17

Orthopedic 441 Team

MED441 KING SAUD UNIVERSITY

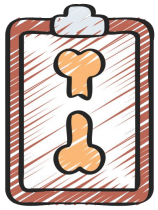
Editing File

# Sport & Soft Tissue Injuries

Prof. Abdulaziz Alomar

Color Index:

- Main Text
- Important
- 441 Notes
- Old Notes
- Extra



# Objectives

Specify the symptoms, signs and potential immediate complications of common sport and soft tissues injuries involving muscles, tendons, and ligaments for commonly injured joints; like shoulder, knee, and ankle.

Outline the assessment and appropriate investigation and to outline the immediate and long term management of patients with muscles, tendons, ligaments and meniscus.

Demonstrate knowledge of indications for non-operative and operative treatment and to know the most common non-operative and operative measurements used for sport/soft tissue injuries.

# Resources

# Introduction

## Soft Tissue Injuries Include:

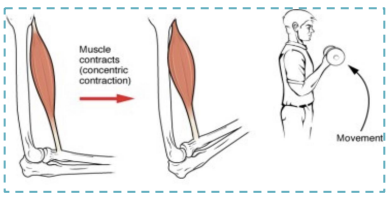
- **Muscle**
  - Muscle Strain
  - Muscle Contusion
  - Muscle Laceration
  - Delayed Onset Soreness
- **Tendon**
  - Overused tendinopathies
  - Tendon Rupture
- **Knee**
  - Ligament
    - AC
    - PC
    - MC
    - LC
  - Dislocation
  - Meniscus
- **Shoulder**
  - Discussed in separate Lecture
- **Ankle**
  - Ankle Sprain

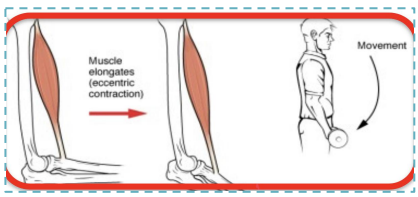
## Initial Management

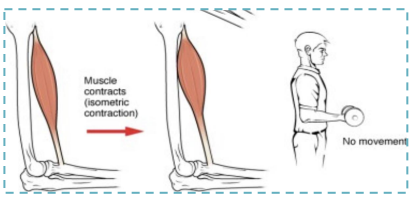
- **In acute phase** (first 2-3 days):
  - **PRICE** protocol, Analgesia, Muscle contusion: immoblize in maximum muscle length position
- **Early mobilization, Physiotherapy, Stope sports until full recovery Duration: based on injury severity**
- **Prevention of recurrent injury protocol.**

| | |
|---|---|
| **P**rotect | the injury (stop using the injured limb, pad to protect) |
| **R**est | the injury It can help in detecting the real side of injury , controlling the damage prevent further damage |
| **I**CE | apply a wrapped ice pack It can help in Pain and swelling relief and prevent further damage. It's golden period is : first 72 hours , after that it's useless |
| **C**omfortable | **support -** apply a supportive bandage It can help in swelling relief , controlling the damage and prevent further damage. |
| **E**levation | to reduce swelling |


## Types of Muscle Contraction



# Muscle Injuries

- The muscles most at risk are those in which the origin and the insertion **cross two joints**
- Frequently injured muscles act in an eccentric fashion (i.e., lengthening as they contract).
- Muscle injuries are the most frequent cause of physical incapacity in sports practice
- It has been estimated that 30 to 50% of all sports-related injuries are caused by soft-tissue lesions

3 types of muscle contractions: contraction (shrink) , **elongation "eccentric" MOST INJURED**, isometric

## Muscle Strain[1]

**Characteristics**

- The most **common** muscle injury suffered in sports. due to noncontact injury
  - How does it happen? overuse, or improper use of a muscle result in → muscle overstretched (muscle strain) → could lead to muscle tear.
  - (39 slide) Both complete and incomplete muscle tears can occur by passive stretch of an activated muscle. (Trying to stretch a contracted muscle by force)
- Caused by non-contact (indirect) trauma.
  - Excessive tensile force (eccentric load) subjected onto the muscle leads to the overstraining of the myofibers
- Muscle tears also typically occur at or near to the myotendinous junction.
  - It can be complete or partial tears
- Clinical features:
  - Immediate pain associated with diminished function.
  - Localize tenderness
  - -/+ swelling
  - Pain/weakness with resisted muscle contraction


Muscle strain can happen in such a football player had sudden pain, the difference from cramps is the cramps lasts mere seconds only.

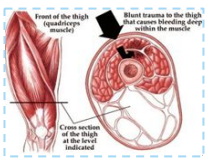
**Treatment (439 slides)**

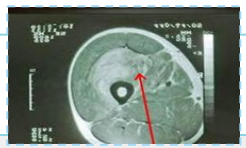
- PRICE, NSAIDs, Physical Therapy

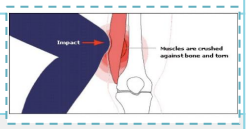
## Muscle Contusion

**Characteristics**

- Caused by a non-penetrating blunt injury (direct blow) to the muscle resulting in hematoma and inflammation.
- Quadriceps and Brachialis muscles are **common involved regions**
- Clinical features:
  - Pain with active and passive motion +/- swelling.
  - Decreased range of motion of joints spanned by the injured muscles.
  - Occasionally a permanent palpable mass.







**Treatment (439 slides)**

- **Short** period of immobilization
- Followed by **early** mobilization and Physiotherapy
- NSAID

## Muscle Laceration (439 slides)

**Mechanism**

- Caused by a direct injury to the muscle by a sharp object.

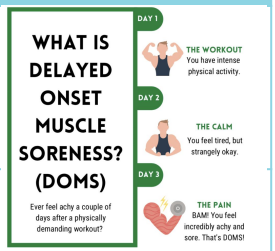
**Treatment**

- I&D (irrigation & debridement) followed by suture repair of the fascia, if possible.

## Delayed Onset Soreness (DOMS) (Muscle fever)

**Characteristics**

- Structural muscle injury leads to progressive edema formation and resultant increased intramuscular pressure.
- Is primarily associated with eccentric loading type exercise.
- **Clinical features**: muscular pain that occurs **1-3 days after** vigorous exercise[2].




**Treatment**

- It's self-limited and **will resolve in a few days**
- NSAIDs

1- Strain is used instead of "tear".
2- Like going to the gym for the first time.
*muscle injury treatment: mainly conservative "RICE", analgesia, immobilization (fully lengthened position; quads injured ->in full knee flexion)

# Complications of muscle injuries

## Scar formation and muscle weakness

- Mainly due to laceration.
  - How the scar formed inside the muscle? The space between ruptured muscle fibers fills with blood which clots and gradually converted into connective tissue, which converted into scar tissue.
  - This leaves the muscle with areas of varying elasticity.
  - In some cases, this scar tissue may need surgical excision. Scars will lead to muscle weakness

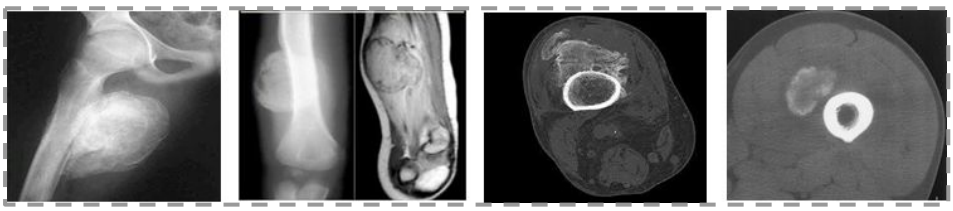
## Compartment syndrome

- At the level of the muscle fibers, capillary bleeding and edema can lead to hematoma formation and can cause compartment syndrome in areas in which the volume is limited by the fascial envelope.
- Patients with Bleeding disorders is at high risk

