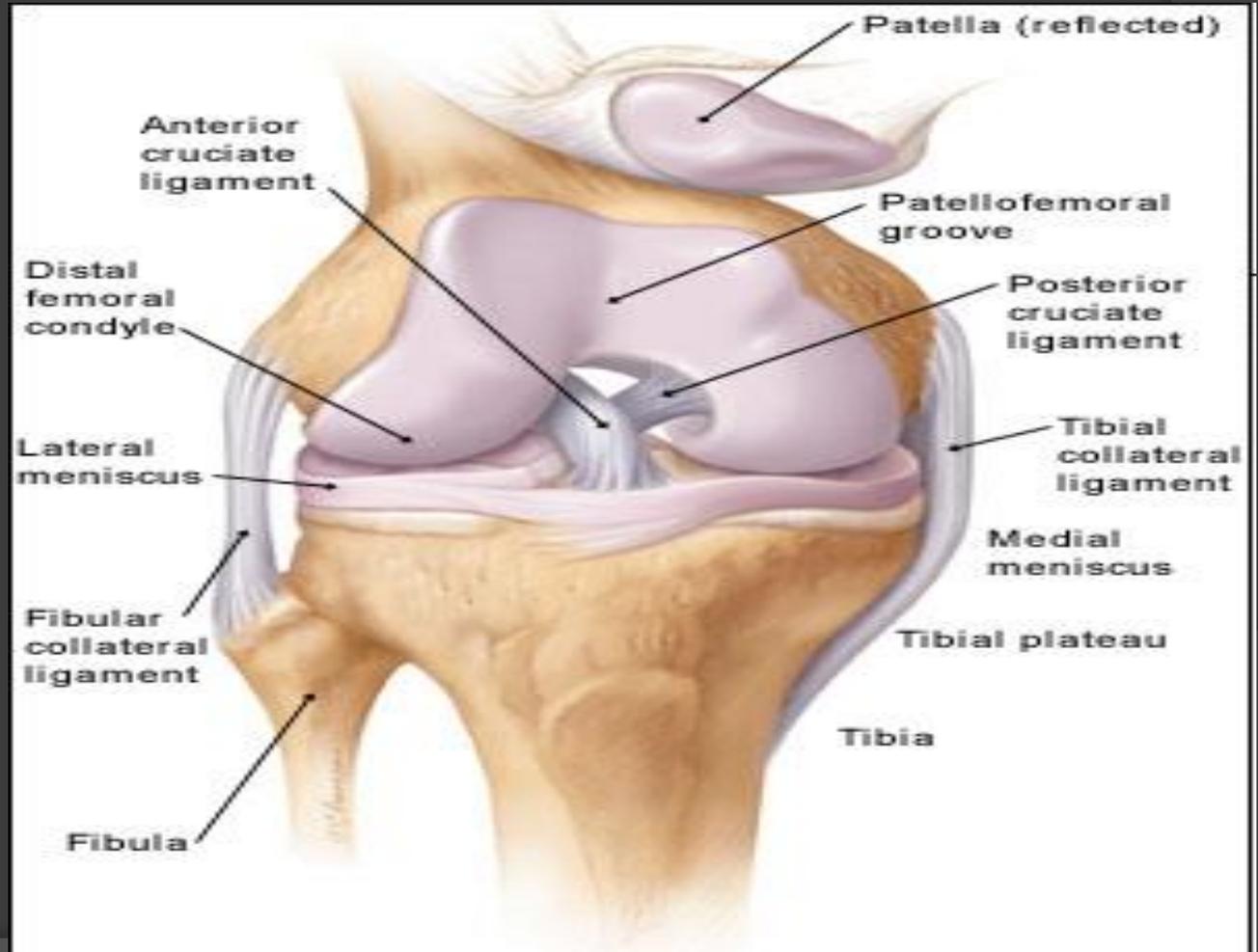


THE LEG

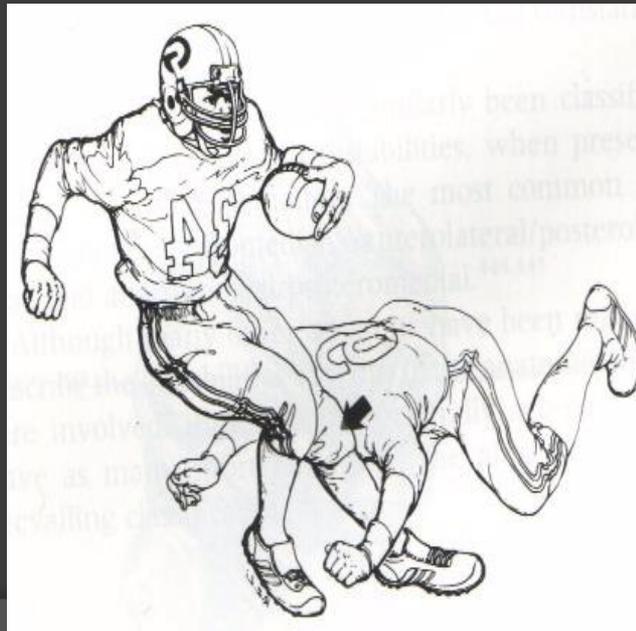
THE LEG

Acute Ligamentous Injury of the Knee



Mechanism of injury:

1. Direct thrust with the tibia forced anteriorly on femur leading to ACL injury; or the tibia forced posteriorly on the femur leading to PCL injury; varus or valgus stress of the femur leads to lateral or medial collateral ligament tear respectively.
2. The commonest injury is an external rotation of the tibia on the femur (twisting force) with the knee flexed and loaded ; this injury leads to group of soft tissue injuries starts with tear of the medial capsule , then with further rotation there will be medial collateral ligament tear , and lastly the ACL



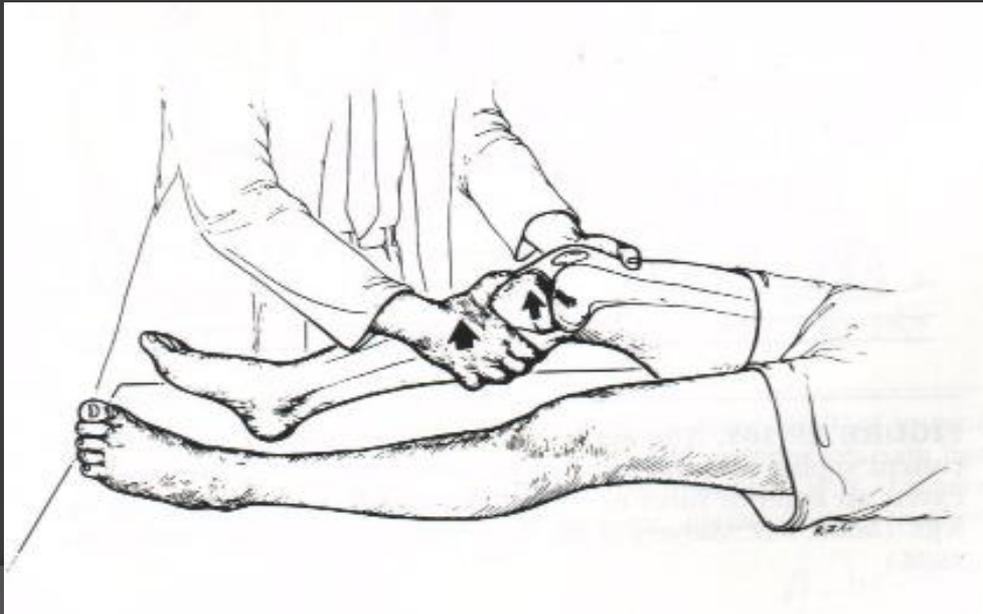
Clinical features:

- ⦿ History of trauma, localized or diffuse knee pain & tenderness, knee swelling due to haemarthrosis which occurs immediately after injury.
- ⦿ Medial collateral ligament tear usually occurs at its femoral attachment while lateral collateral tear usually occurs at its fibular attachment; this leads to localized pain at the site of injury.
- ⦿ A partial tear gives severe pain without instability; while complete tear gives little pain with great instability.

Clinical Examination:

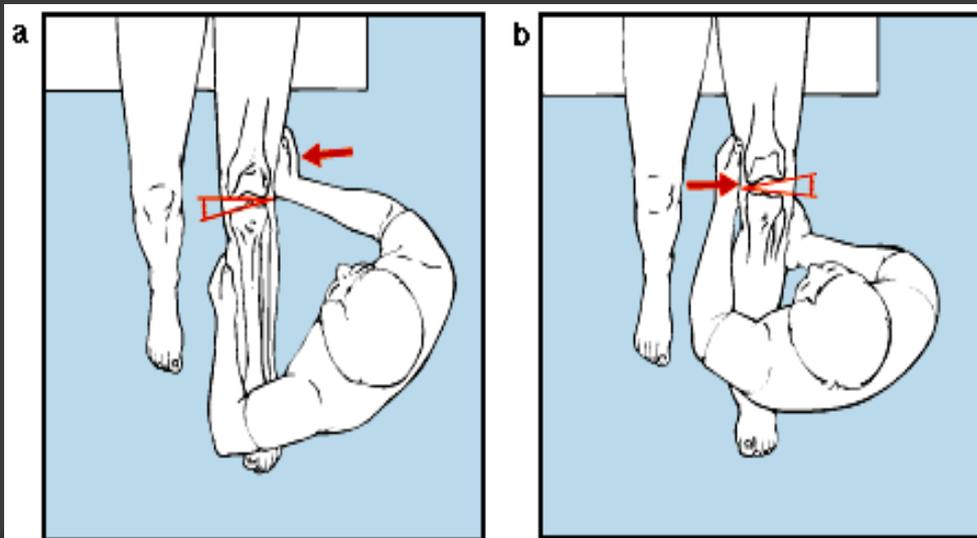
Knee stability is examined by different stress tests (stressing the tibia on the femur);

- ⦿ **Anterior Drawer Tests to examine the ACL.**
- ⦿ **Posterior Drawer Test to examine the PCL.**



Clinical Examination:

- Valgus stress tests to examine the MCL.
- Varus stress tests to examine the LCL.



