# 13- Sport and Soft Tissue Injuries

## 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 immediate and long-term management of patients with muscles, tendons, ligaments and meniscal injuries.
- Demonstrate knowledge of non-operative and operative measurements used for sport/soft tissue injuries and their indications.

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**References:** Team 435, Slides, Notes

# Introduction

**Soft Tissues Injuries Include**

- **Muscle**
  - Muscle Strian
  - Muscle Contusion
  - Muscle Laceration
  - Delayed Onset Soreness
- **Tendon**
  - Overused tendinopathies
  - Tendon Repture
- **Knee**
  - Ligament
    - ACL
    - PCL
    - MCL
    - LCL
  - Dislocation
  - Meniscus
- **Shoulder**
  - Will be in spearate lecture
- **Ankle**
  - Ankle sprian

## ★ Initial Management:

| R | I | C | E |
|---|---|---|---|
| **Rest** | **Ice** | **Compression** | **Elevation** |
| It can help in detecting the real side of injury, controlling the damage prevent further damage.  | 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  | It can help in swelling relief, controlling the damage and prevent further damage.  | Have to be above heart level   |

# Muscle injuries

- The muscles most at risk are those in which the origin and the insertion **cross two joints**. For Example: quadriceps and Hamstrings Muscles are usually injured because they cross two joints → Hip and knee
- Frequently injured muscles act in an eccentric fashion (i.e., lengthening as they contract). Eccentric fashion means usually the injury happened when there is a contraction of the muscle but during the face of length which mean for example when you try to contract the quadriceps while the knee is flexed, the function of quadriceps is to extend the knee. When you flex it, it will stretch (see the pic), or hamstring contraction while the knee is extending.

دايم تشوفون ان الشخص القصير إصابته بالعضلات قليلة لان السيرفس ايريا حقته قليلة بعكس الطويل الي معرض أكثر للإصابة عشان كذا قبل ما تتمرنوا، وقت الإحماء يختلف من شخص لشخص، يعني القصير عشر دقايق تكفيه بس الطويل يحتاج ثلث ساعة وهكذا

## 1- Muscle Strain: الشد العضلي if it's in the ligament we call it sprain

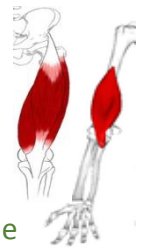
- The most **common** muscle injury suffered in sports.
- Immediate pain associated with diminished function

يمشي او يجري وفجاه شدت عليه رجله وماقدر يتحرك غالباً الشخص الطويل في الكالف مسل

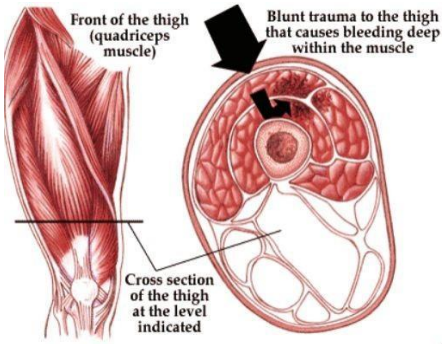
- How it's happen? overuse, or improper use of a muscle result in → muscle overstretched (muscle strain) → could lead to muscle tear
- Both complete and incomplete muscle tears can occur by passive stretch of an activated muscle.
- Muscle tears also typically occur at or near to the myotendinous junction (the connection between muscle and tendon).
- Treatment:
    - RICE
    - NSAID
    - Physical therapy

## 2- Muscle Contusion: كدمة العضلات

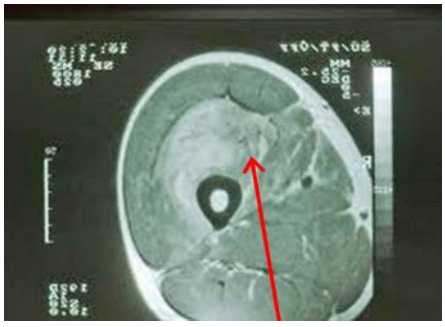
(pic1) (pic2)



- Caused by a non-penetrating blunt injury (direct blow) to the muscle resulting in hematoma and inflammation.
- Quadriceps (pic1) and Brachialis (pic2) muscles are **common involved regions.**
- Clinical features:
    - Pain with active and passive motion +/- swelling.
    - Decreased range of motion of joints spanned امتد by the injured muscles. For example, if the quadriceps affected the passive knee flexion will be painful.
    - Occasionally a permanent palpable mass.
- **Treatment:**
    - **Short** period of immobilization
    - Followed by **early** mobilization and Physiotherapy
    - NSAID




There is inflammation and bleeding inside the muscle



This is MRI, an axial cut at the level of the thigh shows contusion. The white area (arrow) is hematoma

## 3- Muscle Laceration:

- Muscle cut by sharp object.
- Treatment: I&D (irrigation & debridement) followed by suture repair of the fascia, if possible.