(Example: Hemophilic patient that suffers muscle contusion)

## Myositis Ossificans (AKA heterotopic calcification)

- **What is it?** Bone formation (calcification) within muscle secondary to blunt trauma (Muscle contusions).
- Clinical features :
  - Early:
    - Pain, swelling and decreased ROM
    - Erythema, warmth, induration, tenderness
  - Late:
    - Painless swelling with decreased ROM.
- This sometimes mimics osteogenic sarcoma on radiographs and biopsy. Which is why a good history is essential, as many patients forget to mention that they suffered some sort of trauma earlier.
- Increased ESR and serum alkaline phosphatase
- Myositis ossificans becomes apparent approximately 2 to 4 weeks post-injury.
- ~~Does not appear in x-ray until 2-4 weeks later~~
- Management is conservative unless if it is huge then we should excise it Orthobullets: if it remains a problem+do not operate in acute phase, wait at least six months



(39 slides pics)

## others

- **Infection:**
  - Pyomyositis (*S. aureus)*
- **Rhabdomyolysis** (skeletal muscle necrosis)
  - Crush injury , myoglobin in circulation , renal impairment
- **Recurrent injury**

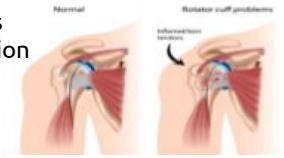
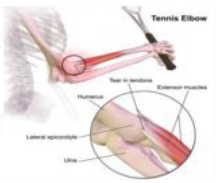
# Tendon Injuries

- What are the functions of tendon? To transfer force from muscle to bone to produce joint motion.
- Type of injuries:
  - **Overuse tendinopathies.**
  - **Tendon rupture**. It's a traumatic tear usually .

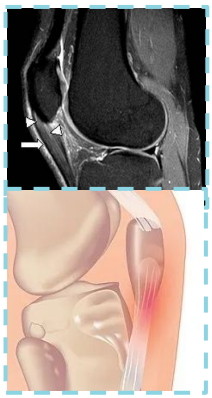
## Overuse Tendinopathies

Common in athletics

- Result of repeated **mechanical** loading (overuse).
- **Osteotendinous junction** is the most common site of overuse tendon injury. Why? Tendons are relatively hypovascular proximal to the tendon insertion. This hypo-vascularity may predispose the tendon to **hypoxic tendon degeneration** and has been implicated in the etiology of tendinopathies.
- Tendinopathy NOT tendonitis.

| Most Common Diagnoses and Locations of Chronic Tendinopathies | | |
|---|---|---|
| **Diagnosis** | **Symptoms** | **Location** |
| **Rotator cuff Tendinopathy**<br>is when a tendon in your shoulder has tiny tears in it or is inflamed and hurts | • Pain and swelling in the front of your shoulder<br>• Pain triggered by raising or lowering your arm<br>• A clicking sound when raising your arm<br>• Stiffness | Supraspinatus tendon insertion  |
| **Lateral epicondylosis (tennis elbow)**<br>(because of the **overuse of arm extensor** will lead to tear in tendon) | • Tenderness on the outside of the elbow.<br>• Morning stiffness of the elbow with persistent aching<br>• Soreness of the forearm muscles<br>• Elbow pain is worse when grasping or holding an object | Common wrist extensor tendon origin mainly involved extensor carpi radialis brevis (ECRB)   |
| **Medial epicondylosis (golfer's elbow)**<br>**(Baseball elbow)** | • Pain when **flexing the wrist** toward the forearm<br>• Pain that extends from the inside of the elbow through the wrist to the pinky<br>• A weak grip<br>• Pain when shaking hands | Common wrist flexor tendon origin   |
| **Hamstring Tendinopathy** | • Pain in or close to the knee joint that radiates up the thigh and possibly into the hip or pelvis & gets with activity , especially repetitive motions .<br>• Swelling in or around the knee or thigh | Hamstring tendon origin   |
| **Quadriceps Tendinopathy** | • Swelling around the quad tendon<br>• Sensitivity to touch<br>• Warmth or burning pain in the affected area .<br>• Stiffness in the knee in the early morning | Quadriceps tendon insertion   |
| **Patellar Tendinopathy (jumper's knee)** | • **Pain around your patellar tendon .**<br>• Swelling<br>• Pain with jumping , running , walking bending or straightening your leg<br>• Tenderness behind the lower part of your kneecap | Patellar tendon origin   |
| **De Quarvain's disease** | • Pain & swelling near the base of your thumb .<br>• Difficulty moving your thumb and wrist when you're doing something that involves grasping or pinching .<br>• A "sticking" sensation in your thumb when moving it . | Sheath/pulley of **abd**uctor pollicis longus  |
| **Achilles Tendinopathy**<br>(runners) | • Increasing pain , usually at the back of your leg or heel .<br>• Stiffness in the Tendon<br>• Swelling & tenderness at the back of your ankle<br>• Crepitus when you move your ankle | Sheath, midsubstance, or calcaneal insertion   |

# Overuse Tendon Injuries

**Patellar Tendinopathy (jumper's knee)**

## Overuse Tendinopathies Treatment

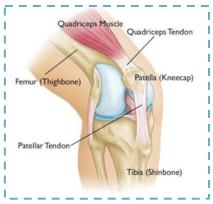
- **Goal: reduce pain and return function**
- **Mainly is Conservative**
  - **Rest**
  - **Physiotherapy** (stretching and eccentric strengthening)
  - **Corticosteroids injections**
    - Injected in the sheath(around the tendon), not the tendon itself to prevent weakness and tendon rupture
  - **Other modalities:**
    - U/S
    - ESWT (extracorporeal shockwave therapy)
    - **iontophoresis**
      - Introduction into the tissues, by means of an electric current, of the ions of a chosen medicament.
    - **phonophoresis**
      - The use of ultrasound to introduce medication into a tissue.
  - Ice (Cryotherapy)
  - Analgesics
  - Orthotics and braces

- **Surgical treatment**:
  - very rarely
  - Failed conservative treatment (at least 3-6 months)
  - Excision of abnormal tendon tissue and performance of longitudinal tenotomies to release areas of scarring and fibrosis.

