

Knee Joint Disorders

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* Knee joint

- Modified Hinge joint (tibiofemoral)

- cephalic and caudal movement by (patellofemoral)

[* Dynamic stabilizers → Muscles
Quadriceps and hamstrings

* Static stabilizers →

Shape of joint + ligaments surrounding
the joint

↳ Intraarticular + Extra articular

- ACL

- MCL

↳ medial epicondyle
with

* Lateral Minsus is less fixed than the medial

↳ bec the ligament isn't
well attached

Contents

- Anatomy.
- Common symptoms.
- Deformities of the knee.
- Soft tissue injure.
 1. Lesions of the menisci.
 2. Acute knee ligaments injuries.

- Osteochondritis dissecans.
- Loose bodies.
- Patellofemoral disorders.
 1. Recurrent dislocation of the patella.
 2. Chondromalacia of the patella.
- Tibial tubercle 'apophysitis'.
- Chronic ligamentous instability.
- Patellar tendinopathy

Anatomy:

- The knee joint is the largest and most complex joint of the body.
- It is a modified hinge joint (it permits slight internal and external rotation at flexed knee).
- It consists of **three joints** within a single synovial cavity:
 - ❑ **Lateral tibiofemoral joint**, between the lateral condyle of the femur, lateral meniscus, and lateral condyle of the tibia.
 - ❑ **Medial tibiofemoral joint**, between the medial condyle of the femur, medial meniscus, and medial condyle of the tibia. (carries about 90% of the load during weight bearing).
 - ❑ An intermediate **patellofemoral joint** is between the patella and the patellar surface of the femur.



more stable than the lateral meniscus

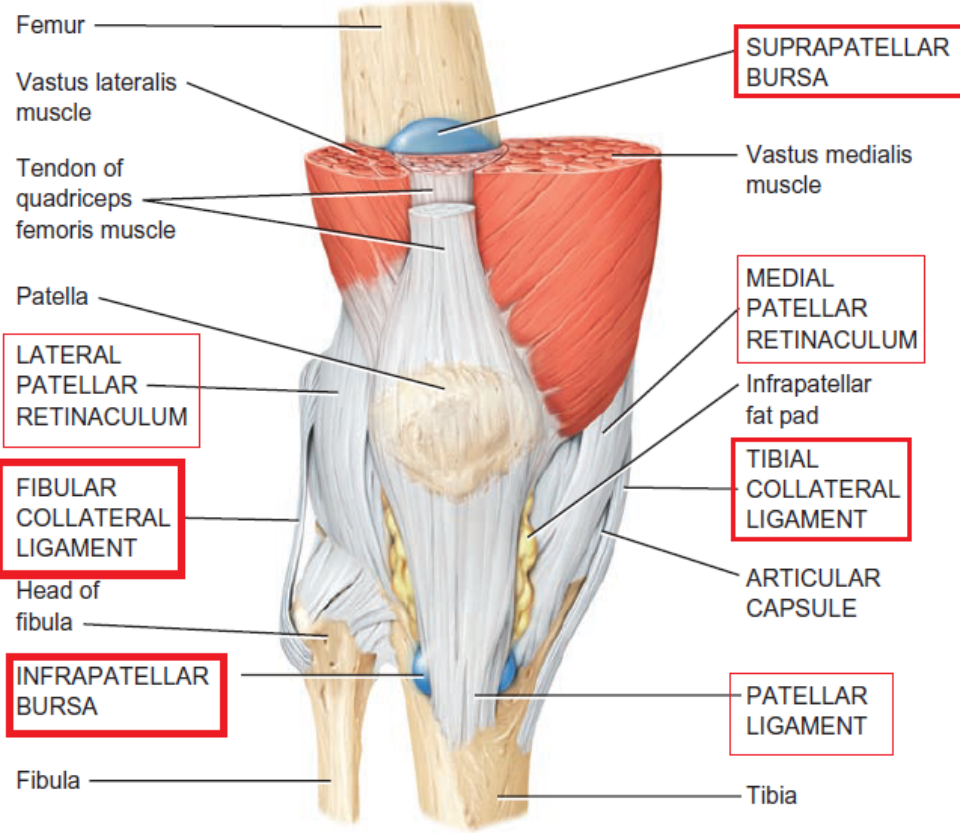
Anteriorly

○Anatomical components:

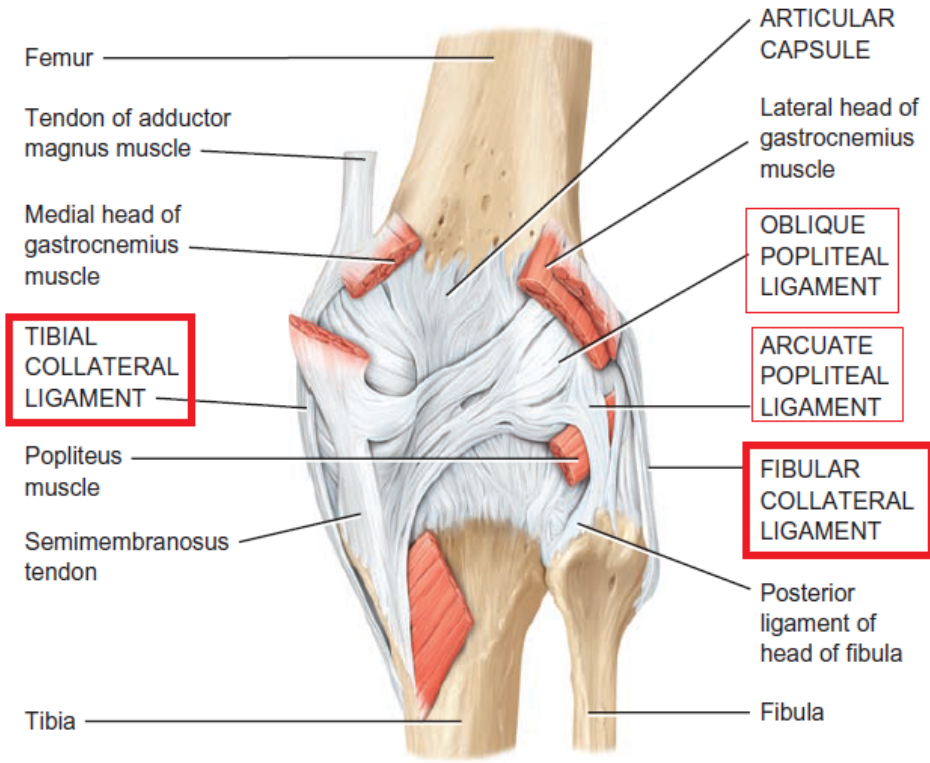
- ❑ **Patellar ligament:** This continuation of the common tendon of insertion of the quadriceps femoris muscle extends from the patella to the tibial tuberosity. (anterior support).
- ❑ **Oblique popliteal ligament** (posterior support).
- ❑ **Tibial (medial) collateral ligament:** extends from the medial condyle of the femur to the medial condyle of the tibia (medial support).

The tibial collateral ligament is firmly attached to the medial meniscus.

- ❑ **Fibular (lateral) collateral ligament:** extends from the lateral condyle of the femur to the lateral side of the head of the fibula (lateral support).
- ❑ **Medial and lateral patellar retinacula.** (anterior support)
- ❑ **Arcuate popliteal ligament.** (posterior support)



(e) Anterior superficial view



(f) Posterior deep view

○ Intracapsular ligaments:

= crossing
↓

☐ The **anterior and posterior cruciate ligaments** are named based on their origins relative to the intercondylar area of the tibia.

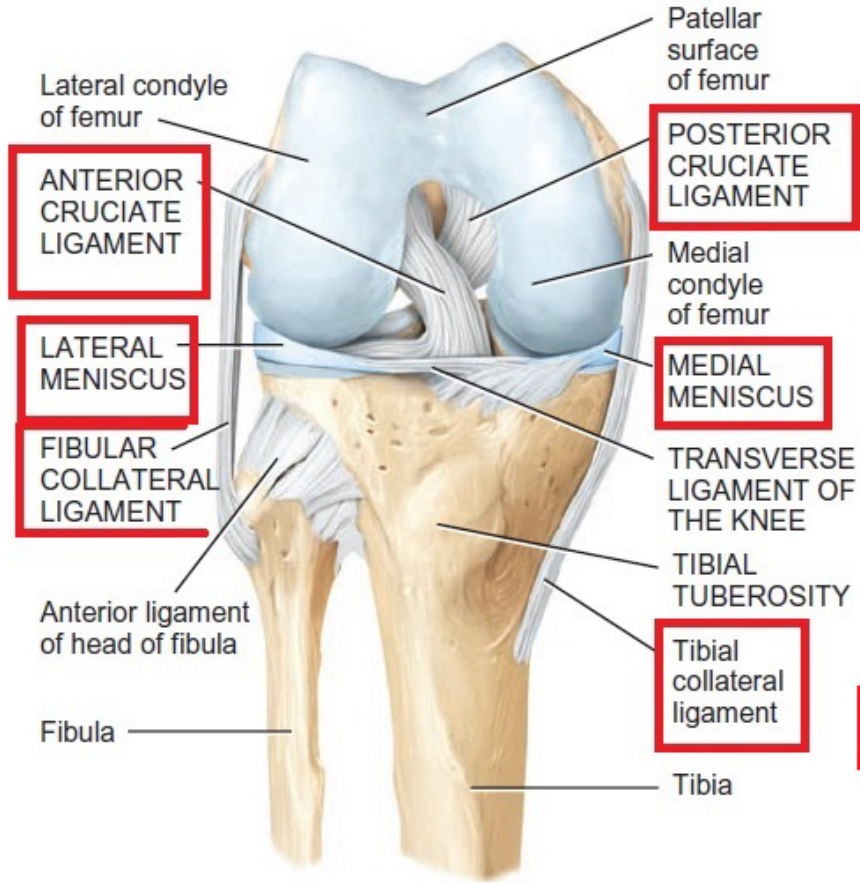
☐ From their origins, they cross on their way to their destinations on the femur.

☐ The **ACL** limits hyperextension of the knee and prevents the anterior sliding of the tibia on the femur.