## 4- Delayed Onset Soreness:

شائع جدا والكل جربه، لما نكون فترة ما رحنا النادي ومافي لياقة بعدين نروح ونتمرن وقتها نكون مشغولين بالتمرين وما نحس بشيء، او لما نمشي لفترة طويلة بالسوق وبالنا مشغول بالتسوق، بس ننام ونقوم اليوم الثاني نلقى عضلاتنا كلها تألم، هذا عبارة عن اجهاد للجسم اكثر من المعدل الطبيعي المتعود عليه لهذا يجي للي مو متعود على هذا المجهود وما يجي الرياضيين غالبا، ومن احد اسباب اننا ما نحس بالالم بلحظتها لان مخنا مشغول بأمور ثانية. الألم هذا راح يخف مع الوقت من نفسه

- 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.
- Treatment:
  - It's self-limited and **will resolve in a few days**
  - NSAID

## ★ Complications of muscle injuries:

1. **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
2. **Compartment syndrome:** Mainly due to contusion

- 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

Let's revise the pathophysiology of compartment syndrome: Swelling, injury, hematoma → Increased interstitial compartment pressure → obstruction of capillary perfusion → Direct transfer of oxygenated blood from arterial to venous system without oxygenation of the tissues→ Ischemia and necrosis of the compartment structures. In general, all the types of compartment syndrome:

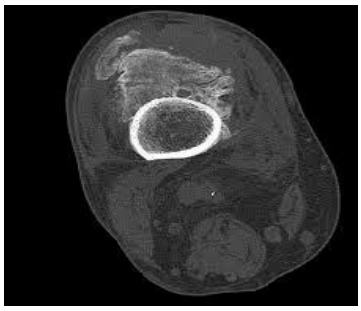
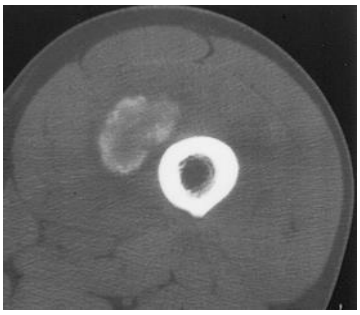
- Acute (fracture or soft tissue injury) → medical emergency
- Chronic (activity related) → reversible once the exercise stop

3. **Myositis Ossificans:** AKA heterotopic calcification

- **What is it?** Bone formation (calcification) within muscle secondary to blunt trauma. It's bone formation outside the bone, if it's formed in the muscle we call it myositis ossificans.
- Clinical features:
  - ⇒ Early:
    - Pain, swelling and decreased ROM
    - Erythema, warmth, induration, tenderness
  - ⇒ Late: painless swelling with decreased ROM. The most common presentation, they forget the trauma or injury and come to you with swelling so good history is very important
- This sometimes mimics osteogenic sarcoma on radiographs and biopsy. you should take a good history because it will confuse you with osteogenic sarcoma. how to differentiate? **history of trauma**
- Increased ESR and serum alkaline phosphatase
- Myositis ossificans becomes apparent approximately 2 to 4 weeks' post-injury

- Treatment: if you sure it's a myositis ossificans the treatment will be conservative unless there is a significant ossification and causing significant functional limitation of the involved muscle.



This is X-ray of o myositis ossificans. When you see like this picture you think it's a tumor, so if you confused and not sure you need to do biopsy

# Overuse Tendon injuries فرط إجهاد الوتر

- What are the functions of tendon? To transfer force from muscle to bone to produce joint motion.
- Type of injuries:

1. **Overused tendinopathies.** We don't call it any more tendonitis because it's not a true inflammation, it's degenerative process, so we call it tendinosis or tendinopathies. Tendinopathies means اعتلال الوتر

فنقول اعتلال الوتر الناتج عن فرط الإجهاد للوتر، المتعارف عليه بالمجتمع وعند المرضى بالتهاب الأوتار.

2. **Tendon rupture.** It's a traumatic tear usually. تمزّق الأربطة

It's very important to remember that overused tendinopathies are degenerative process, there is no inflammation or tear while tendon rapture is a tear. So, since the tendinopathies is a degenerative process so we can treat it conservatively but in rupture we have to repair the tear, so it's always surgical management in tendon rapture and there is no conservative treatment.