# Tendon Rupture

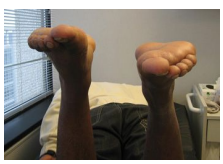
- Knee extensor mechanism: Quadriceps tendon, and Patellar tendon
- Achilles tendon (more common than patellar tendon)
- Partial vs complete

## Patellar/Quadriceps tendon rupture

| | |
|---|---|
| **Predisposing factors** | **Steroid use**, Chronic disease, Tendinopathy |
| **Age** | • Patellar < 40 usually in young<br>• Quadriceps > 40<br>That's why if you examined randomly people with patellar pain you'll find<br>- >40 Pain above Patella<br>- <40 Pain below Patella<br>  |
| **Location** | At the tendon attachment to the patella |
| **Physical Examination** | • Tenderness at the site of the injury , hematoma , and a palpable defect (gap) in the tendon<br>• Unable to extend the knee against resistance or to perform a straight -leg raise .<br>can do passive movement only<br>**How to differentiate between them clinically ?**<br>The most significant sign is extension lack. Patient is unable to do active extension and if you can do it passively it can be fully extended. |
| **X-ray** | How to differentiate between them in X-ray ? **Best diagnostic is: examination + MRI**<br>• Patella-alta > Patellar tendon rupture (Patella goes up)<br>• Patella-infera(Baja) > Quadriceps tendon rupture (Patella goes down)<br>You don't need MRI for diagnosis, but you may use it to exclude other injuries or to determine how you will reconstruct in the surgical treatment .<br>Sometimes the Patella is above its normal position which indicate patellar tendon rupture patella-alta. While in patella baja it will deviate below its normal position.<br>  |
| **Treatment** IMPORTANT | Treatment in tendon repair is usually **surgical (primary repair).** |

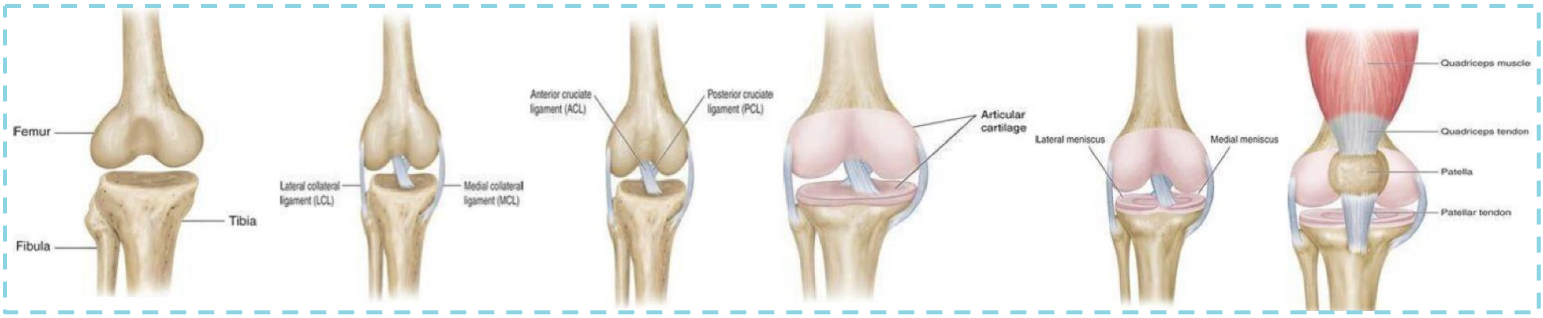
**Common scenario**: 20 y boy came to ER with inability to rise his right lower limb "knee extension" . What is your DDx? Knee ligament tear , fracture of patella , quadriceps or patellar tendon rupture, femoral nerve injury or psychology

## Achilles Tendon Rupture

| | |
|---|---|
| **Occurrence** | Most common rupture (75%) during sporting activities. |
| **History** | • The patient reports a "pop" or the sensation of being kicked in the heel during the injury. The stored energy will be released suddenly, creating what the patient perceives as a pop.<br>• Weakness and difficulty walking |
| **Physical Examination** IMPORTANT | Increased resting dorsiflexion with the knees flexed, a palpable gap, **weak plantar flexion**, and an abnormal Thompson test<br>(lack of plantar flexion when squeezing the calf).<br>**One leg standing test.**<br>  |
| **Diagnosis** | Diagnosis is clinical, but MRI or ultrasound can confirm |
| **Treatment** | **Usually surgical** (repair)(always) as we said before in tendon rupture the management is surgical only. Conservative treatment is not recommended as it usually leads to chronic weakness. |

# Knee Injuries

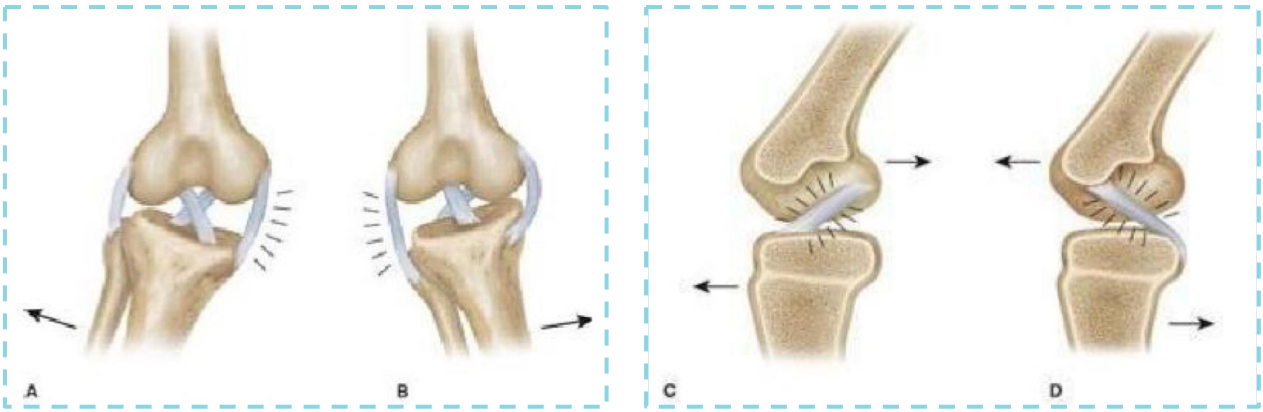
## Knee Anatomy




- Joint stability: bone stability + soft tissue
- Dynamic Stabilizer: Tendon/Muscles
- Static Stabilizer: Ligaments ± meniscus

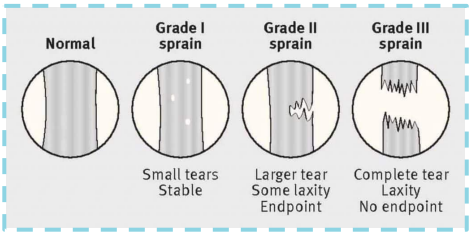
Complex Synergy leading to a Functional and Stable joint.

## Functions of The Knee ligaments




- The medial collateral ligament (MCL) prevents valgus deformities.
- The lateral collateral ligament prevents varus deformities.
- The anterior cruciate ligament prevents anterior tibial translation over the femur.
- The posterior cruciate ligament prevents posterior tibial translation over the femur.

## Types of Knee Injuries




| | |
|---|---|
| 1 | Ligaments injuries (ACL, MCL, LCL, PCL) |
| 2 | Knee Dislocation (red flag) |
| 3 | Menisci |

# Knee Injuries

## Ligaments injuries

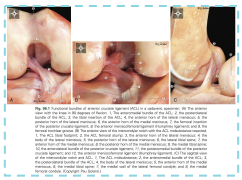
**Common Signs & Symptoms:**

- Some patients will offer that they felt, or even heard, a "pop" when the ligament was injured. Knee ligaments are very strong structures. They can store a tremendous amount of energy before failing. If the load is big enough to fail the ligament, then the ligament will rupture, and that stored energy is released suddenly, causing the tibia to swing back hitting the femur creating what the patient perceives as a pop.
- Many patients present a long time after injury with symptoms of instability. In these patients, the pain and swelling from the initial injury has been resolved, but, because the ligament did not heal, they are prone to intermittent episodes of instability.
- Ligaments are more vascular than meniscal tissue, and patients with ligament injuries tend to develop effusions within an hour of their injury. In patients with meniscus tears, effusions usually develop much more slowly.