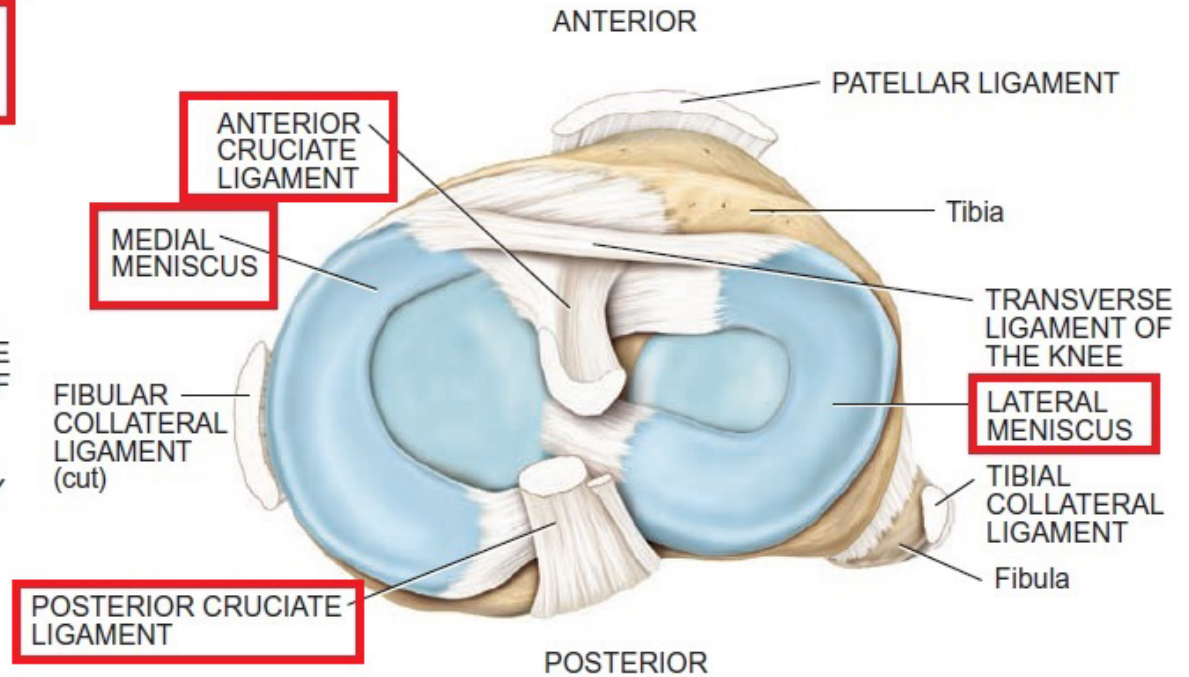
Antero lateral rotation
↙

☐ The **PCL** prevents the posterior sliding of the tibia when the knee is flexed, a very important function when you **walk down stairs** or a steep incline.

→ post tibia to post femoral condyle



(a) Anterior deep view



(b) Superior view of menisci

* more circular than the medial

○ **Articular discs (medial and lateral menisci):** *Shock absorbing cartilage.*

1. Increasing the stability of the knee.
2. Control the complex rolling and gliding actions of the joint.
3. Distributing load during movement.
4. *2 way stabilizer for the knee*

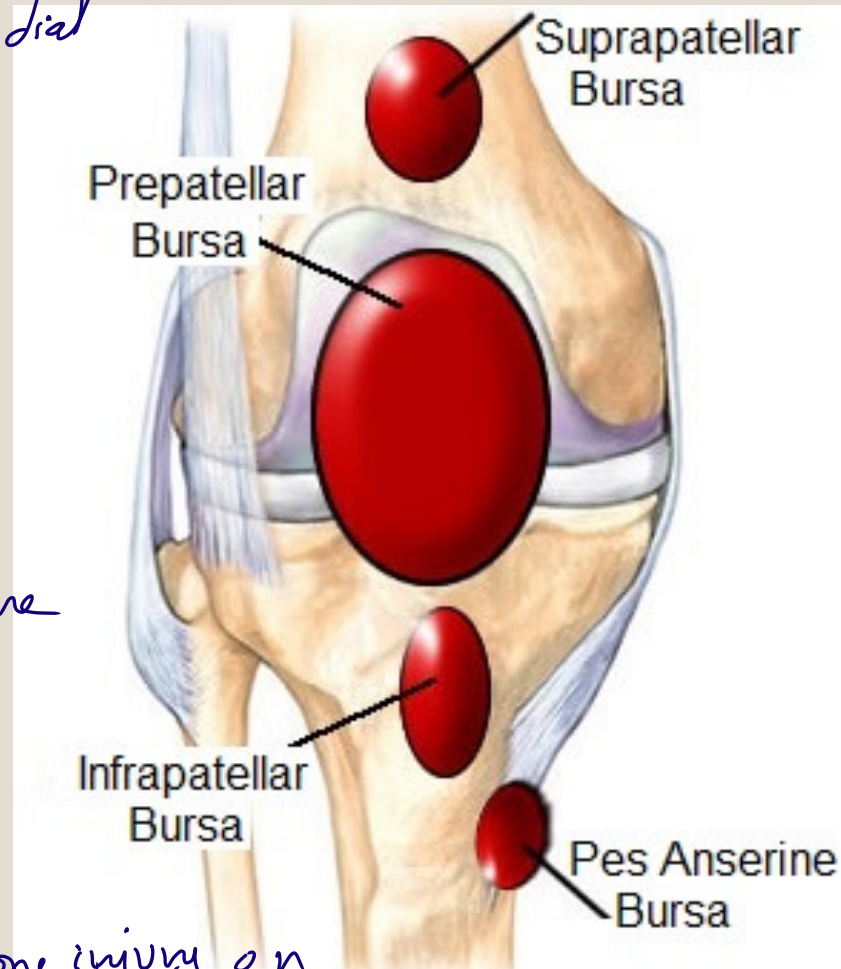
○ **Bursae:**

cyst like

- a) Prepatellar bursa.
- b) Infrapatellar bursa.
- c) Suprapatellar bursa.

D) Pes Anserine Bursa

** They lower the friction of bone*



** more injury on knee will be on flexion*

○ Common symptoms of knee disorder:

1. **Pain** (the most common symptom):

☐ **Diffuse**: in inflammatory or degenerative disorders.

☐ Gradual in onset with *osteoarthritis*.

☐ Sudden and severe with *gout or infection*.

☐ **Localized**: in mechanical disorders (meniscus or ligament).

2. **Swelling** (diffuse vs. localized // acute vs chronic) **see below**

3. **Stiffness**: poor flexibility of the joint/ pain on moving / lose of motion / loss of range of motion (sign)

4. **Locking** : one minute it moves perfectly and the next it can still flex as before but it cannot extend fully.

☐ **Pseudolocking**: when movement suddenly stopped by pain the fear of impending pain. → when you can't move your knee bec you're afraid of pain.

* Stiffness → the whole joint is involved / Generalized disorder within the joint

* Block → certain motion stopped, once the cause is removed the motion is back to normal
↳ mechanical cause

5. Deformity.

- **Giving way** the knee suddenly "gives out" → Related to structure
- The cause is usually ligamentous injury, most commonly through ACL causing instability and giving way. It can be caused by fractures and patellar dislocation.

7. Loss of function:

- A. Difficulty in standing up from a low chair.
- B. Progressively diminishing walking distance.
- C. Inability to run.
- D. Difficulty going up and down steps.

ex: LCL injury prevented the patient from stepping his leg bec he will fall

Acute swelling of the entire joint

Traumatic synovitis

Post traumatic hemarthrosis

Non-traumatic hemarthrosis

Acute septic arthritis

Aseptic inflammatory arthritis

Chronic swelling of the entire joint

Non-infective arthritis

Chronic infective arthritis

Swellings in front of the knee

Prepatellar bursitis

Infrapatellar bursitis

Swellings at the back of the knee

Semimembranosus bursa enlargement

Popliteal cyst

Popliteal aneurysm

Swellings at the side of the joint

Meniscal cyst

Calcification of the collateral ligament

Bony swellings

○ **PHYSIOLOGICAL BOW-LEGS AND KNOCK-KNEES:**

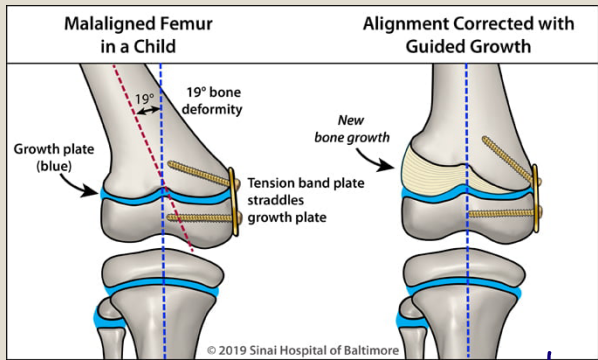
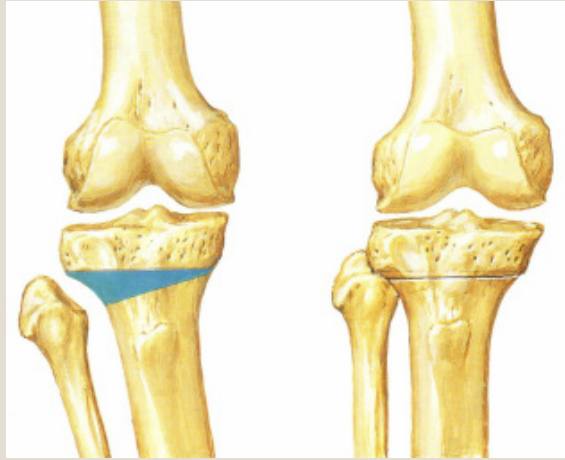
- ❓ Bow-legs in babies and knock-knees in 4 year-olds are so common that they are considered to be stages of normal development.
- ❓ Bilateral bowlegged appearance can be recorded by measuring the distance between the knees with the child standing and the heels touching; it should be less than **6 cm.**
- ❓ Similarly, knock-knee can be estimated by measuring the distance between the medial malleoli when the knees are touching with the patellae facing forwards; it is usually less than **8 cm.**

Deformities of the knee

born with bowlegs → fixed at 2 months →

genu valgus
↓
becomes
knock knee → fixed
Later in
life

All children born with genu varus then become genu valgus } } "physiological"



* Blounts Disease → they have genu varus

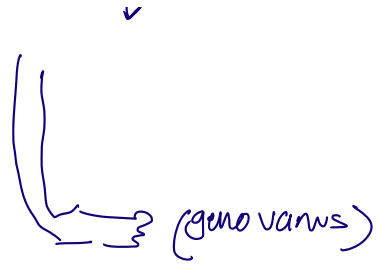
- ❓ In the occasional case where, by the age of 10 years, the deformity is still marked, operative correction can be offered.
- ❓ This is done by inserting a **staple or small plate** on the side of the physis (the convex side of the deformity) that needs growth restriction (hemi-epiphyseodesis) ----- vs. osteotomy
- ❓ When the deformity has been corrected, the staple or plate is removed.

to control a deformity you can control the Growth

* epiphysodesis

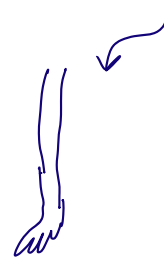


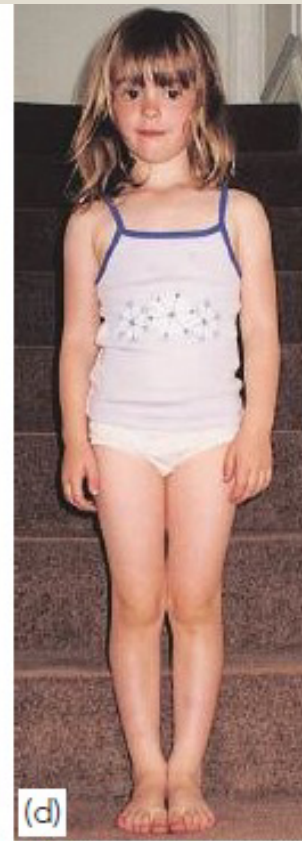
to control the Growth



in this case stop the Plate of Growth Laterally

let the medial Grow





○ Two sisters with natural self-correcting 'deformities' of the knees. (a,b) Tamzin at 1½ and 2½ years; (c,d) Jessy at 3 and 4½ years.

valgus
varus

○ Pathological bow-legs and knock-knees in children:

❓ **Unilateral deformity:** usually caused by eccentric growth from the physis of the distal femur or proximal tibia; this may result from rickets, injury, infection, or an inherent growth disorder.