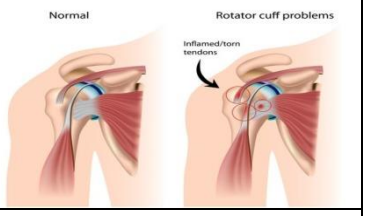
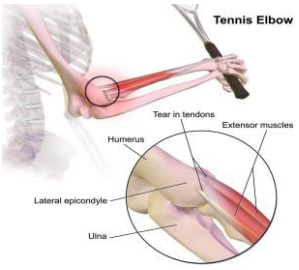
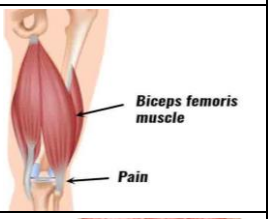
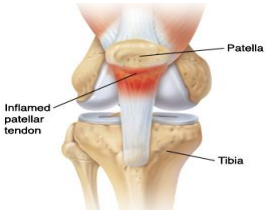
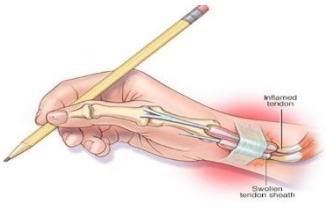
## 1. Overused Tendinopathies:

- 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 tendenitis.

## Most common Diagnoses and Locations of Chronic Tendinopathies

This is an **important** table, the doctor said that we have to know the symptoms and **site** for each.

All the pictures and symptoms in this table are **extra**

| Diagnosis | Symptoms | Location |
|---|---|---|
| Rotator cuff Tendinopathy | - 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 for 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) | - 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 worse 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, or walking, bending or straightening your leg.<br>- Tenderness behind the lower part of your kneecap. | Patellar tendon origin   |
| De Quervain'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>وتر العرقوب | - 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   |

## ★ Treatment:

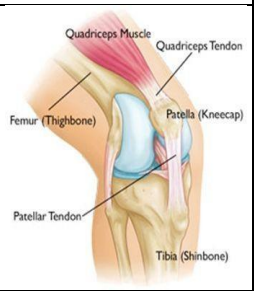
- **Goal:** reduce pain and return function.
- Mainly is **conservative** Rx:

- Rest
- Ice (Cryotherapy)
- Physiotherapy (stretching and eccentric strengthening)
- Analgesics
- Corticosteroids injection don't give it on the tendon, you should inject around it because it can cause weakness and rupture of the tendon except tennis elbow
- Orthotics and braces
- Other modalities: U/S, ESWT (extracorporeal shockwave therapy), ionotophoresis, phonophoresis

○ **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.

## 2. Rupture Tendon:

○ 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,** 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 |
| **Location** | At the tendon attachment to the patella.<br>Quadriceps tendon rupture    |
| **Physical examination** | - Tenderness at the site of the injury, hematoma, and a palpable defect in the tendon.<br>- Unable to extend the knee against resistance or to perform a straight-leg raise.<br>How to differentiate between them clinically?<br>The most significnt sign is extension lack. Patient is unable to do **active** extension and if you can do it passively it's full passive. |
| **X-ray** | How to differentiate between them in x-ray?<br>- Patella-alta: Patellar tendon rupture<br>- Patella-infera (baja): Quadriceps rupture<br>You don't need MRI for diagnosis, but u may use it to exclude other injuries or to determine how will u reconstruct in the surgical treatment. Notice here the patella is above its normal position which indicate patellar tendon rupture patella-alta. while in patella baja it will   |