### Anterior Cruciate Ligament (ACL) injury إصابة الرباط الصليبي الأمامي

**Anatomy and function**

**Function**: Prevents anterior translation of the tibia relative to the femur
**Anatomy**:
- Extrasynovial but intracapsular
- Origin: Lateral femoral condyle
- Insertion Between the intercondylar eminences of the tibia



**Mechanism of Injury**

- About 70% of ACL injuries are caused **without contact,** by cutting or pivoting. Sport such as Basketball, football, Soccer. الرياضات التي تتطلب تغيير الاتجاه بشكل سريع
- **Contact** = associated with Medial collateral ligaments (**MCL**) injury.
- Sports-Related (80%)
  - 70% of patient will hear a "POP" sound. Very loud!
  - Female: 2-4x > Male. if both female and male are active, but in Saudi Arabia it is less than in males. **Why it's more common in females abroad? Because:**

1. Outside, women play sports more than men, while here men are 4 times more.
2. Their notch (the place where the ACL & PCL cross -between the 2 condyles) is narrower than the males, so any over activities makes the ACL more prone to injury.
3. The pre period hormones change so they develop laxity.
4. The way they have it: they always jump with valgus so there is stress on ACL.
5. Neuromuscular balance+strengthening (decreases risk of injury); more effective in females

**Symptoms**

In acute phase the patient will present with pain, swelling, instability but in chronic phase only instability and it's usually not because of ACL injury! but because of associated injuries like meniscus tear or cartilage damage.

- Instability "giving way episodes" أو مو ثابتة "تخوني" ركبتي Later this is the only symptom left
- **Immediate Swelling (Hemarthrosis** دم في المفصل **)** is noted within 1-2 days of the injury. And a "pop" sound.
- Pain : (in acute stage):▪ Bone contusion ▪ Meniscus tear /MCL injury ▪ Chondral injury ▪ Severe effusion
- Pain if associated with Meniscus tear or cartilage damage. After acute injury we will have pain because of meniscus injury, or bone contusion so the tibia will sublux interiorly. In case of femur it subluxed in the middle.

Dx is done clinically. MRI r/o soft tissue injury, xray r/o fractures

**Physical Examination**

- The patient needs to be relaxed and comfortable.
- Must be compared with those of the normal knee.
- A moderate to severe effusion is usually present in the acute cases.
- **ROM:** in acute injury the range of motion may limited by Pain, Effusion, Hamstring spasm, ACL stump impingement (قطع الرباط الممزق تتكدس بالمفصل وتعيق حركته) , or Meniscal pathology.
- **Special tests:**
  1. Lachman's test. ( at 20-30 degree) (the most sensitive test)
  2. Anterior Drawer test (ADT) (at 90 degree)
  3. Pivot shift test: is pathognomonic for ACL ry (best in Chronic settings).


ADT


Lachman's test


PST

# Knee Injuries

## Ligaments Injuries con.

### Anterior Cruciate Ligament (ACL) injury إصابة الرباط الصليبي الأمامي

**Investigations**[1]

#### X-ray (Important)

**Segond Fracture** (avulsion fracture)

Pathognomonic for ACL injury. There is avulsion of anterolateral capsule attachment & its sign of ACL

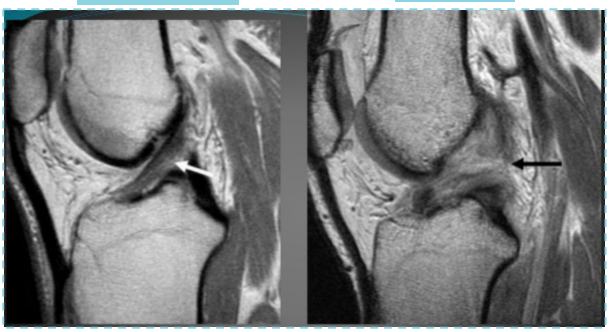
**Tibial spine avulsion**

Here we see growth plate still opens = immature skeleton so this is a pediatric pt.. In pediatric the ligament is stronger than adult so there will be avulsion without piece of bone usually.

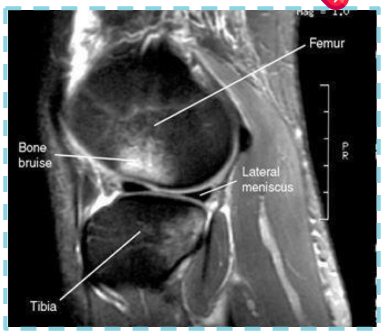
#### MRI

Normal ACL

Torn ACL



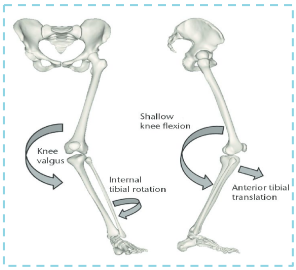
Bone Bruise[2] IMPORTANT

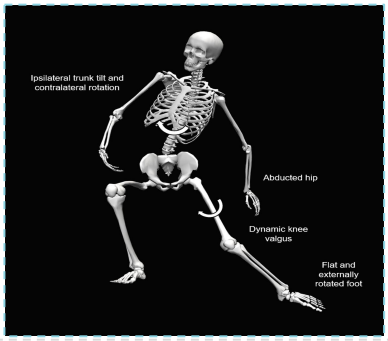



**Injuries Associated with ACL disruption**

- Injuries of the **ACL rarely occur in isolation**. The effects of other injuries, including:
  1. Other ligament sprains (MCL). Contact injury = MCL
  2. Meniscal tears = pain (40% -30%)
  3. Articular cartilage injuries (chondral injuries)
  4. Bone bruises causes pain and "pop" sound, there is subluxation of tibia over femur especially on the lateral aspect leading to impingement of the posterolateral part of the tibia against the middle part of the lateral femoral condyle.
- Complicate the treatment and eventual outcomes of ACL disruptions.

Mechanism for non-contact ACL injury




1- ACL is mainly diagnosed by H&E, you don't really need any investigations mostly.
2- The POP sound heard in ACL tear is caused by the impact between the tibial and femoral condyles, this contact may lead to bone contusions "Bruises", which can cause pain for some time.

# Knee Injuries

## Ligaments Injuries con.

## Anterior Cruciate Ligament (ACL) injury إصابة الرباط الصليبي الأمامي

**Treatment**

**WHEN ACL IS TORN IT DOES NOT HEAL!** why not repair? the difference is in repair we repair the same ligament while in reconstruction we change it to new one, so we do reconstruction because the studied shows that the healing in repair is very poor.

