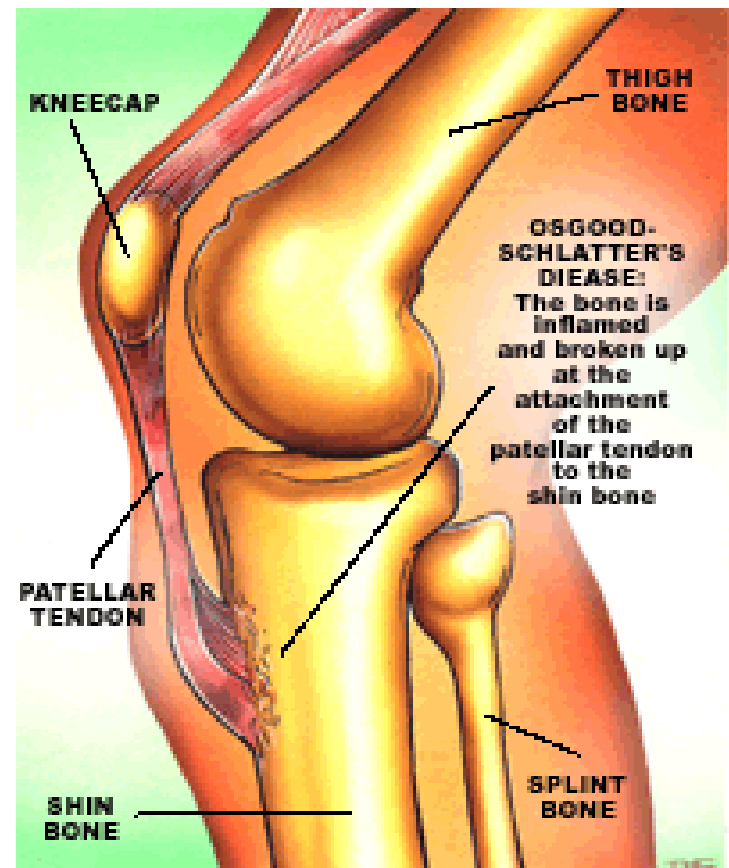
- ❑ Overuse, not a disease.
- ❑ Inflammation to the patellar tendon at the *tibial tuberoscity*
- ❑ Most common in adolescents (8-13 year olds girls and 10-15 year old boys); age of rapid bone growth



# Osgood- Schlatter Disease

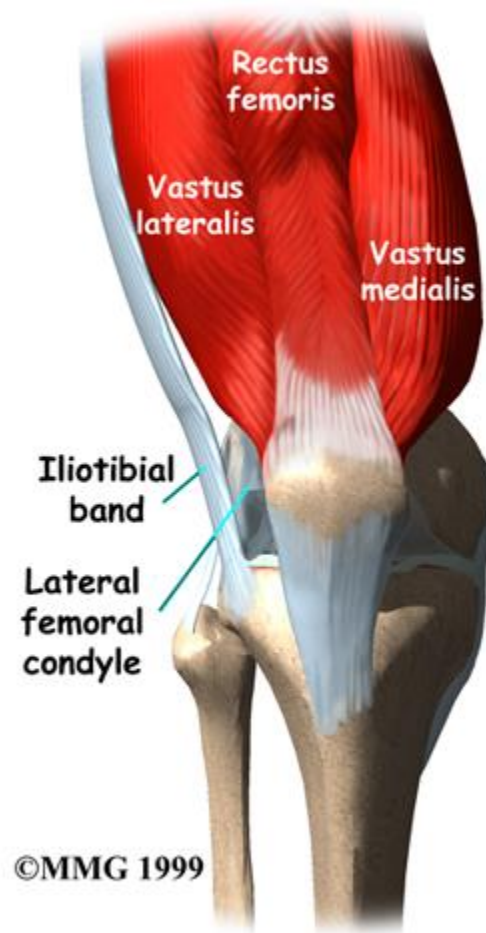
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- Anterior pain about 2-3 inches below the patella
- Avulsion fracture



# 5. IT Band Syndrome - Anatomy

- ❑ The ITB moves anteriorly over the lateral condyle of the femur as the knee extends
- ❑ The ITB slides posteriorly over the lateral condyle of the femur as the knee flexes
- ❑ Recurrent rubbing can produce irritation and subsequent inflammation, especially beneath the posterior fibers of the ITB, which are thought to be tighter against the lateral femoral condyle than the anterior fibers.



# Causes of ITB Syndrome

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- ❑ Duration (or mileage) of exercise
- ❑ Hip abductor weakness
- ❑ Tight hip abductors and/or IT band