| | |
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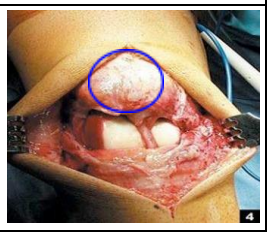
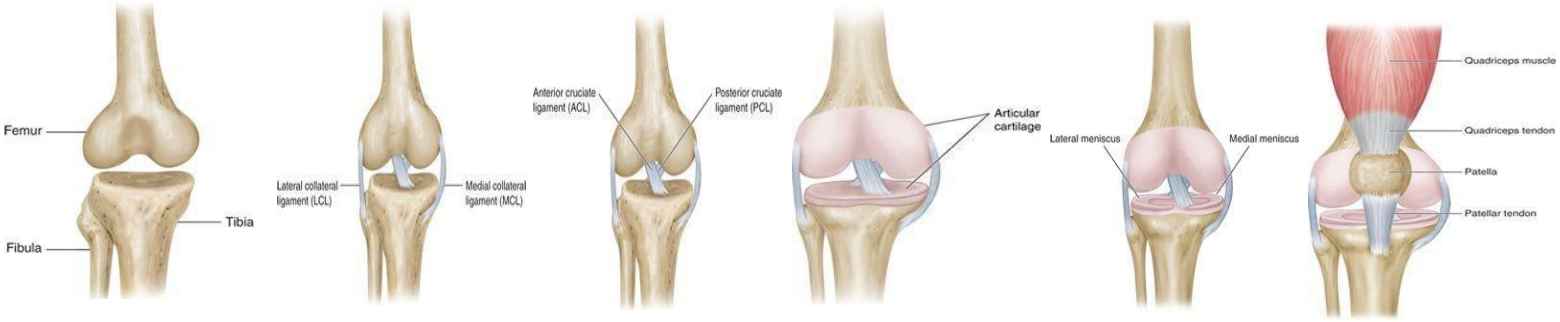
| | be lower than its normal place. |
| **Treatment** | Usually Surgical (always) as we said before in rapture the management is surgical only.  |
| Common scenario: 20 y boy came to ER with inability to rise his right lower limb *knee extension*. **What is your DDx?** knee ligament tear, fracture of patella, quadriceps or patellar tendon rupture, femoral nerve injury or psychology | |

| **Achilles Tendon Rupture** | |
|---|---|
| **Occurrence** | Most ruptures (75%) occur during sporting activities. common |
| **History** | - The patient reports a "pop" or the sensation of being kicked in the heel during the injury.<br>ليش البيشنت يحسون او حتى يسمعون بوب لما يتقطع التندن؟ لأن الاكيليس تندون من اقوى التندنز الي بالجسم قوي جدا فيتطلب طاقه قويه جدا جدا عشان تقطعه فلما يتقطع الطاقة المتجمعة هناك بتطلع فجأة فنسمع الصوت<br>The stored energy will be released suddenly, creating what the patient perceives as a pop.<br>- Weakness and difficulty walking. |
| **Physical examination** | Increased resting dorsiflexion with the knees flexed, a palpable gap, weak plantar flexion, and an abnormal Thompson test (**lack of plantar flexion when squeezing the calf**).  <br>في هذه الصورة الخلل يمين المريض<br>Negative test positive test |
| **Diagnosis** | Diagnosis is clinical, but MRI or ultrasound can confirm. |
| **Treatment** | Usually surgical. (always) as we said before in rapture the management is surgical only, if we treat it conservatively there will be permanent weakness |

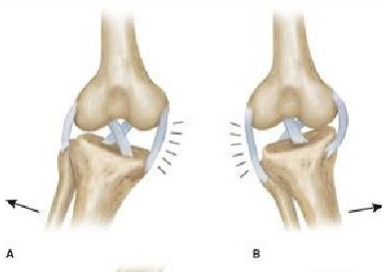
# Injuries of Knee

**Knee Anatomy:** extra pics, but the doctor said that we have to know the anatomy. Check the pics from left to right




✓ Joint stability: bone stability + soft tissue ⇘
✓ Dynamic stabilizer: Tendons/Muscles ⇨ Complex synergy leading to a FUNCTIONAL and STABLE joint
✓ Static stabilizer: Ligaments ± meniscus ⇗

## ★ The functions of the knee ligaments: extra pics





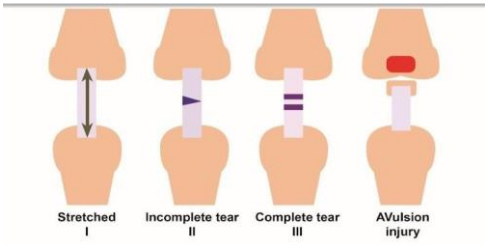
A. The medial collateral ligament (MCL) prevents valgus deformities.
B. The lateral collateral ligament prevents varus deformities.
C. The anterior cruciate ligament prevents anterior tibial translation over the femur.
D. The posterior cruciate ligament prevents posterior tibial translation over the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

## ★ Types of Knee injuries:

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

## 1. Ligaments injuries

The role of the knee cruciate and collateral ligaments is to stabilize the joint. These structures connect the bones in a way that allows normal motion (flexion and extension) but resists the forces that create abnormal motion (hyperextension; varus/valgus; anteroposterior translation and rotation).