1. **Nonsurgical treatment:**
   - Appropriate for asymptomatic patients with partial injuries to the ACL.
   - Patients who are older or less physically active may elect to modify their activities and proceed with nonsurgical treatment.
   - Nonsurgical treatment involves rehabilitation to strengthen hamstrings and quadriceps, as well as proprioceptive training.
   - Activity modification is also an important part of nonsurgical management, as patients who avoid cutting and pivoting sports are at lower risk for knee instability.
   - ACL sports braces have not been shown to prevent abnormal anterior tibial translation

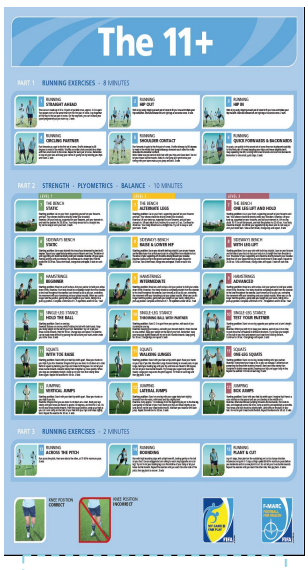
2. **Surgical Treatment indications:**
   - Athletes with ACL injuries rarely return to **cutting and pivoting sports** (e. basketball, football, soccer) without first undergoing surgery. Or walking on uneven ground
   - For individuals who wish to return to such sports, surgery is generally recommended to avoid instability and secondary meniscal and/or articular cartilage damage.
   - Individuals who work in occupations that may involve physical combat, such as police officers, or risk, such as firefighters, should have ACL reconstruction before returning to work.
   - Most patients can function well and perform activities of daily living (ADLs) without instability after a complete ACL injury. However, some have difficulty performing even simple ADLs because of ACL deficiency related instability, and they may require surgery.
   - Young patients.
   - **In summary**: Surgery needed if unstable during activities or someone who use his legs for living even if he didn't reach instability stage.

❖ **Summary of the treatment from the doctor** IMPORTANT

★ **Surgical (ACL reconstruction)** عملية بناء الرباط أو وضع بديل له:
1. **Young, athletic and active patient.**
2. **Middle age not having arthritis:**
   - If there is instability during daily activity.
   - If there is **NO** instability and the patient is active and want to play sports.

★ **Conservative: (exercise, and physiotherapy)**

★ **Isolated ACL injury, Old patient, no symptoms, not active**
1. **Middle age not having arthritis:**
   - If there is **NO** instability and the patient will not play sports.
2. **Old or osteoarthritis patient.**
   - To come to the point, patient who are old or not willing to participate in any kind of sports, or asymptomatic or no instability, treat them conservatively; this is only exception




**ACL Prevention**

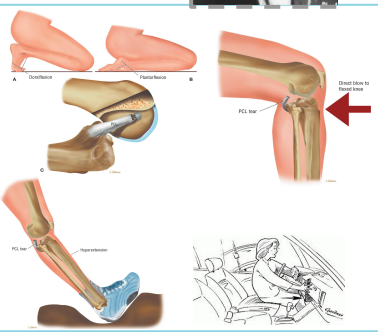
In general surgical intervention for tendon injury is a primary repair and for ligaments reconstruction

# Ligaments Injuries con.

## Posterior Cruciate Ligament (PCL) injury إصابة الرباط الصليبي الخلفي

| | |
|---|---|
| **PCL Function** | • The PCL is the primary restraint to posterior tibial translation in the intact knee |
| **Mechanism of Injury (MOI)** | • A direct blow to the proximal aspect of the tibia is the most common cause of PCL injury.<br>• Dashboard injury:<br>  ○ اللي يركب قدام بالسيارة لما يصير فيه تسارع بعده فرامل تروح ركبته تضرب بدرج السيارة فتدخل داخل خصوصا اللي جالس 90 درجة وينقطع الرباط<br>  ○ "Direct blow to flexed knee"<br>• **In athletes:** a fall onto the flexed knee with the foot in Plantar flexion, which places a posterior force on the tibia and leads to rupture of the PCL. or hyperflexion |
| **PCL special test** | Posterior sag sign   Posterior drawer test |
| **Complications** | • PCL insufficiency significantly increased the risk of developing medial femoral condyle and patellar cartilage degeneration over time. |
| **Treatment** | 1. **Non operative:** They do healing without surgical intervention, it won't affect our performance. Mainly non-operative unless there is combined ligament injury.<br>2. **Surgical** if combined ligament injury , or symptomatic grade 3 rarely because it's hard to get there, it doesn't cause frank instability, if it does, we do surgery. if the extensive physiotherapy doesn't succeed we do surgery |

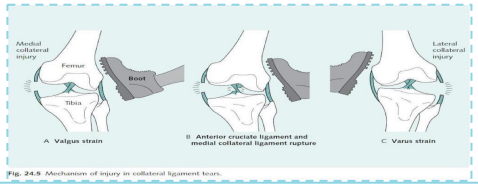




## Medial Collateral Ligament (MCL) injury إصابة الرباط الجانبي الأنسي

| | |
|---|---|
| **Anatomy** | • The main function of this complex is to resist valgus and external rotation loads. (stress) |
| **Occurrence** | • The tibial MCL is the Most coMMonly injured ligament of the knee. 40% |
| **MOI** IMPORTANT | • Usually result from **contact** injury like a direct blow to the lateral aspect of the knee<br>Like what happened to THE GOAT in EURO final   |
| **Associated Injuries** | • Concomitant ligamentous injuries (95% are **ACL**)<br>• Concurrent **meniscal injuries** have been noted in up to 5% of isolated medial ligamentous injuries |
| **Physical Examination** | • Valgus stress test should be performed with the knee at 0° and 30° of flexion:<br>  ➜ **Laxity at 30° : isolated MCL**<br>  ➜ **Laxity at both 0° and 30°: concurrent injury** to the<br>• Posteromedial Capsule and/or cruciate ligament<br>• Rule out associated injuries (ACL and Medial Meniscus)  |
| **Investigations** | • It Is a clinical diagnosis and most of the time does not need further investigation.<br>• If the injury is severe or suspecting associated injuries (e.g. significant knee effusion)<br>• then the MRI will be modality of choice.<br>• **X Ray:** to rule out fracture (lateral tibial plateau fracture) |
| **Treatment** | • **Conservative Rx:** Is the mainstay of treatment for the isolated MCL injuries<br>• Crutches, PRICE, and anti-inflammatory/pain medication<br>• No brace is usually required for partial tear<br>• A knee brace is recommended for complete tear.<br>• **Surgical Rx:** Very rarely if failed conservative Rx + complete tear (Grade 3) + associated with other ligaments (Combined) injury. When I have ACL and MCL I will treat ACL surgical and MCL conservative. |

# Knee Injuries

| Lateral Collateral Ligament (LCL) injury إصابة الرباط الجانبي الخارجي | |
|---|---|
| **LCL Function** | • The LCL is the primary restraint to varus stress at 5° and 25° of knee flexion. |
| **Occurrence** | • Less commonly injuries than MCL Usually comes with posterolateral corner injury which is way above your level |
| **Mechanism of Injury** | • **Varus strain:** Injuries to the lateral ligament of the knee most frequently result from injury motor vehicle accidents and athletic injuries.   Fig. 24.5 Mechanism of injury in collateral ligament tears. |
| **Treatment** | • **Isolated injury:** non operative<br>• **Combined injury:** surgical |

## Knee Dislocation

**ACUTE EMERGENCY!**

★ Multiligament knee injuries are usually caused by high-energy trauma and are often considered knee dislocations. A lot of cases come late to the ER after spontaneous reduction. At least 3 ligaments are injured: ACL, PCL, and one of The collateral ligaments, why? Because the dislocation is either laterally or medially.

★ Less frequently, low-energy trauma or ultra-low-velocity trauma in obese patients can also result in this injury pattern.

★ A bicruciate (ACL+PCL) injury or a multiligament knee injury involving three or more ligaments should be considered a spontaneously reduced knee dislocation.