❓ **Severe bilateral deformity.**

○ Pathological bow-legs and knock-knees in adults:

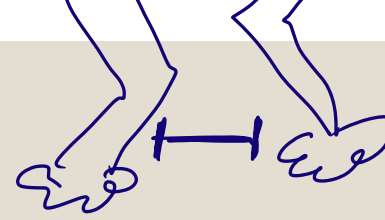
- ❑ Usually bow-legs in men and knock-knees in women.
- ❑ While this may be a sequel to a childhood problem, the deformity usually arises from an asymmetrical cartilage or bone loss on one side of the joint, e.g. in osteoarthritis, rheumatoid arthritis, subchondral fractures or Paget's disease.
- ❑ Provided the joint is stable, a corrective osteotomy may be all that is required.
- ❑ However, a *unilateral ligament injury* may also cause an *unstable valgus or varus* deformity; this will call for ligament reconstruction.
- ❑ In some cases partial or total joint replacement will be needed.

→ way of measuring:

* by x-ray and measure distance

* Intercondylar distance if genu varus

* in genu valgum measure the Intermalleolar distance



SOFT TISSUE INJURE

The knee joint is the joint most vulnerable to damage because:

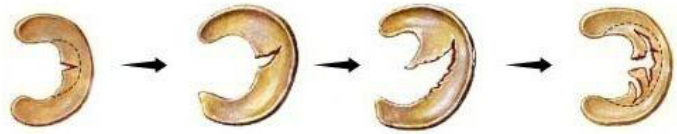
- ❑ It is a mobile, weight-bearing joint.
- ❑ Its stability depends almost entirely on its associated ligaments and muscles.
- ❑ The articular surfaces have only minimal contact throughout the range of motion.

Lesions of the menisci

Meniscal tear:

- **The medial meniscus** is **less mobile** than the lateral and, the medial compartment of the knee **carries about 90%** of the load during weight bearing.
- Accordingly, the meniscal lesions are more common on the medial side than the lateral.

The firm attachment of the tibial collateral ligament to the medial meniscus is clinically significant, because tearing of the ligament also typically results in tearing of the meniscus.



A: Radial Tear (small) Radial Tear (large) Progresses to a Flap Tear Progresses to Complex or Degenerative Tear



B: Flap Tear Flap Tear Double Flap Tear C: Discoid Meniscus

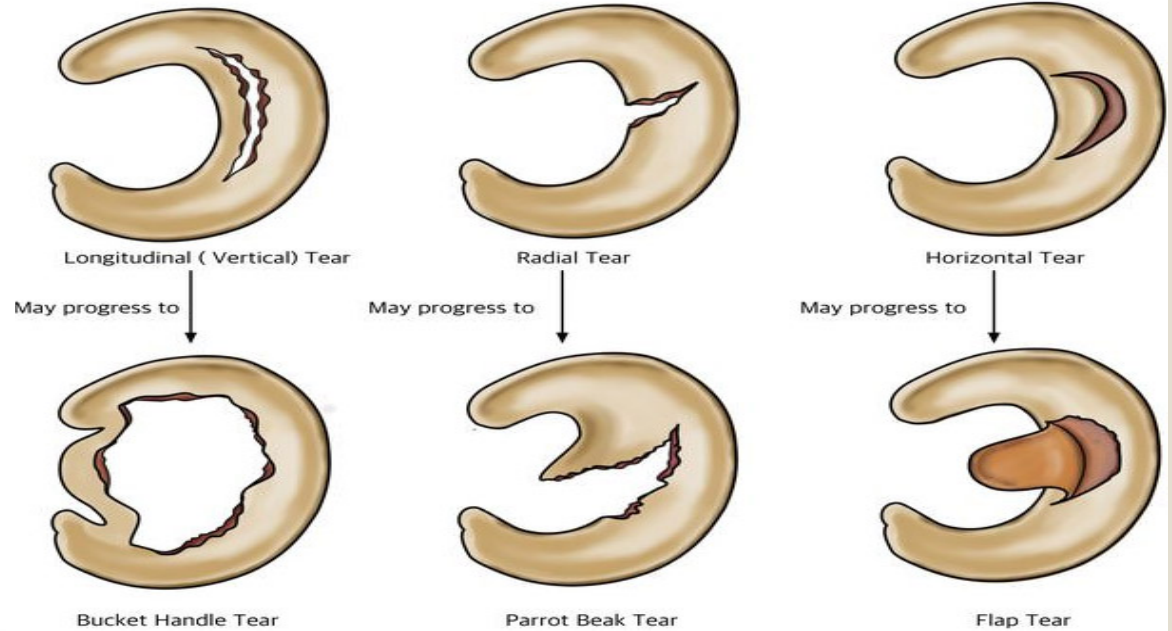


D: Peripheral Tear Repaired Peripheral Tear E: Horizontal Flap Tear Displaced Flap Tear (horizontal)



F: Longitudinal Tear (short) Longitudinal Tear (long) Longitudinal Tear (displaced bucket-handle)

Different Types Of Meniscus Tear

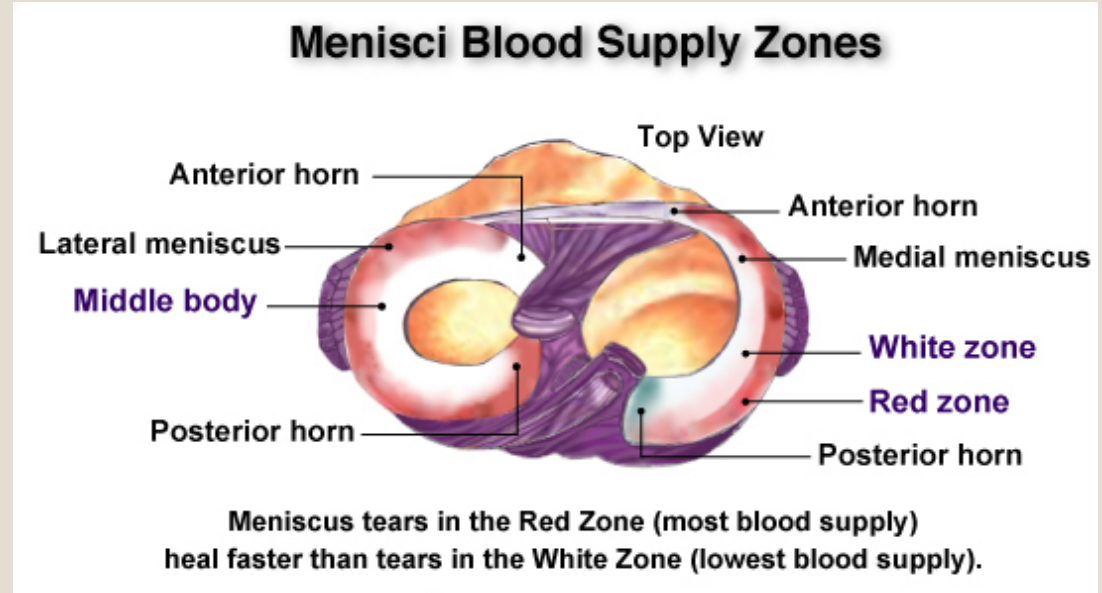


* This will trap the femoral condyle prevent some movements "locking"

LOCAL PHYSIO[®]

The torn portion sometimes **displaces** towards the center of the joint and, if **trapped** between femur and tibia, it can block the knee extending fully ('locking').

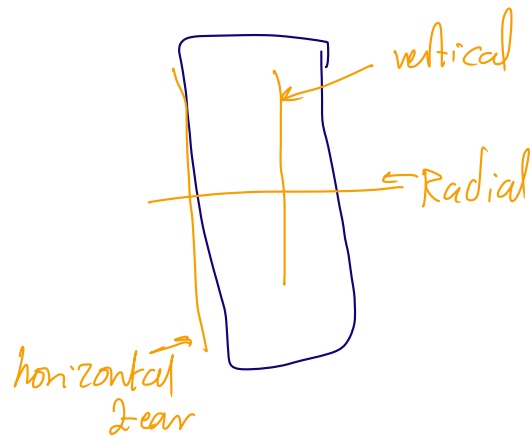
- Some tears, if **peripheral** (outer third), can heal after suture but others, closer to the **centre** of the joint, do not heal because they are avascular.



- * outer 1/3 is vascular
if torn → can be fixed ↑ chance of healing
- * inner 2/3 → Avascular → ↓ chance of healing

* collagen more with the direction of the meniscus fibers

Ant. horn → body → Post. horn .



* One of the causes of locking is → bucket handle tear

* Menisci injury → ↓ amount of bleeding bec avascular

But swelling can happen

* Bleeding with the joint the whole joint is affected

so it's stiffness.

Clinical features:

- ❑ **Pain** is often severe and further activity is avoided.
- ❑ Occasionally the knee is '**locked**' in partial flexion.
- ❑ **Swelling** appears a few hours later, or perhaps the following day.
- ❑ With rest the **initial symptoms subside**, only to recur periodically after trivial twists or strains.
- ❑ Sometimes the knee **gives way** spontaneously and this is again followed by pain and swelling.

○ **On examination:**

❓ The joint may be **held slightly flexed** and there is often an **effusion**.

❓ In late presentations, the **quadriceps will be wasted**.

❓ **Tenderness** is localized to the joint line, in the vast majority of cases on the medial side.

❓ Flexion is usually full but extension is often slightly limited.

❓ *McMurray's test, Apley's grinding test, Thessaly test.* } not sensitive to meniscal tear

The Most Sensitive Test

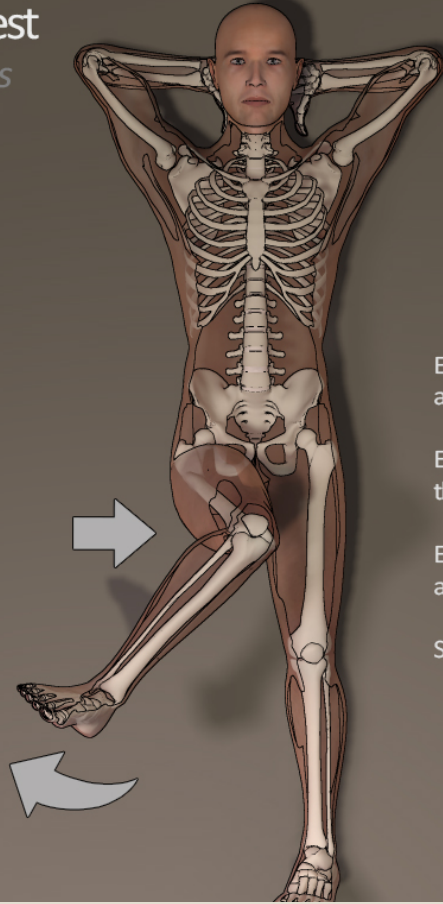
✳ joint line tenderness

once you palpate over the injured meniscus it's tender

the most sensitive is

McMurray Test

Medial Meniscus



Examiner applies one hand at knee along medial meniscus.

Examiner's other hand holds the foot and ankle.

Externally rotate the foot, and apply valgus stress at the knee.

Slowly extend the knee.