**A grading of ligamentous injury** In type I, there is injury and pain but no instability. In type II, there is more motion but clear endpoint on manual testing. Type III is characteried by instability, is associated with capsular injury, and lacks an endpoint. Avulsion is reflection that ligament is stronger than bone in the immature child.

**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, 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 have 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.

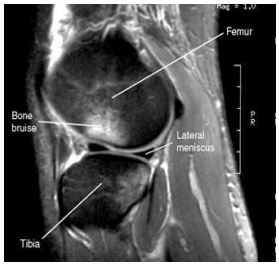
| **ACL injury الرباط المتصالب الأمامي** Toronto notes Kaplan notes | |
|---|---|
| **Mechanism of injury** | ○ **Noncontact** (about 70% of ACL): Cutting or Pivoting sport such as basketball, football, soccer. تكون غالبا بالرياضات اللي تتطلب تغيير الاتجاه بشكل سريع<br>○ Sports-Related (80%)<br>ليه اللاعب إذا أصيب حتى لو non-contact يقول غيروني؟ بسبب البروبريوسبشن، لو ماعندك البروبريوسبشن ايش بيصير؟ البروبريوسبشن اللي في اللور لمب يمثل تسعين بالمية فتخيلوا أنه فجأة يفقده! راح يبدأ يحس بدوخة ويصير موعارف يمشي عشان كذا يقول بدلوني بس بعد نص ساعة تقريبا يبدا جسمه يطور طريقة ثانية للإحساس فيرجع يقول رجعوني، راح يكون يعرج على رجله بس يقدر يمشي مو زي أول ما أصيب ماكان قادر يتحرك ابدا فبدّلوه ولهذا السبب بعد مانسوي الريبير نحطه على سبلنت لمدة ست اسابيع لأنه في البداية اللقمنت يصير لها ريفاسكلريزيشن وبعدها يبدا يرجع البروبريوسبشن شوي شوي فست اسابيع عشان يتعود. |

| | |
|---|---|
| | ○ 70% of patient will hear a "POP" sound.<br>○ Female: 2-4x > Male. But in Saudi Arabia is less than male<br>Why it's more common in female outside? Because:<br>1. Outside, women play more sports more than men, while here men are 4 times more.<br>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.<br>3. The pre period hormones change so they develop laxity.<br>4. The way they have it: they always jump with valgus so there is stress on ACL. |
| **Symptoms** | In acute phase the patient will present with pain, swelling, instability but in chronic phase only Instability and its usually not because of ACL injury! but because the associated injury like meniscus tear.<br>○ Instability "giving way episodes"<br>○ Swelling (Hemarthrosis) is noted within a 1-2 days of the injury.<br>○ Pain if associated with meniscus tear. in the acute phase we will have pain because of bone contusion so the tibia will sublux interior. In case of femur it subluxe in the middle |
| **Physical examination:** | ○ The patient needs to be relaxed and comfortable.<br>○ Must be compared with those of the normal knee.<br>○ A moderate to severe effusion is usually present in the acute cases.<br>○ **ROM:** in acute injury the range of motion may limited by: Pain, Effusion, Hamstring spasm, ACL stump impingement قِطَعْ الرباط الممزق تتكدس بالمفصل وتعيق الحركة, or Meniscal pathology.<br>○ **Special tests:**<br>- Lachman's test. The most sensitive test<br>- Anterior Drawer test<br>- Pivot shift test: is pathognomonic for ACL injury (best in the chronic setting). You don't need to know how to perform this test |
| **Investigation**: | History and examination are usually enough and diagnostic but sometimes we need to some investigations to check if we suspecting something but not to diagnose.<br>○ X ray, MRI. We do x-ray if we suspecting a fracture otherwise the x-ray will be normal but MRI is the most important if we are not sure from the history or examination or if we want to double check because it will show me is the rapture complete or partial and if there is any other injury<br>○ In the skeletally mature patient, the femoral insertion or midsubstance is usually the site of disruption.<br>○ In the skeletally immature patient, the tibial attachment may be avulsed with or without a piece of bone. |