★ A knee dislocation should be considered a limb-threatening injury, and careful monitoring of vascular status after the injury is imperative.

★ Popliteal artery (estimated at 32%) or peroneal nerve injury (20% to 40%) also can occur. Look for pulse and perfusion sign: color, temperature, capillary refill time (exam question)

★ Vascular examination is **critical** in an acutely dislocated knee:

- Pulse and ankle-brachial index (ABI) should be carefully assessed. An ABI of less than 0.90, and most certainly less than 0.80, should be considered abnormal.
- If there is any concern about an abnormal vascular examination, there should be a low threshold for ordering an angiogram.
- **MCQ**: pt have ABI less than 0,9 what is the next step? Angiogram
- If pulses are still abnormal or absent following reduction of the dislocation, immediate vascular surgery consultation with intraoperative exploration should be the next step in management.
- A vascular injury in a knee dislocation is a limb-threatening injury and needs to be corrected within 6 to 8 hours the golden period. If not corrected, amputation may be required.

★ Neurologic examination is also critical, as peroneal nerve injury can occur with multifilament injuries, particularly in concomitant lateral/posterolateral corner injuries.

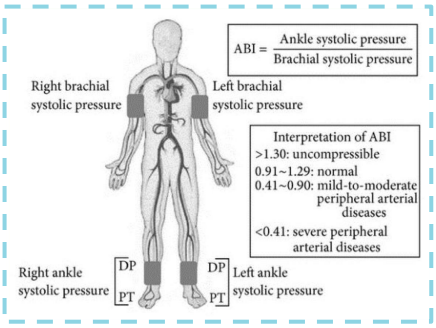
# Knee Injuries

## Knee Dislocation Management

**Need Emergent Reduction**

Multiligament knee injury requires v high energy trauma

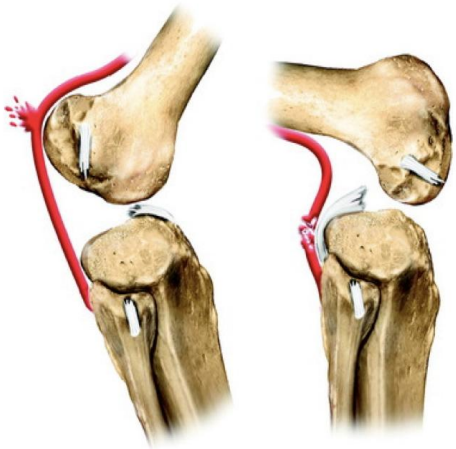
- Emergent closed reduction and splinting or bracing should be performed immediately. Post reduction radiographs should be taken to confirm knee reduction.
- What are the steps of reduction in ER?
  - Analgesia ➜ Reduce joint ➜ Immobilization ➜ Neurovascular assessment before reduction and after ➜ Vascular ABI ➜ X-ray ➜ Call OR




**Extra pic but important**

## Acute knee Dislocation

1) Activate ATLS if high energy trauma or associated with other injuries
2) Analgesia++
3) Quick clinical/NV assessment
4) 2 view x-rays (if you can get it quickly!)
5) Urgent reduction (should not be delayed!)
6) Check stability and safety zone
7) Re-check neurovascular status after reduction (including ABI)
8) Examine the compartment to R/O CS
9) Immobilize the joint
10) Post reduction 2 view X-rays
11) Consult Orthopaedics



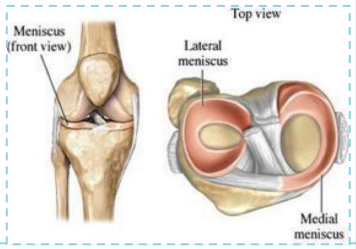
# Knee Injuries

## Menisci injury

### Menisci Injuries تمزق الغضروف الهلالي

**Meniscus Anatomy**

- The menisci are crescent-shaped, with a triangular appearance On cross-section.
- The lateral meniscus covers 84% of the condyle surface; it is 12 to 13 mm wide and 3 to 5 mm thick.
- The medial meniscus is wider in diameter than the lateral meniscus; it covers 64% of the condyle surface and is 10 mm wide and 3 to 5 mm thick.



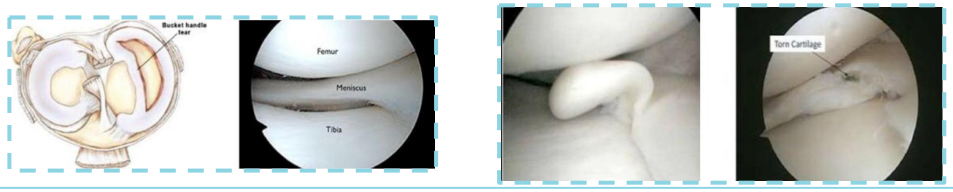

**Meniscus Function**

- The meniscus provides stability, absorbs shock, increases articular congruity, aids in lubrication, prevents synovial impingement, and limits extremes flexion/extension.
- The **most important function** of the meniscus is **load-sharing** across the knee joint, which
- it accomplishes by increasing contact area and decreasing contact stress[1].

**Epidemiology of Meniscus injuries**

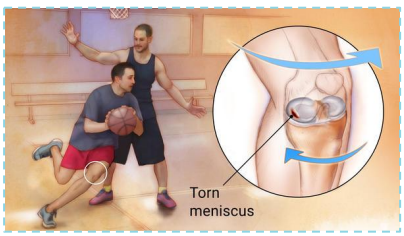
- Meniscus injuries are among the most common injuries seen in orthopaedic practices.
- Arthroscopic partial meniscectomy is one of the most common orthopaedic procedures

Bucket-handle tear Normal Mechanical block Torn (rupture) Cartilage




**Incidence**

- Meniscal tears are unusual in patients younger than age 10 years.
- Most meniscus tears in **adolescents** and young adults occur with a twisting injury or with a change in direction. In young patients, the meniscus is tough and durable, and it is hard for a person under the age of 25 to tear their meniscus without some element of knee trauma. Usually, this is a weight-bearing, twisting injury. (acute kind)
- **Middle-aged and older adults** can sustain meniscus tears from squatting or falling. As we age, the meniscus cartilage becomes more fragile (degenerative), and it is possible to tear the meniscus cartilage by simply squatting. (degenerative kind)




**History (symptoms)**

- With an acute meniscal tear, an effusion may develop slowly several hours after injury. This differs from an anterior cruciate ligament (ACL) injury, where swelling develops rapidly within the first few hours.
- Patients with meniscal injuries localize pain to the joint line or posterior knee and describe
- mechanical symptoms of locking or catching. نسأل المريض هل ركبته تخونه؟
- Mechanical symptoms: Locking or catching.
- Chronic meniscal tears demonstrate intermittent effusions with mechanical symptoms

1- Which is why meniscectomy is often associated with early Osteoarthritis.