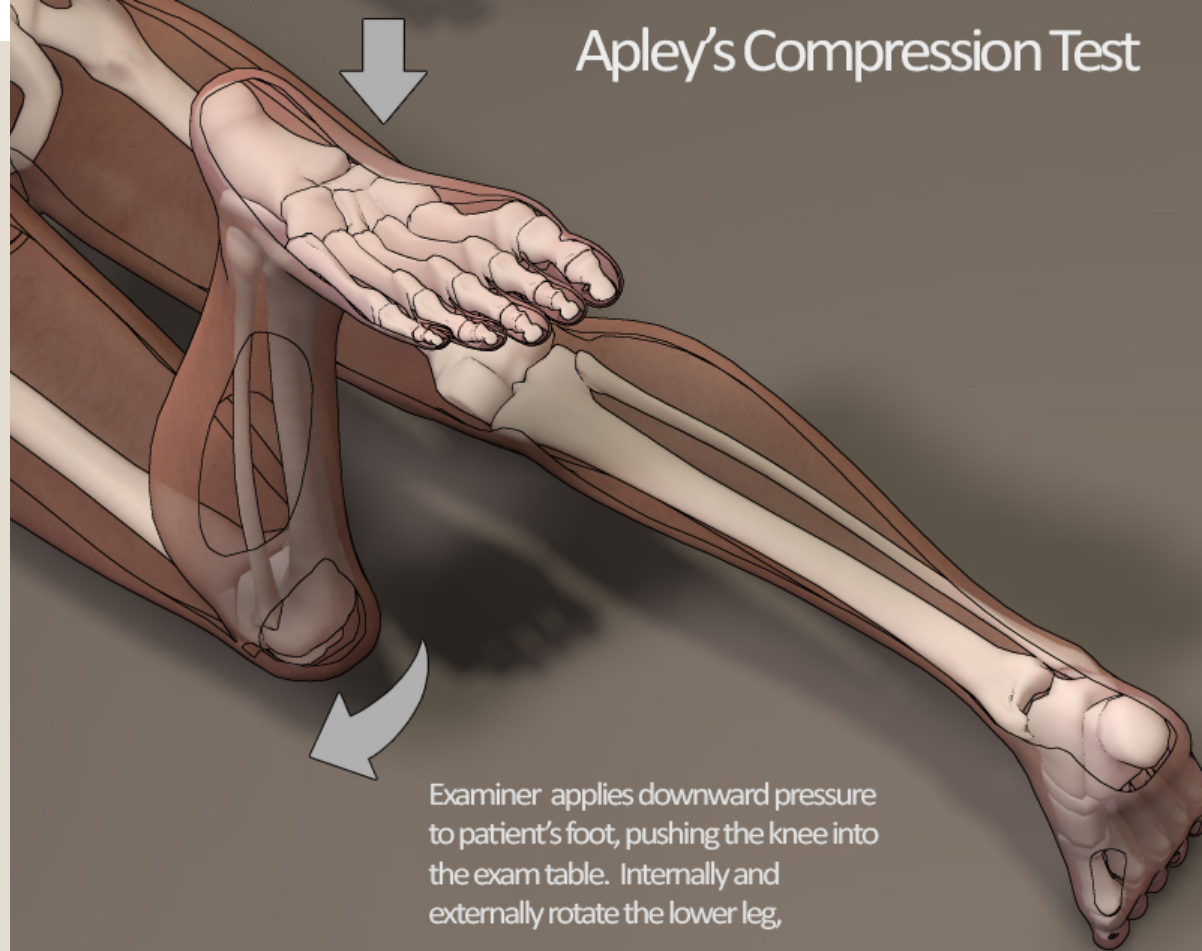
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McMurray's test is based on the fact that a loose meniscal tag can sometimes be trapped between the articular surfaces and then induced to snap free with a palpable and audible click.

A positive test is helpful but not pathognomonic and a negative test does not exclude a tear.

* on flexed knee like do rotation you will hear pop sound or like patient in pain

In Apley's grinding test the meniscus is forcibly compressed and the leg is rotated from side to side between the articular surfaces; a painful response signifies the likelihood of a torn or degenerate meniscus.

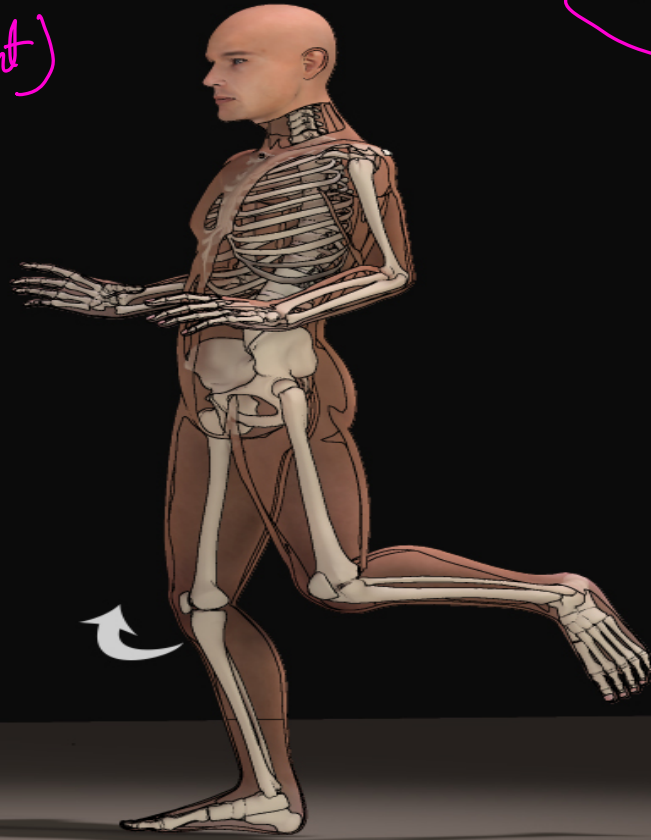


Thessaly Test

so The patient stands on leg (weight)
the flexion and
Rotation

Examiner supports
the patient by holding
their outstretched hands.

With the knee flexed 20°,
Patient pivots on knee,
internally and externally
rotating 3 times.



Diagnosis:

- ***Imaging:***

Plain x-rays are normal but **MRI** is a reliable method for confirming the diagnosis, and may even reveal tears that are missed by arthroscopy.

- ***Arthroscopy:***

Arthroscopy has the advantage that, if a lesion is identified, it can be treated at the same time. You have to be certain, though, that the lesion which you see is the one causing the patient's symptoms!

○ Treatment:

○ Treatment for a torn meniscus often begins conservatively:

- Rest
- Ice.
- Medication (over-the-counter pain relievers).

* RICE ?

TTT → Start Conservative

↓
Physiotherapy (strengthen the muscles to

○ Physiotherapy:

Physical therapy can **strengthen the muscles around the knee** and in legs to help stabilize and support the knee joint.

○ Surgery:

- If the knee **remains painful** despite rehabilitative therapy
- If the knee **cannot be unlocked**.

help pair weight)
←
if none worked?

☐ It's sometimes possible to repair a torn meniscus, especially in **children** and **young** adults.

☐ If the tear can't be repaired, the meniscus might be surgically trimmed (**Partial meniscectomy**), possibly through tiny incisions using an arthroscope. After surgery, physiotherapy is needed to optimize knee strength and stability.

surgery → Remove the

Meniscal cysts:

- It is probably traumatic in origin, arising from either a **small horizontal tear** or **repeated squashing of the peripheral part of the meniscus**.
- It contains gelatinous fluid and is surrounded by fibrous tissue.
- The patient presents with pain and a small lump can be seen and felt, usually on the lateral side of the joint; it may feel surprisingly firm (or tense), particularly when the knee is extended.
- If the symptoms are sufficiently troublesome, the cyst can be decompressed or removed arthroscopically; any meniscal lesion can be dealt with at the same time.

✓ more common on the lateral side b.c the MCL is attached to the medial meniscus but the LCL not attached to the lateral meniscus.

part of the meniscus
↖

✗ But the knee shock absorber is removed so faster degenerative changes than normal people will happen

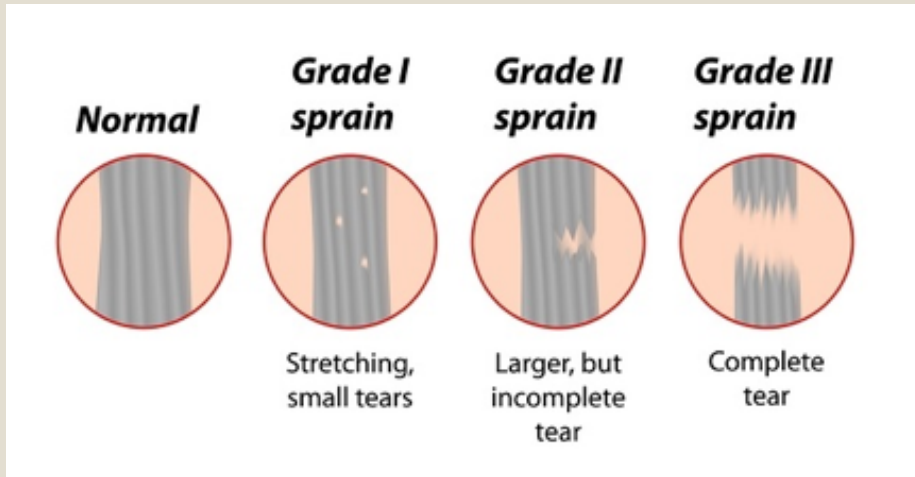
ACL Tear



Acute knee ligaments injuries

- Injuries of the knee ligaments are common, particularly in **sporting players** but also in **road accidents**, where they may be associated with fractures or dislocations.
- They vary in severity from a **simple sprain** to **complete rupture**.

It is important to recognize that these injuries are seldom 'unidirectional'; they often involve more than one structure and it is therefore useful to refer to them in functional terms (e.g. anteromedial instability) as well as anatomical terms (e.g. torn MCL and ACL).



GRADE 1

- Mildly damaged.
- Slightly stretched, but is still able to help keep the knee joint stable.

• <50% fibers ruptured

GRADE 2

- Becomes loose.
- Referred to as a partial tear of the ligament.
- Rarely occur.

• >50% + some still in contact

GRADE 3

- Most commonly referred to as a complete tear.
- The ligament has been split into two pieces, and the knee joint is unstable.

• Complete tear

Clinical features:

* ACL → the most affected knee injury is ACL tear

- The patient gives a history of a twisting or wrenching injury and may even claim to have heard a 'pop' as the tissues snapped.
- The ACL is usually torn as a result of a quick deceleration, hyperextension or rotational injury that usually does not involve contact with another individual.
- The knee is painful and, in contrast to the story in meniscal injury, swelling appears almost immediately.
- Tenderness is most acute over the torn ligament, and stressing one or other side of the joint may produce excruciating pain.
- Partial tears permit no abnormal movement, but the attempt always causes pain. Complete tears permit abnormal movement, which sometimes causes surprisingly little pain.

* MCL and LCL injury won't cause haematoma bec
klyne outside the joint

Physical Examination:

* ACL + PCL ? even though vascularized
are vascularized + inside the joint → haemarthrosis

○ *Collateral ligaments*: The medial and lateral ligaments are tested by stressing the knee into valgus and varus respectively.

○ *Cruciate ligaments*:

sag sign (PCL).

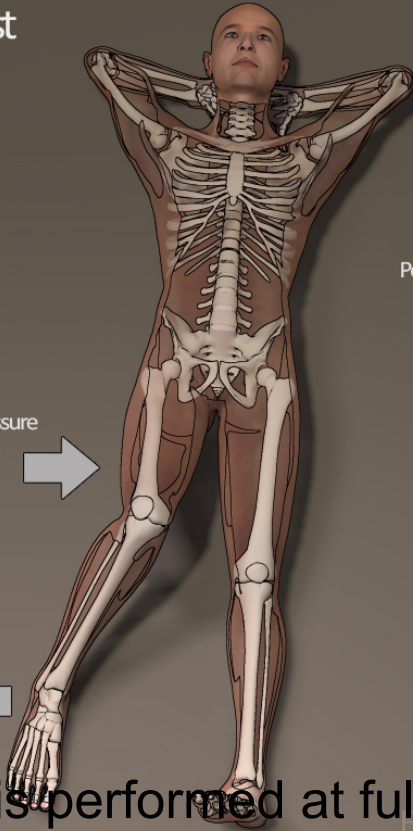
drawer test.