**X-ray**

| Segond fracture | Tibial spine avulsion |
|---|---|
| There is avulsion of anterolateral capsule attachment & its sign of ACL  | Her we see immature skeletal so this is a pediatric. 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 |
|---|---|---|---|
| |  |  |  |
| **Injuries Associated With ACL Disruption:** | ○ Injuries of the **ACL rarely occur in isolation.** The effects of other injuries, including:<br>- Other ligament sprains (MCL). Contact injury = MCL<br>- Meniscal tears = pain (40% -30%)<br>- Articular cartilage injuries<br>- Bone bruises<br>○ Complicate the treatment and eventual outcomes of ACL disruptions. | | |
| **Treatment** | **Summary of the treatment:** we will divide the treatment to 3 part:<br>1. **Young, athletic and active patient: ACL reconstruction.** why not repiar? 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. اسمها عملية استباء الرابط الصليبي او المتصالب الأمامي<br>2. **Old or osteoarthritis patient:** we try with them conservative.<br>3. **Middle age not having arthritis:**<br>a. If there is instability during daily activity will do ACL reconstruction.<br>b. If there is **NO** instability and the patient is active and want to play sports will do ACL reconstruction.<br>c. If there is **NO** instability and the patient will not play sports, we try conservative with him.<br>So, age is not a good factor in deciding the treatment because sometimes you will see 60-year man who can exercise better than a 20-year boy.<br>**#Nonsurgical treatment:**<br>○ Appropriate for asymptomatic patients with partial injuries to the ACL.<br>○ Patients who are older or less physically active may elect to modify their activities and proceed withnonsurgicaltreatment.<br>○ Nonsurgical treatment involves rehabilitation to strengthen hamstrings and quadriceps, as well as proprioceptivetraining.<br>○ 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.<br>○ ACL sports braces have not been shown to prevent abnormal anterior tibial translation.<br>**#Surgical treatment:**<br>In summary: Surgery needed if unstable during activities or<br>الي رجلينه مصدر رزقه حتى لو ماوصل لمرحلة الانستيبيلتي<br>○ Athletes with ACL injuries rarely return to cutting and pivoting sports (e. basketball, football, soccer) without first undergoing surgery.<br>○ For individuals who wish to return to such sports, surgery is generally recommended to avoid instability and secondary meniscal and/or articular cartilage damage.<br>○ 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.<br>○ 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.<br>○ Young patients. |

| **PCL injury الرباط المتصالب الخلفي** Kaplan notes Toronto notes | |
|---|---|
| **PCL function** | The PCL is the primary restraint to posterior tibial translation in the intact knee. |
| **Mechanism of injury:** | ○ 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 فرملة تروح ركبته تضرب بدرج السيارة فتدخل داخل خصوصاً للي جالس 90 درجة فتقطع<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.<br>  |
| **Complication**: | ○ PCL insufficiency significantly increased the risk of developing medial femoral condyle and patellar cartilage degeneration over time. |
| **Treatment:** | ○ **Non operative** they do healing without surgical intervention, it won't affect our performance<br>○ **Surgical** if combined ligament injury, 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 |

| **MCL injury رباط الركبة الجانبي الداخلي** | |
|---|---|
| **Anatomy** | The main function of this complex is to resist valgus and external rotation loads. |
| **Occurrence** | The tibial MCL is the Most coMMonly injured ligament of the knee. |
| **Mechanism of injury** | Usually result from **contact** injury like a direct blow to the lateral aspect of the knee. |
| **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 examinations** | ○ 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 posteromedial capsule and/or cruciate ligaments.<br>○ Rule out associated injuries (ACL and M. Meniscus)<br>  |
| **Investigation** | ○ 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) then the **MRI** will be modality of choice.<br>○ **X Ray:** to rule out fracture (lateral tibia plateau fracture) |
| **Treatment** | **#Conservative Rx:**<br>- Is the mainstay of treatment for the isolated MCL injuries |

| | |
|---|---|
| | - Crutches, RICE, and anti-inflammatory/pain medication<br>- No brace is usually required for partial tear<br>- A knee brace is recommended for complete tear.<br><br>**#Surgical Rx:** very rarely if failed conservative Rx + complete tear + associated with other ligaments injury. When I have ACL and MCL I will treat ACL surgical and MCL conservative |

| **LCL injury رباط الركبة 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 |
| **Mechanism of injury** | **Varus strain:** Injuries to the lateral ligament of the knee most frequently result from motor vehicle accidents and athletic injuries. |
| **Treatment** | ○ Isolated injury: non operative<br>○ Combined injury: surgical |