# Knee Injuries

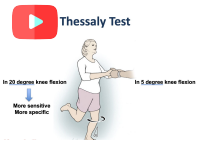
## Menisci Injuries تمزق الغضروف الهلالي

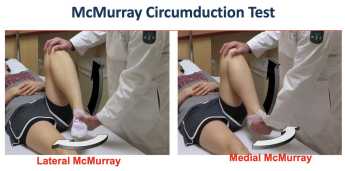
### Physical Examination

- Small joint **effusions** and **joint line tenderness** with palpation are **common findings** with meniscus tears, palpation with patient has osteoarthritis isn't useful. Joint line tenderness is a most sensitive sign.
- Manipulative maneuvers, including the **McMurray** and **Apley tests** may produce a palpable audible **click** with localized tenderness, but they are **not specific** for meniscal pathology.
  - ★ Range of motion is typically normal, but longitudinal bucket-handle tears may **block** full **extension** of the knee joint. -> locking. (+Know difference between leg lag and lock?)
  - ★ **Combined testing has improved accuracy**
  - ★ **An effusion combined with joint line tenderness (JLT) is one of the most sensitive and reliable signs of a meniscal tear.**

Doctor skipped this table

| Test | Sensitivity | Specificity |
|---|---|---|
| Joint line tenderness | 71% MM<br>78% LM | 87% MM<br>90% LM |
| Apley grind test | 41% for both | 93% MM<br>86% LM |
| McMurray test | 48% MM<br>65% LM | 94% MM<br>86% LM |
| Thessaly test | 89% MM<br>92% LM | 97% MM<br>96% LM |




### Imaging

- Standard knee radiographs should be obtained for evaluating for: Bone injuries or abnormalities, Osteoarthritis, x ray we can't see anything regards of meniscus but to see possible arthritis.
- **MRI** remains the noninvasive diagnostic p**rocedure of choice for confirming meniscal pathology**.

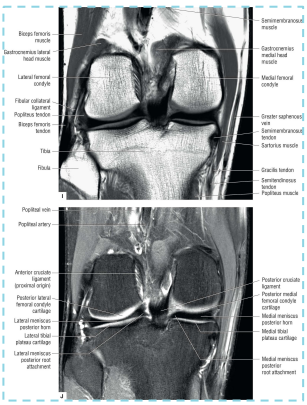
### Differential Diagnosis

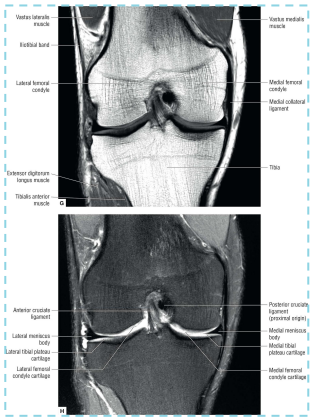
- Differential diagnosis Prior to MRI, several large studies demonstrated accuracy of the clinical diagnosis of meniscus tears to be 70% to 75%.
- **The differential for meniscus tears includes intra-articular and extra-articular diagnoses:**
  - **Intra-articular:** possibilities include: osteochondritis dissecans, medial patella plica, patellofemoral pain syndromes, loose bodies, pigmented villonodular synovitis, inflammatory arthropathies, and osteonecrosis.
  - **Extra-articular:** possibilities include: collateral ligament injuries, slipped capital femoral epiphysis, bone or soft-tissue tumors, osteomyelitis, synovial cyst, pes or medial collateral ligament bursitis, injury, reflex sympathetic dystrophy, lumbar radiculopathy, iliotibial band friction, and stress fracture.

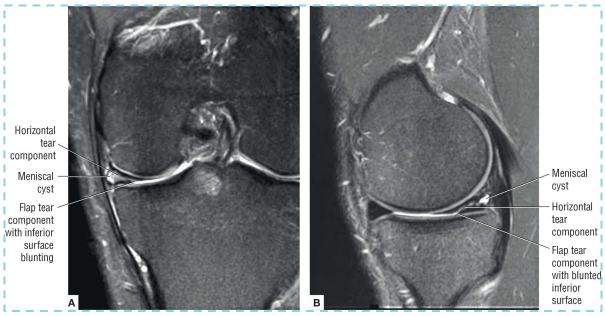
### Management

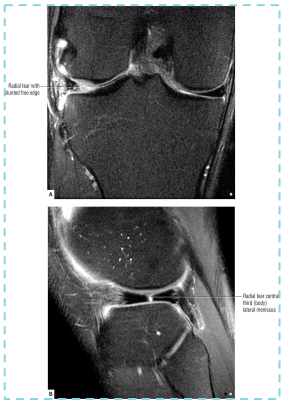
- **Nonsurgical:** if no mechanical symptoms
  - Not all meniscus tears cause symptoms, and many symptomatic tears become asymptomatic.
  - All degenerative meniscus tear.
  - Nonsurgical management include: ice, NSAIDs, or physical therapy for range of motion
  - and general strengthening of the lower extremities. they respond well
- **Surgical indications:** no need for surgery unless it disturbs his life his daily activities not
  - his hobbies or there is pain or mechanical block
  - Failure of conservative treatment
  - Locked knee blocking or displaced bucket handle tear
  - Concomitant ACL surgery. We do meniscectomy with ACL reconstruction.
  - Mechanical symptoms (unstable tears)
  - Young active patient
  - **Type of surgical intervention:**
    - Repair whenever possible, meniscus tear should be repaired and saved. first choice, but if the tear is at an avascular zone we might have to do meniscectomy
    - Meniscectomy (Arthroscopic partial/subtotal/ or total meniscectomy) Only if NOT REPAIRABLE tear – Tears not amenable to repair (complex, degenerative, radial tear patterns) More risk of osteoarthritis progression !