Lachman test.

Movement is compared with the normal side.

Valgus Stress Test

Medial
Collateral
Ligament



Perform maneuver twice:

1. Knee flexed 0°
2. Knee flexed 30°

Examiner applies inward pressure at lateral thigh with one hand.

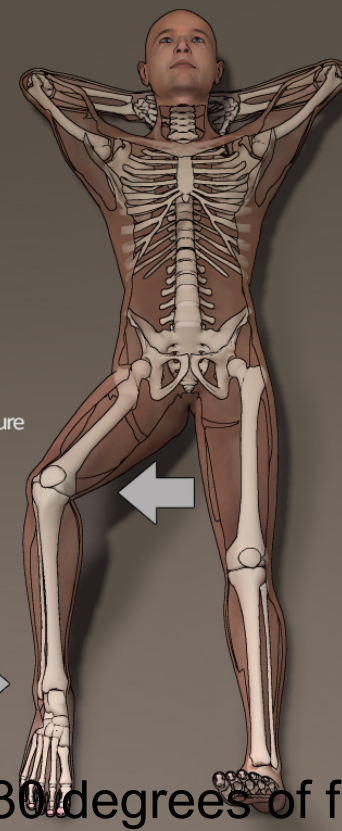


Examiner applies outward pressure from medial ankle with other hand.



Varus Stress Test

Lateral
Collateral
Ligament



Perform maneuver twice:

1. Knee flexed 0°
2. Knee flexed 30°

Examiner applies outward pressure at medial thigh with one hand.



Examiner applies inward pressure from lateral ankle with other hand.



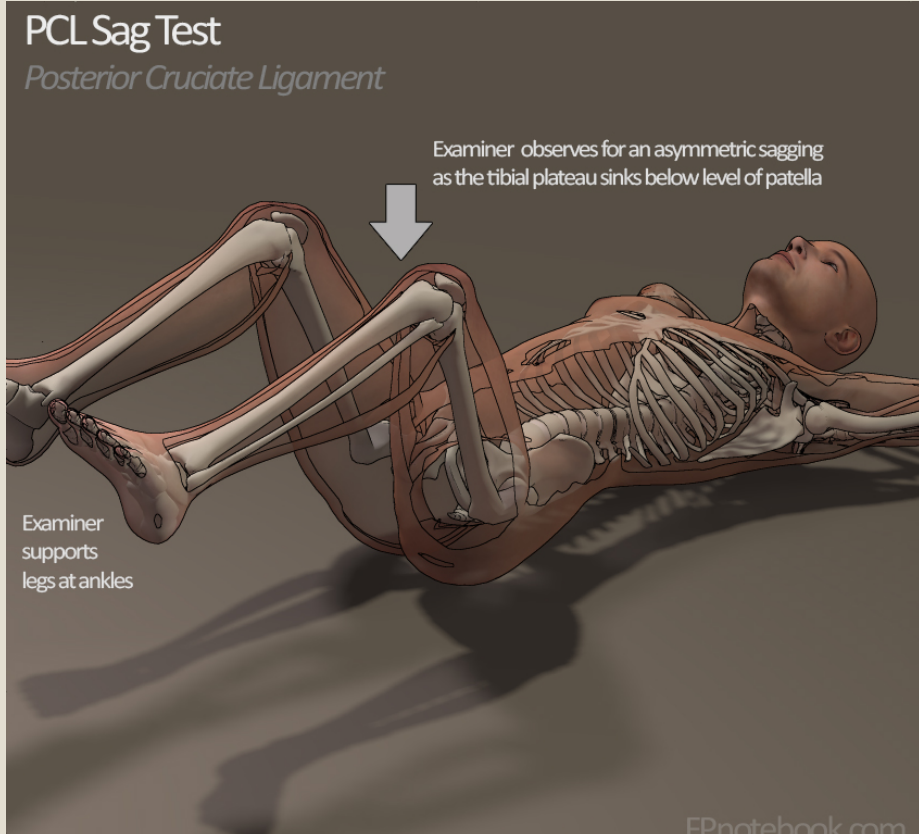
- ❓ The test is performed at full extension and again at 30 degrees of flexion.
- ❓ There is normally some mediolateral movement at 30 degrees, but if this is excessive (compared to the normal side) it suggests a torn or stretched collateral ligament.

Stress the knee medial → you press on the one penetrating the knee

(medial = medial)

from going medially \rightarrow LCL

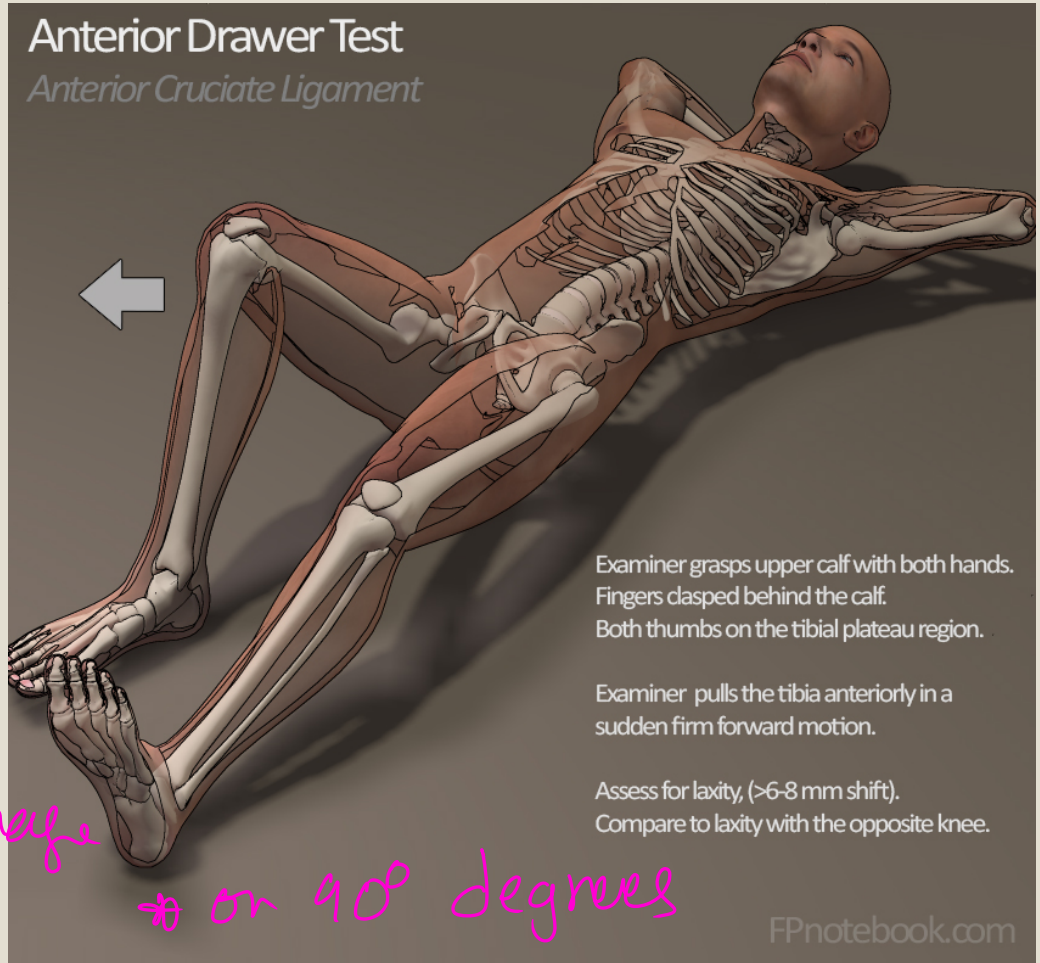
press laterally \rightarrow MCL



* MCL + LCL \rightarrow 2 way stabilization, \rightarrow prevent varus and valgus

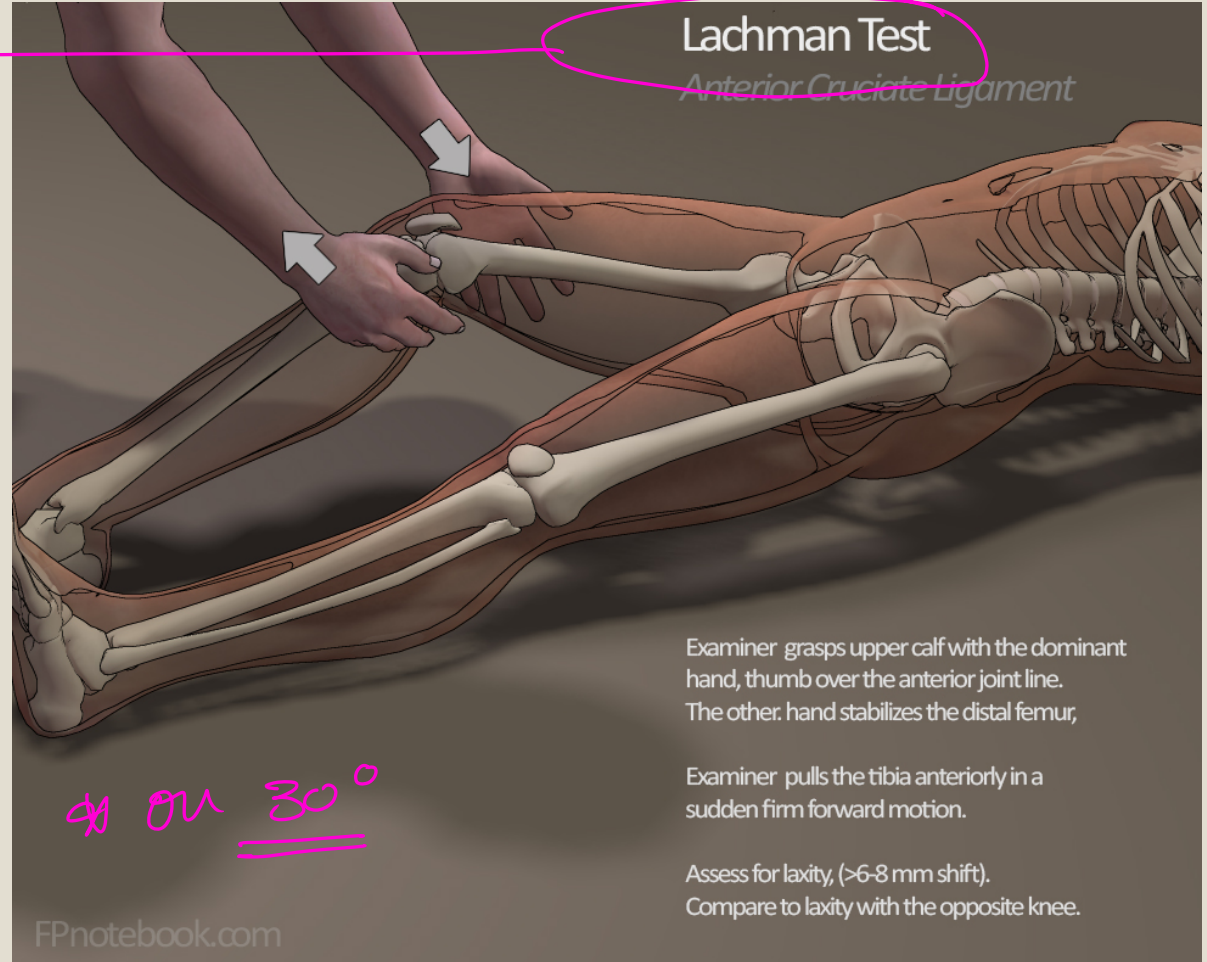
- Excessive anterior movement (a positive anterior drawer sign) denotes anterior cruciate laxity; excessive posterior movement (a positive posterior drawer sign) signifies posterior cruciate laxity.

if Drawer Anterior → ACL damage
post → PCL



The most sensitive
for ACL damage

- More sensitive is the *Lachman test*, but this is difficult if the patient has big thighs (or the examiner has small hands).
- If the knee is stable, there should be no gliding.