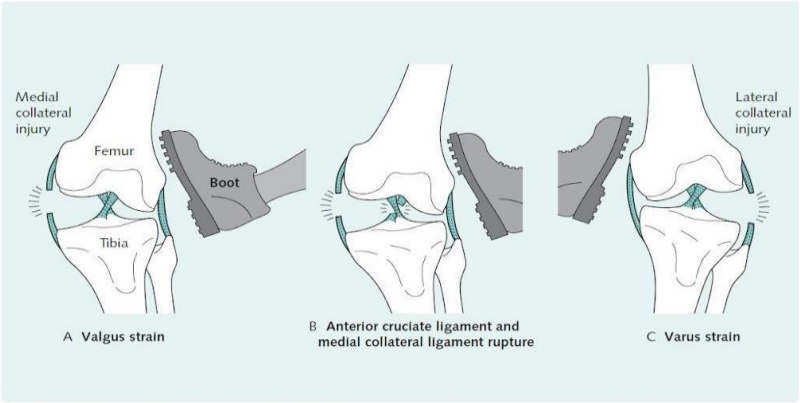


Fig. 24.5 Mechanism of injury in collateral ligament tears.

## 2. Knee Dislocation Toronto notes

- Multiligament knee injuries are usually caused by high-energy trauma and are often considered knee dislocations. a lot of cases came late after spontaneous reduction

اقل حاجة عندك ثلاث لقمنت راحت: انتيريور، بوستيريور، وواحد من الكولاترا. ليه؟ لان بالدسلوكيشن يا انت رايح ميديال او رايح لاترال

- 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.

Important consideration Neurovascular status:

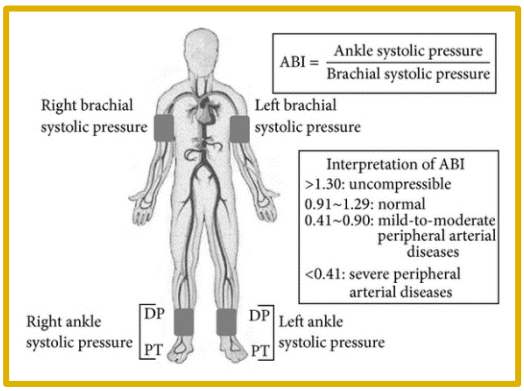
- A knee dislocation should be considered a limb-threatening injury, and careful monitoring of vascular status after the injury is imperative.
- Popliteal artery (estimated at 32%) or peroneal nerve injury (20% to 40%) also can occur. Look for pulse and perfusion sign: color, temperature, capillary refill 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.

⇒ 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.




Extra pic but important

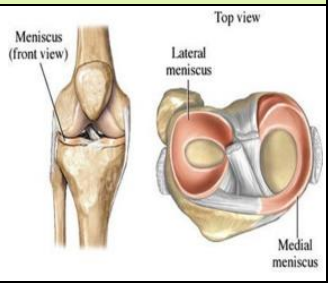
## ★ Management:

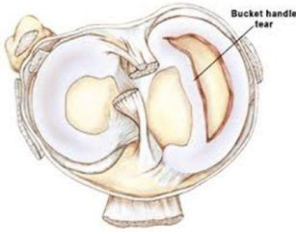
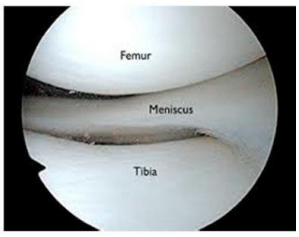
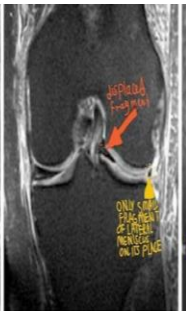
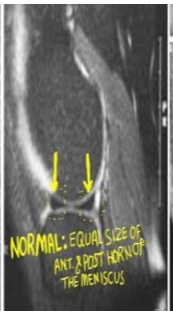
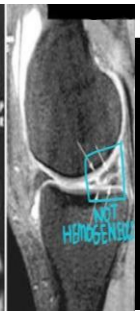
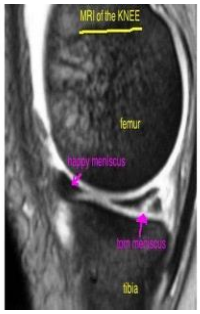
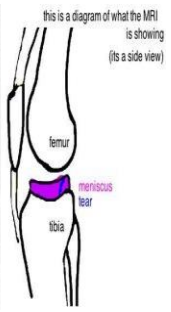
**NEED EMERGENT REDUCTION**

⇒ 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?