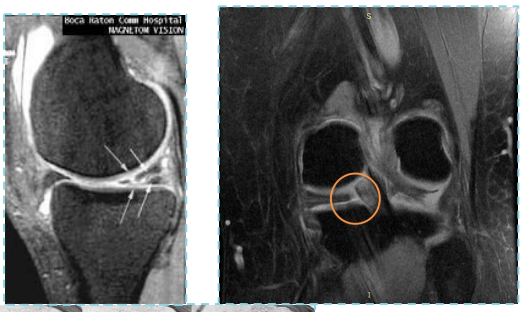
# Imaging

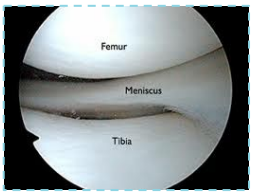


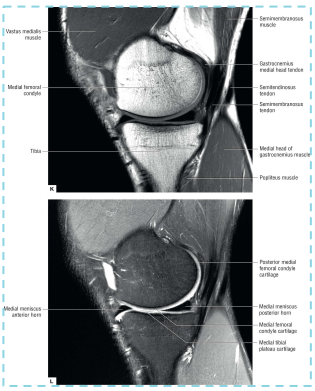


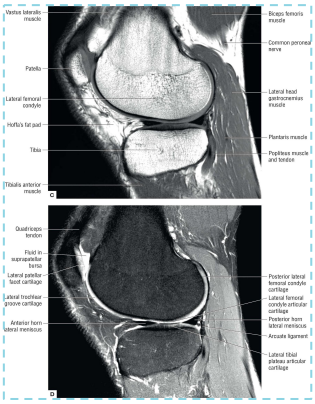


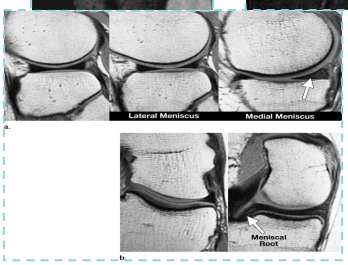





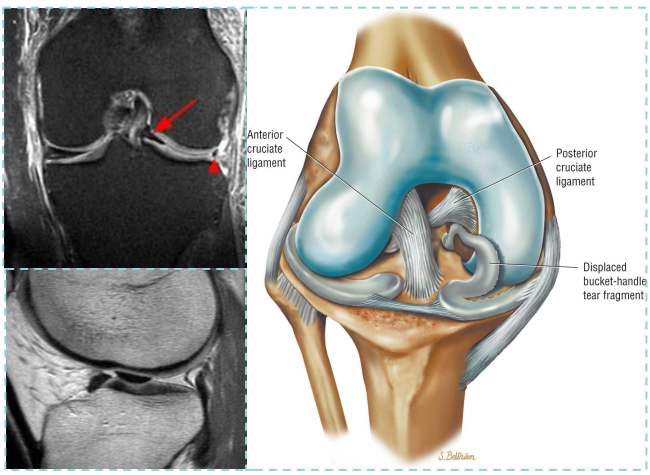







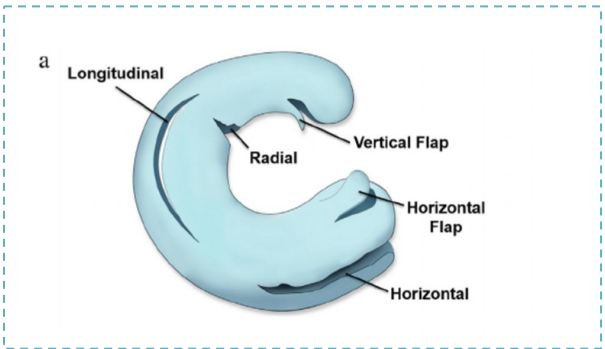


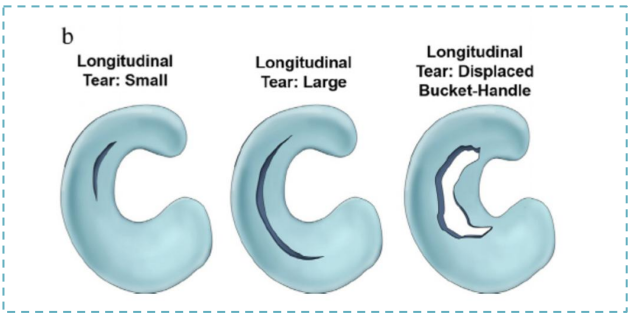



Bucket handle tear

[Mensical radiology guide for dummies]

# Meniscal tear types



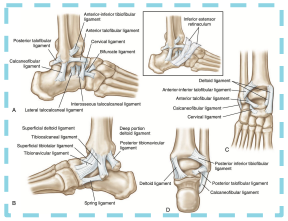



# Ankle Sprain

## Ankle Sprain التواء الكاحل

### Characteristics

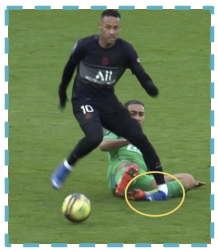
- Ankle sprain is a common sports related injury. more than ACL
- Lateral sprains accounting for 85% of all such injuries.
- The most common reason for missed athletic participation
- We have something called anterior fibular ligament which is more common to be injured than the ACL. Especially in female but they can live with it to the point that the stress start to develop upon the bones so she can't handle it anymore.
- Females more common because of laxity and high heeled shoes.



### Classification of Acute Lateral Ankle Sprains

- **Grade I :**
  - **Mild injury to the lateral ligamentous complex.**
  - No frank ligamentous disruption is present.
  - Mild swelling, little or no ecchymosis on the lateral aspect of the ankle, and no or mild restriction of active ROM. Difficulty with full weight bearing is sometimes seen. No laxity on examination.

- **Grade II:**
  - **Moderate injury and partial tear to the lateral**
  - ligamentous complex.
  - Restricted ROM with localized swelling, ecchymosis, hemorrhage, and tenderness of the anterolateral aspect of the ankle.
  - Abnormal laxity may be mild or absent.
  - May be indistinguishable from a grade III injury in the acute setting.



**Inversion type ankle injury on a plantarflexed foot**

- **Grade III:**
  - **Complete disruption of the lateral ligamentous complex.**
  - Diffuse, swelling,tenderness and ecchymosis on the lateral side of
  - the ankle and heel. ++ instability

### Ankle sprains types

- **High ankle sprain**: Syndesmosis injury. 1-10% of all ankle sprains
- **Low ankle sprain**: Lateral ankle sprain. ATFL and CFL injury. >85% of all ankle sprains
- **Medial ankle sprain**: Deltoid ligament injury

CFL: Calcaneofibular Ligament ATFL: Anterior talofibular ligament

### Presentation

- **History:** History suggestive of inversion injury
- **Physical examination:** Localized tenderness, swelling, and ecchymosis over the lateral ankle.
- **Special tests:**
  - The anterior drawer test may demonstrate anterior talar subluxation.
  - The talar tilt stress test may demonstrate positive tilt to inversion stress

### Treatment

- **Non-surgical management:** Start with Conservative; (functional treatment) consists of 4 (RICE-proper shoes - brace - physiotherapy)
  - Initial treatment consists of RICE. + short period of immobilization (10 days or less)) followed by early physiotherapy.
  - Early weight bearing and use of a protective brace during functional activities facilitates recovery better than non–weight bearing or immobilization.
  - Functional instability may result and should be treated with a course of Physical therapy and proprioceptive training[1].
  - Residual mechanical instability may be managed effectively with bracing or taping.
  - Patients may return to unrestricted activity when cutting, running, and hopping on the affected leg are no longer painful.
  - 90% of acute ankle sprains resolve with PRICE and early functional rehabilitation.
- **Surgical indications :**
  - when an adequate trial of nonsurgical treatment fails to control symptoms for grade III.
  - Ligaments repair/reconstruction



# Quiz

**Q1: An 18 year old young man presented to the orthopedic OPD with a H\O twisting injury to his left knee 10 days ago. He reported that his knee is (locked) since the injury. O\E: left knee medial side tenderness and ROM from 150 to full flexion. MRI showed a tear of the medial meniscus. Which of the following is the most appropriate treatment ?**

- A: Manipulation under anesthesia
- B: Physiotherapy
- C: Steroid injection
- D: Urgent Arthroscopy

**Q2: A 35 years old man C/O severe knee pain for 2 hours sustaining a non-contact twist while playing soccer. O/E showed massive effusion in the knee with ecchymosis. What's the most important initial investigation?**

- A: MRI
- B: Plain X-ray
- C: US
- D: Nuclear Medicine Studies

**Q3: A 30 years old man came to the ER with pain and swelling of the knee after Dashboard injury, what is the most common injury in this case?**

- A: ACL injury
- B: MCL injury
- C: PCL injury
- D: Meniscal injury

**Q4: A 21 years old came to the ER due to Knee dislocation, there was multiligament injury involving ACL, PCL, MCL, after checking NV examination there was no distal pulse, what is the most likely injured artery and injured nerve respectively in this case?**

- A: Popliteal Vein, Peroneal Nerve injuries.
- B: Popliteal Artery, Sciatic Nerve Injuries
- C: Popliteal Artery, Peroneal Nerve Injuries.
- D: Popliteal Artery, Vagus nerve Injuries.

1:D 2:B 3:C 4:C

# Team Leader

## Abdulrahman Alroqi

## Done by

Faisal Alroba

## Organized by

Abdullah Alomran

وفّقكم الله