- Stress x-rays of the knee may provide visual evidence of instability.
- Plain x-rays may show that the ligament has avulsed a small piece of bone:
 - ☐ The MCL usually from the femur.
 - ☐ The LCL from the fibula.
 - ☐ The ACL from the tibial spine.
 - ☐ The PCL from the back of the upper tibia.
- Another sign is an avulsion fracture off the edge of the lateral tibial condyle (the so-called Segond fracture), indicating an ACL injury.
- A magnetic resonance imaging (MRI) scan is usually requested. This is especially good at identifying ligament injuries.

Diagnosis:

ACL is the one which needs reconstruction, bec it happens in young ages and athletes

while other lig. injury ttt is conservative

Treatment

○ *Sprains and partial tears:*

- ☐ The intact fibres splint the torn ones and **spontaneous healing** will occur.
- ☐ The **hazard is adhesions**, so active exercise is prescribed from the start.
- ☐ **Aspirating the hemarthrosis** may help ease the pain.
- ☐ Applying **ice-packs** intermittently also helps relieve pain.
- ☐ Weightbearing is allowed, but the knee is protected from rotation or angulation strains by a heavily **padded bandage or a functional brace**.
- ☐ A complete **plaster cast is unnecessary** and **disadvantageous**, as it inhibits movement.

-hemarthrosis: bleeding in the joint cavity and can be identified from proper history, PE and investigations & the best way of diagnosis is to perform arthrocentesis and synovial fluid analysis.



Padding bandage



Functional brace

Treatment

- *Complete tears:*

CRITERIA OF ACL rupture:

- immediate hemarthrosis.
- twisting injury.
- out of field.

❓ Isolated tears of the **MCL** or the **LCL** can be treated as above.

❓ Isolated tears of the **ACL** may be treated by early operative reconstruction if the individual is **a professional sportsman. (ACL reconstruction is recommended in professional athletes, runner, failure of conservative management twice).**

❓ In all other cases, it is more prudent to follow the **conservative** regimen described above; the cast-brace is worn only until symptoms subside.

❓ A significant proportion of patients regain sufficiently good function **not to need further treatment**. The remainder complain of varying degrees of instability.

❓ Whether the treatment involves surgery or not, **rehabilitation** plays a vital role in getting the patient back to his daily activities.

❓ Isolated tears of the **PCL** are usually treated conservatively.

Treatment



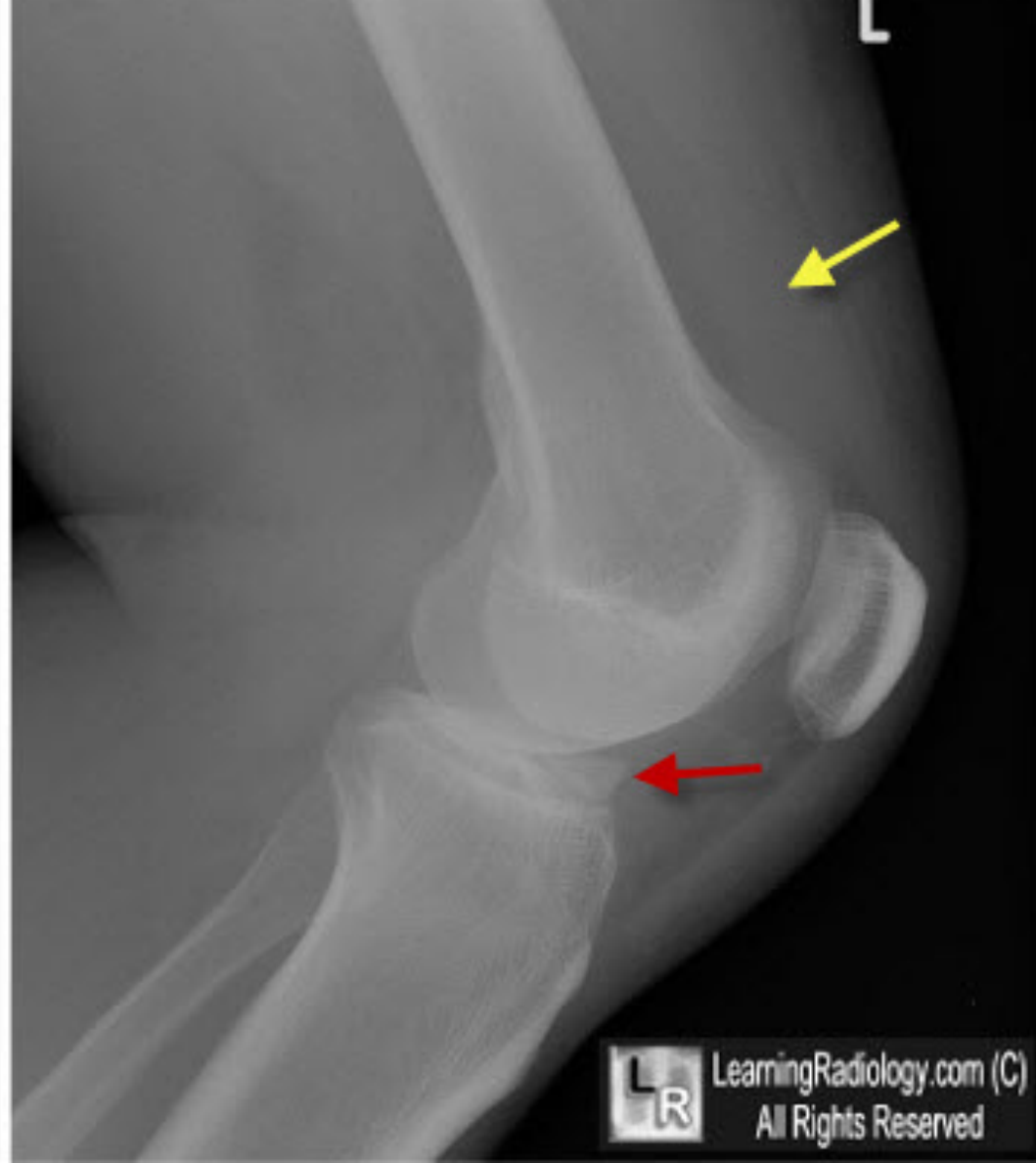
- *Avulsion fractures of the tibial intercondylar eminence:*

due to a **forced hyperextension coupled with lateral or rotational movement**

between the femur and tibia, which place a pathological force upon

the anterior cruciate ligament (ACL) that, instead of tearing the ligament, causes an avulsion of the tibial spine bone that the ACL is rooted into.

- ❓ Sometimes a severe strain in the younger patient, ***instead of rupturing a cruciate ligament, results in an avulsion fracture at the insertion of the ligament.***
- ❓ The fragment may be only partially displaced and difficult to detect on x-ray.
- ❓ If the fragment **can be manipulated back** into position and **allows full extension** of the knee, **immobilization in a plaster cylinder for 6 weeks will suffice.**
- ❓ If the fragment **cannot be reduced**, or if there is a block to full extension, **operative reduction and fixation** with strong sutures (or with small screws if the pysis has closed) will be needed.
- ❓ Full movement is usually regained within 3 months.



Treatment

- *Combined injuries:*

- ☐ With combined **ACL and collateral** ligament injury, it is wiser to start treatment with joint bracing and physiotherapy in order to restore a good range of movement before following on with ACL reconstruction.

- ☐ The collateral ligament does not usually need reconstruction.

- ☐ A similar approach is adopted for combined injuries involving the PCL, but here all damaged structures will need to be repaired.

Complications

- *Adhesions:*

- ❑ If the knee with a partial ligament tear is not actively exercised, torn fibres stick to intact fibres and to bone.
- ❑ The knee 'gives way' with catches of **pain**; localized **tenderness** is present, and pain occurs on medial or lateral rotation.
- ❑ The obvious confusion with a torn meniscus can be resolved by repeating an **MRI**.

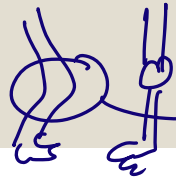
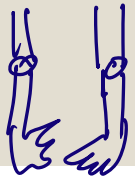
Complications

○ *Instability:*

- ❑ The instability tends to get worse and ultimately predisposes to **osteoarthritis** (OA).
- ❑ Reconstruction before the onset of cartilage degeneration is wise.
- ❑ If OA is already present, ACL reconstruction may mean that the patient will have to accept more pain from their degenerative disease in return for gaining stability.
- ❑ This has to be *discussed with the patient* before deciding on the best form of treatment.

O'Donoghue's triad (unhappy triad):

- The firm attachment of the tibial (medial) collateral ligament to the medial meniscus is clinically significant, because tearing of the ligament also typically results in tearing of the meniscus.
- Such an injury may occur in sports such as football and rugby when the knee receives a blow from the lateral side while the foot is fixed on the ground.
- The force of the blow may also tear the anterior cruciate ligament, which is also connected to the medial meniscus.
- The term **“unhappy triad”** is applied to a knee injury that involves damage to three components of the knee joint at the same time: the tibial collateral ligament, medial meniscus, and anterior cruciate ligament.