1. Analgesia
2. Reduce joint
3. Immobilization
4. Neurovascular assessment before reduce and after
5. Vascular ABI
6. X-ray
7. Call OR

## 3. Menisci Injuries

| **Menisci Injuries** Toronto notes Kaplan notes | |
|---|---|
| **Meniscus anatomy:** | ○ The menisci are crescent-shaped, with a triangular appearance on cross-section.<br>○ The lateral meniscus covers 84% of the condyle surface; it is 12 to 13 mm wide and 3 to 5 mm thick.<br>○ 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.<br>  |
| **Meniscus function** | ○ The meniscus provides stability, absorbs shock, increases articular congruity, aids in lubrication, prevents synovial impingement, and limits extremes flexion/extension.<br>○ 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. |
| **Epidemiology of meniscus injuries** | ○ Meniscus injuries are among the most common injuries seen in orthopaedic practices.<br>○ Arthroscopic partial meniscectomy is one of the most common orthopaedic procedures. in the past they used to do partial meniscectomy but now we avoid this procedure because it increases the risk of osteoarthritis. |

| | |
|---|---|
| |     <br>Bucket handle tear Normal Mechanical block Torn (rupture) cartilage |
| **Incidence** | ○ Meniscal tears are unusual in patients younger than age 10 years.<br>○ 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.<br>○ **Middle-aged** and older adults can sustain meniscus tears from **squatting** or falling. As we age, the meniscus cartilage becomes more fragile, and it is possible to tear the meniscus cartilage by simply squatting. |
| **History** | ○ 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.<br>○ 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<br>○ Chronic meniscal tears demonstrate intermittent effusions with mechanical symptoms |
| **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. Tenderness is a most **sensitive** sign<br>○ Manipulative maneuvers, including the McMurray and Apley tests, may produce a palpable or audible click with localized tenderness, but they are not specific for meniscal pathology.<br>○ Range of motion is typically normal, but longitudinal bucket-handle tears may block full **extension** of the knee joint. |
| **Imaging** | ○ Standard knee radiographs should be obtained for evaluating for: Bone injuries or abnormalities, Osteoarthritis.<br>○ **MRI** remains the noninvasive diagnostic **procedure of choice for confirming** meniscal pathology<br>        |
| **Differential diagnosis:** | ○ Differential diagnosis Prior to MRI, several large studies demonstrated accuracy of the clinical diagnosis of meniscus tears to be 70% to 75%.<br>○ The differential for meniscus tears includes intra-articular and extra-articular diagnoses:<br>- **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. |
| **Nonsurgical Management** | **Nonsurgical:**<br>○ Not all meniscus tears cause symptoms, and many symptomatic tears become asymptomatic.<br>○ **Nonsurgical management include:** ice, NSAIDs, or physical therapy for range of motion and general strengthening of the lower extremities. they respond well<br>**Surgical:** no need for surgery unless it disturbs his life his daily activities not his hobbies or there is pain or mechanical block<br>o Failure of conservative treatment<br>o Locked knee<br>o Concomitant ACL surgery. We do meniscectomy with ACL reconstruction.<br><br>**Type of surgical intervention:**<br>○ Excision (Arthroscopic partial/subtotal/ or total meniscectomy) in the past they used to do partial meniscectomy but now we avoid this procedure because it increases the risk of osteoarthritis.<br>⇒ Repair first choice |

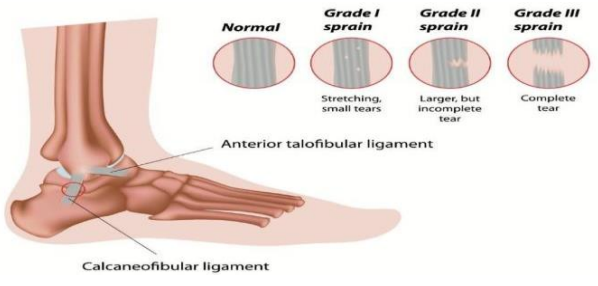
# Ankle Sprain

## ★ Characteristics:

- Ankle sprain is a common sports related injury. more than ACL
- Lateral sprains accounting for 85% of all such injuries.
- 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 heel shoes

## ★ Classification of Acute Lateral Ankle Sprains:

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



## ★ 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; consists of 4 (RICE-proper shoes - brace - physiotherapy)

- Initial treatment consists of RICE.
- 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.
- 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.
- Ninety percent of acute ankle sprains resolve with RICE and early functional rehabilitation.

**#Surgical management:** Surgery is a reasonable option when an adequate trial of nonsurgical treatment fails to control symptoms for grade III.