Damage to MCL then Medial Meniscus then ACL

منزل

- **A small, well-demarcated, avascular fragment of bone and overlying cartilage sometimes separates from one of the femoral condyles and later appears as a loose body in the joint.**
-
- **The most likely cause is trauma, either a single impact with the edge of the patella or repeated contact with an adjacent tibial ridge.**
- **The incidence appears to be increasing and this may parallel growing participation of adolescents in competitive sport.**
- **Over 80% of lesions occur on the lateral part of the medial femoral condyle and lesions are bilateral in 25% of cases.**

Osteochondritis dissecans

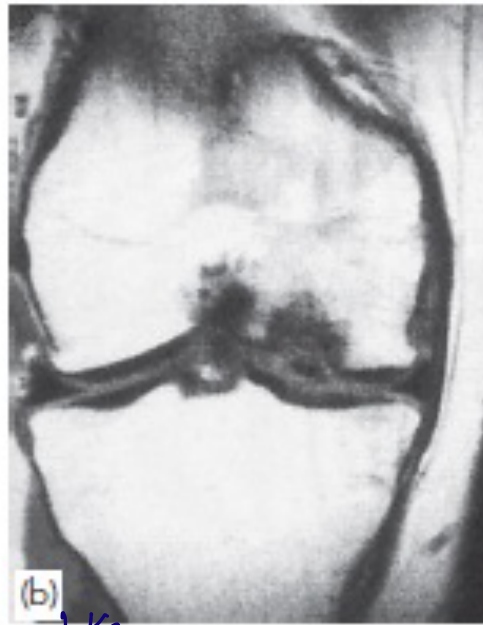
*↳ completely detached
can cause locking*

wilson test
Flex the knee
then medial
rotation of
knee, which
will cause pain

if you do
lateral rotation
the pain is
relieved

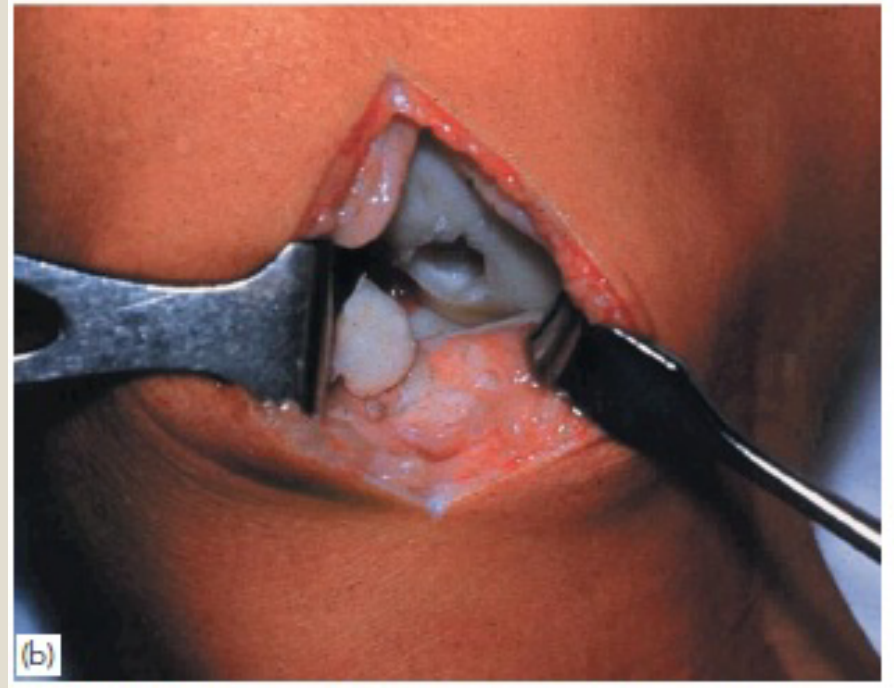
- **Clinical features:**
- The patient, usually a male aged 15–20 years, presents with intermittent ache or swelling.
- Later, there are attacks of giving way and the knee feels unreliable. From time to time the knee may 'lock'.
- The quadriceps muscle is wasted and the joint may be slightly swollen; there is usually a small effusion.
- **Two signs** which are almost diagnostic are: (a) **tenderness localized to one femoral condyle**; and (b) **Wilson's sign**: if the knee is flexed to 90 degrees, rotated medially and then gradually straightened, pain is felt; if the test is repeated with the knee rotated laterally, the patient feels no pain.
- **Imaging:**
- Plain x-rays, especially intercondylar (**tunnel**) views, may show a line of demarcation around a lesion, **usually in the lateral part of the medial femoral condyle**.
- Once the fragment has become **detached**, the empty hollow may be seen and **possibly a loose body elsewhere in the joint**.
- Radionuclide scans show increased activity around the lesion, and MRI consistently shows an area of low signal intensity in the T1-weighted images.

- **Treatment:**
- In the earliest stage, when the cartilage is intact and the lesion ‘stable’, no treatment is needed but activities are limited for 6–12 months. Small lesions often heal spontaneously.
- If the fragment is ‘unstable’ – i.e. surrounded by a clear boundary with sclerosis of the underlying bone, or showing MRI features of separation, or even detached – treatment will depend on the size of the lesion. A small or ill-fitting fragment should be removed by arthroscopy and the base drilled; the bed will eventually be covered by fibrocartilage.
- A large fragment (more than 1 cm in diameter) or one that can be shaped to fill the crater should be fixed in situ with pins or Herbert screws.
- After any of the above operations the knee is held in a cast for 6 weeks; thereafter, movement is encouraged but weight bearing is deferred until x-rays show signs of healing.
- In recent years attempts have been made to fill the condylar defect by cartilage transplantation. This should still be regarded as an experimental procedure.

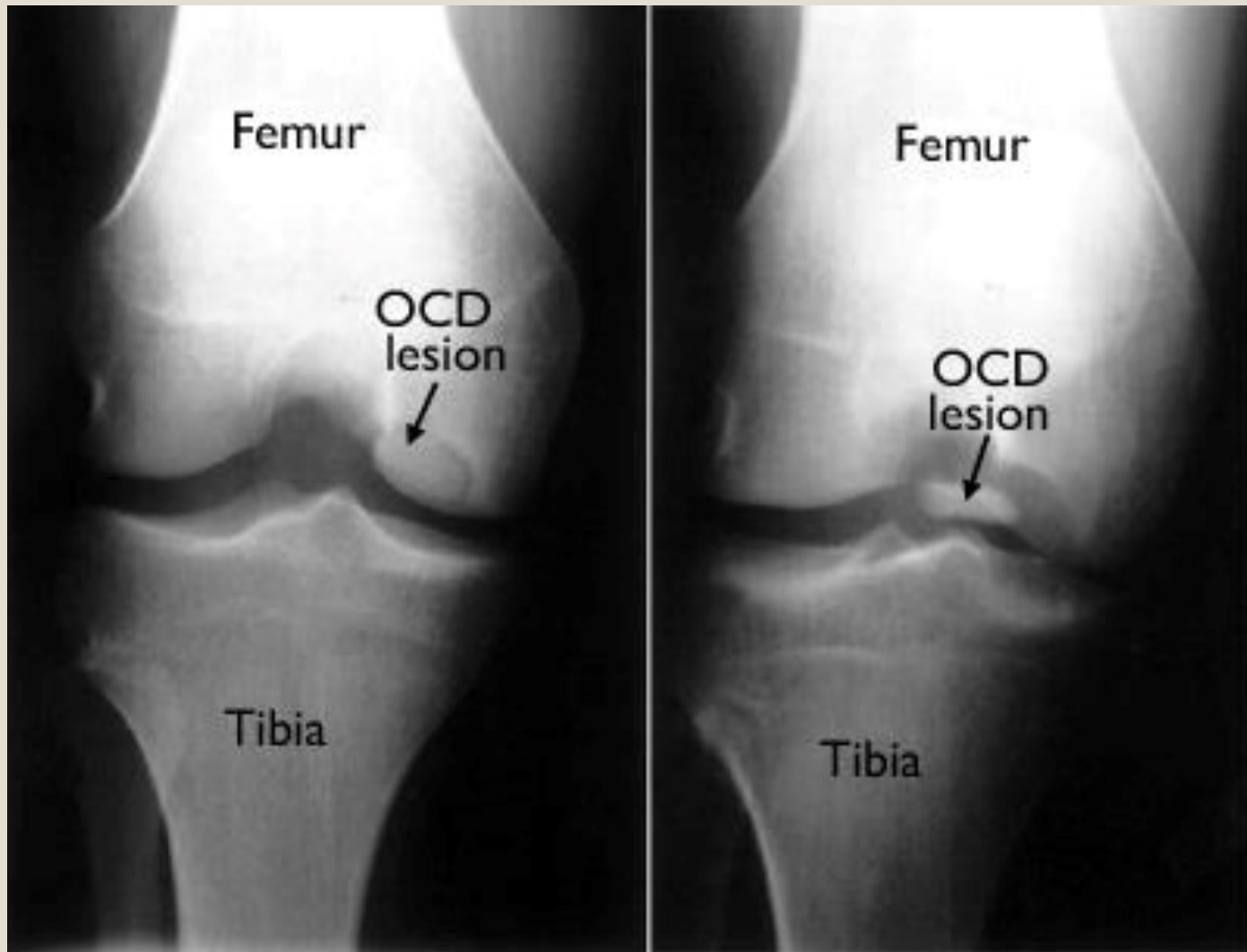


Disc like

7 Osteochondritis dissecans – imaging The lesion is best seen in the 'tunnel view', usually along the lateral side of the medial femoral condyle (a). Here the osteochondral fragment has remained in place but sometimes it appears as a separate body elsewhere in the joint. (b) MRI provides confirmatory evidence.



Lateral Aspect of femoral condyle is most common site



Loose bodies

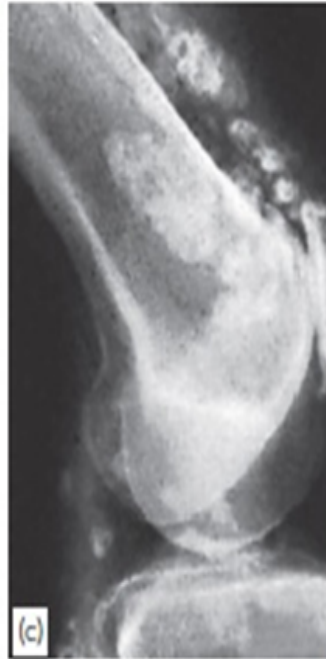
- The knee joint offers a relatively capacious haven for loose bodies. These may be produced by:

1. injury (a chip of bone or cartilage)
2. osteochondritis dissecans (which may produce one or two fragments)
3. osteoarthritis (pieces of cartilage or osteophyte)
4. Charcot's disease (large osteocartilaginous bodies, separated by repeated trauma in a joint that has lost protective sensation)
5. synovial chondromatosis (cartilage metaplasia in the synovium, sometimes producing hundreds of loose bodies).

- Clinical features:

- The patient may be symptomless, or may complain of sudden locking without injury. The joint gets stuck in a position which varies from one attack to another. Sometimes the locking is only momentary and usually the patient can wriggle the knee until it suddenly unlocks. The patient may be aware of something 'popping in and out of the joint'. Sometimes, especially after the first attack, the knee swells up, due to synovitis.

- In some cases there is evidence of an underlying cause. A pedunculated loose body may be felt; one that is truly loose tends to slip away during palpation (aptly named a 'joint mouse').
- X-ray will usually confirm the diagnosis; most loose bodies are radio-opaque and the examination also shows an underlying joint abnormality.
- A loose body causing symptoms should be removed, unless the joint is severely osteoarthritic. This can usually be done with the aid of arthroscopy.



20.19 Loose bodies (a) This loose body slipped away from the fingers when touched; the term 'joint mouse' seems appropriate. (b) Which is the loose body here? Not the large one (which is a normal fabella), but the small lower one opposite the joint line. (c) Multiple loose bodies are seen in synovial chondromatosis, a rare disorder of cartilage metaplasia in the synovium.

the most common Dislocation of
patella is going laterally
dynamic stabilizer →
static →

Musculus as Vastus

with a Groove ①

② Ligament
medial
patello
femoral
Ligament

dislocation of the

patella:

- Patella is attached to quadriceps muscle through quadriceps tendon.
- It facilitates the function of quadriceps to extend the knee joint.
- It lies within the patello-femoral groove.
- Dislocation mostly occurs when the medial patello-femoral ligament is disrupted so the patella is dislocated laterally with a consequence of impact injury between the medial patella and the lateral femoral condyle.

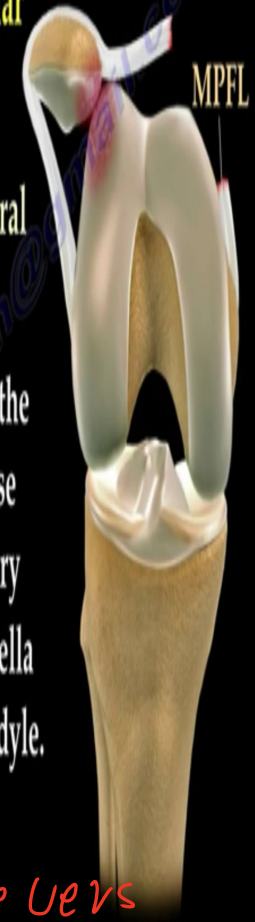
Patellar Dislocations

Mechanism of Patellar Dislocation:

Dislocation:

Medial Patellofemoral Ligament Failure

Lateral dislocation of the patella may also cause direct impact injury to both the medial patella and lateral femoral condyle.



ligament on medial side to prevent patella going laterally and vice versa

Patellofemoral disorders

○ **Recurrent dislocation of the patella**

○ In about 15% of cases an acute episode is followed by recurrent dislocation and subluxation after minimal stress, due to disruption or stretching of the ligamentous structures which normally stabilize the extensor mechanism.

○ However, in a significant proportion of cases there is no history of an acute strain and the initial episode is thought to have occurred 'spontaneously'.

○ Predisposing factors are often present: **(1) generalized ligamentous laxity**; **(2) under-development of the lateral femoral condyle** and flattening of the intercondylar groove; **(3) maldevelopment of the patella** (which may be unusually small or seated too high (patella alta); **(4) valgus deformity of the knee**; **(5) external tibial torsion**; or **(6) a primary muscle defect**. (Weakness in vastus medialis obliquus muscle). (7) High patella (patella alta) outside of the trochlear

○ Repeated dislocation damages the contiguous articular surfaces of the patella and femoral condyle; this may result in further flattening of the condyle, so facilitating further dislocations.

○ Dislocation is almost always towards the lateral side.

in valgus
(knee medially)
the patella will
go laterally

Gen valgus

Miserable Malalignment syndrome → Excessive femoral Anteversion + 2 + 3 →

Clinical features

The angle between neck and shaft of femur

External tibial torsion

- Girls are affected more commonly than boys.
- Often bilateral.
- The main (or only) complaint is that from time to time **the knee suddenly gives way and the patient falls**; this may be accompanied by pain and sometimes the knee gets stuck in flexion.
- Although the patella always dislocates laterally, the patient may think it has displaced medially because the uncovered medial femoral condyle stands out prominently.
- If the knee is seen while the patella is dislocated, the diagnosis is obvious.
- There is usually tenderness on the medial side of the joint.
- Later the joint becomes swollen, and aspiration may reveal a blood-stained effusion.
- Between attacks clinical signs are sparse; however, the apprehension test is positive.(patellar apprehension test:knee is flexed in 45 degrees, stabilize the leg and apply a force to move the patella laterally).
- **Treatment:**
- If the patella is still dislocated, it is pushed back into place while the knee is gently extended. A plaster cylinder or splint(for 2-3 weeks), isometric quadriceps strengthening exercises(at least 3 months specially vastus medialis muscle), walking with the aid of crutches.
- In cases of repeated and distressing episodes of dislocation surgical reconstruction is indicated.

- The principles of operative treatment are: (a) to repair or strengthen the medial patellofemoral ligaments; and (b) to re-align the extensor mechanism so as to produce a mechanically more favorable angle of pull.



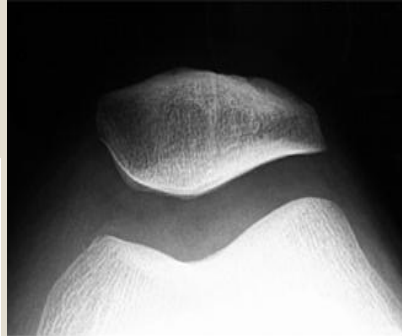
20.24 Patellofemoral instability This young girl presented with recurrent subluxation of the right patella. (a,b) The knee looks abnormal and the x-ray shows the patella riding on top of the lateral femoral condyle. (c) Performing the apprehension test – watch the patient's face.

Chondromalacia of the patella

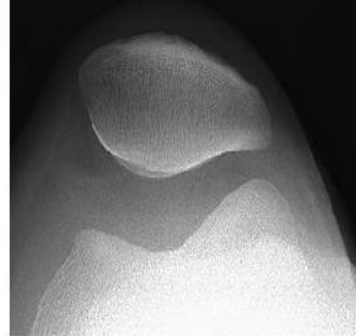
- ‘softening’ of the patellar articular cartilage.
- The basic disorder is probably repetitive mechanical overload of the patellofemoral joint due to either:
 - (1) malcongruence of the patellofemoral surfaces because of some **abnormal shape of the patella** or intercondylar groove.
 - (2) **malalignment of the extensor mechanism**, or **relative weakness of the vastus medialis**, which causes the patella to tilt, or subluxate, or bear more heavily on one facet than the other during flexion and extension of the knee.

- **Clinical features:**
- Often a teenage girl or an athletic young adult.
- Pain over the front of the knee or ‘under the knee-cap’.
- Symptoms are aggravated by activity or climbing stairs, or when standing up after prolonged sitting.
- The quadriceps may be wasted and there may be a small effusion.
- Patellofemoral pain is elicited by pressing the patella against the femur and asking the patient to contract the quadriceps – first with central pressure, then compressing the medial facet and then the lateral. If, in addition, the apprehension test is positive, this suggests actual previous subluxation or dislocation.

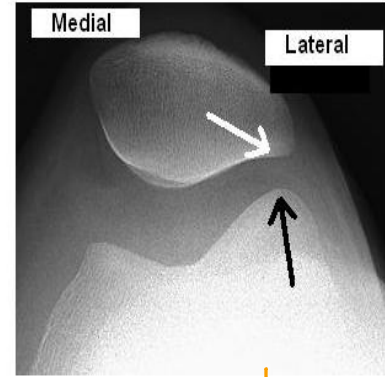
- **Imaging:**
- X-ray examination should include skyline views of the patella, which may show abnormal tilting or subluxation, and a lateral view with the knee partly flexed to see if the patella is riding high or is unusually small.
- **The most accurate way** of showing and measuring patellofemoral malposition is by computed tomography (CT) or MRI, with the knees in full extension and varying degrees of flexion.
- **Arthroscopy:**
- The findings at arthroscopy are usually of mild fibrillation and softening of the articular cartilage on the undersurface of the patella. **Arthroscopy is also useful in excluding other causes of anterior knee pain**
- **Treatment:**
- adjustment of stressful activities and physiotherapy, combined with reassurance that most patients recover. Exercises are directed specifically at **strengthening the medial quadriceps so as to counterbalance the tendency to lateral tilting or subluxation of the patella**.
- If symptoms persist, surgery can be considered lateral release, or lateral release combined with one of the re-alignment procedures
- Patients should be reassured that chondromalacia does not inevitably lead to patellofemoral osteoarthritis in later life.



Normal Patello-Femoral joint (Skyline View)



Abnormal Patello-Femoral joint (Skyline View)

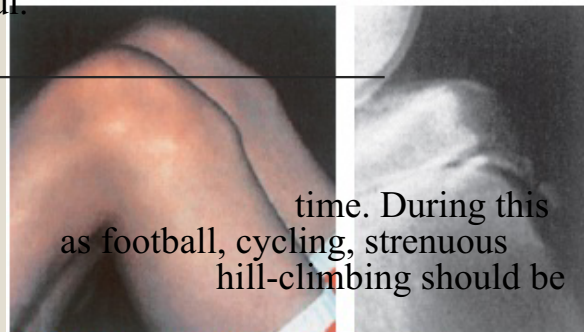


Exaggerated lateral pulling causes increased lateral compressive forces contributing towards

tilt in the patella

Tibial tubercle ‘apophysitis’

- This condition (also called Osgood–Schlatter’s disease) is characterized **by pain and swelling of the tibial tubercle.**
- It is a fairly common complaint among adolescents, particularly those engaged in strenuous sports. It is, in fact, a traction injury of the incompletely fused apophysis (The **apophysis** is a normal secondary ossification center that is located in the non-weight-bearing part of the **bone** and eventually fuses with it over time (most of the **apophyses** fuse during the 2nd decade of life) into which part the patellar ligament is inserted.
- On examination the tibial tuberosity is unusually prominent and tender. Sometimes active extension of the knee against resistance also is painful.
- X-rays show displacement or ‘fragmentation’ of the tibial apophysis.
- Spontaneous recovery is usual, but it takes time. During this as football, cycling, strenuous hill-climbing should be period activities such walking and restricted.



20.26 Osgood–Schlatter’s disease This boy complained of a painful bump below the knee. X-ray shows the traction injury of the tibial apophysis.



Chronic ligamentous instability

- The knee is a complex hinge which depends heavily on its ligaments for mediolateral, anteroposterior and rotational stability. Ligament injuries, from minor strains through partial ruptures to complete tears, are common in sportsmen, athletes and dancers.
- Whatever the nature of the acute injury, the victim may be left with chronic instability of the knee – a sense of the joint wanting to give way, or actually giving way, during weight bearing activity.
- There are basically three types of tibiofemoral instability: sideways tilt (varus or valgus), excessive glide (forwards or backwards) and unstable rotation. Some patients develop a combination of abnormal movements.

Clinical features

- The patient complains of the knee feeling insecure and giving way (or threatening to give way) during weight bearing activities.
- sometimes this is accompanied by pain.
- With collateral ligament instability the knee tends to wobble to one side.
- With anterolateral rotatory instability (due to an old anterior cruciate ligament injury) the knee gives way as the patient pivots on the affected side.
- In the less common posterior cruciate insufficiency, symptoms are mild and may be felt only on climbing stairs.

chronic
manifestations
& w/o
Acute
ligamentous
instability

- The joint looks normal apart from slight wasting; **there is rarely tenderness.**
- Comparison with the normal knee is essential.
- A useful routine is to **observe gait and knee posture in standing and walking**, then to **examine for hyperextension**, then for **increased tilting into varus or valgus (at both 0 and 30 degrees of knee flexion).**
- **X-rays** may show suspicious signs: **avulsion of a small bone fragment at the ligament insertion point, or old ossification in the ligament.**
- However, **MRI** is more useful and can reliably diagnose both ligament and meniscal injuries.
- **Arthroscopy** may be needed to exclude other abnormalities in the joint.

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- **Treatment:**
- **Most patients with chronic symptoms** – especially those with previous isolated collateral ligament sprains – have reasonably good function and will not require an operation. The first approach should always be a well-supervised exercise program.
- **The indications for operation are:**
 1. intolerable symptoms of giving way; these are usually patients with severe anterior cruciate insufficiency or combined injuries causing rotatory instability.
 2. unacceptably reduced function in patients with specialized occupations (e.g. professional sportspersons)
 3. the presence of an associated internal injury such as a torn meniscus or an avulsion fracture of the tibial spine
 4. symptomatic ligament injuries in adolescents.
- The operation, in principle, consists of ligament reconstruction or replacement with an autologous graft or an allograft. This is followed by a long period of intensive physiotherapy.

Patellar tendinopathy

- A patellar tendon strain or partial rupture may lead to a traction ‘tendinitis’ causing repeated episodes of pain and local tenderness – usually close to its attachment at the lower pole of the patella.
- If persistent, it may lead to calcification at the inferior pole of the patella.
- The condition is fairly common in adolescent athletes and has acquired the eponym Sinding-Larsen–Johansson syndrome.
- It usually resolves spontaneously; if it does not, the painful area is carefully removed keeping the major part of the tendon in continuity.

Thank you