X-Ray:

- ⦿ It may show associated avulsion fracture of medial femoral condyle, the tibial spine or the head of the fibula.
- ⦿ Stress tests with X-ray may be useful & sometimes done under anesthesia.

Arthroscopy:

Indications:

1. Suspected isolated ACL injury.
2. Suspected associated meniscal tear.

Contra-indication:

complete collateral ligament tears where there will be extravasation of the fluid used during arthroscopy into the calf region which may lead to compartment syndrome.

Treatment:

Partial Tears:

1. Aspiration of tender haemarthrosis.
2. Ice packing and sometimes local steroid injection.
3. Removable back splint that allow physiotherapy and exercises for 3-4 weeks.
4. After removal of the splint continue with physiotherapy and exercises.

Complete Tears:

Ideally it needs surgical repair, but this is not always applicable.

1. **Conservative Treatment:** In those cases of complete tears sometimes we treat patients non-operatively like in older patients or in young non-athletic patients; we do long POP cast for 6-8 followed by physiotherapy & exercises with graduation of weight bearing.

Complete Tears:

2. Surgical Treatment: We inspect the medial & lateral meniscus & remove any torn meniscus when indicated, repair any torn capsule or other repairable structures as follows :

- ⦿ Medial & lateral collateral ligaments: we do direct repair with sutures; sometimes we add reinforcement by using surrounding structures like tendons or fascia lata.

Complete Tears:

ACL If there is avulsion of tibial spine we do fixation. If the ligament is torn; direct suture is neither useful nor enough it usually needs reconstruction by using nearby structures like tendons (semitendinosus) or fascia lata to be inserted in a direction where they can act like ACL to take some of its function.

Postoperatively:

we do full length POP leg cast for 3-4 weeks, followed by functional brace for another 3-4 weeks with physiotherapy & graduation of weight bearing.

Complications:

- ⦿ *Adhesions:*
- ⦿ *Chronic instability:*

Dislocation of the Knee J.:

It's a serious injury of young adults associated with severe trauma. It's usually associated with ACL and one or both collateral ligaments tear, sometimes there is neurovascular injury.



Clinical features:

Swollen, deformed & bruised knee
neurovascular examination is essential.



X-ray:

It can show the dislocation and the possible associated fracture sometimes arteriogram to check vascular injury.



Treatment:

- ❑ MUA.
- ❑ If this fail go to open reduction & back splint.
- ❑ After 2-4 weeks change it to full POP cylinder for 12-16 weeks.
- ❑ Q-exercises and graduation of weight bearing is done as soon as the patient is comfortable.



Complications:

Early:

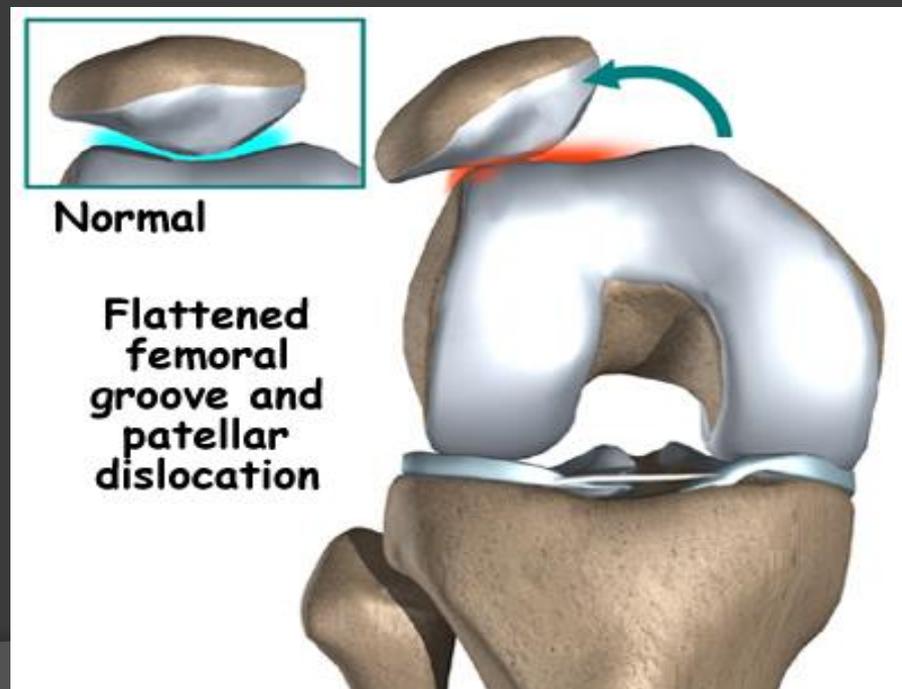
Neurovascular injury.

Late:

1. Knee stiffness.
 2. Knee instability.
-

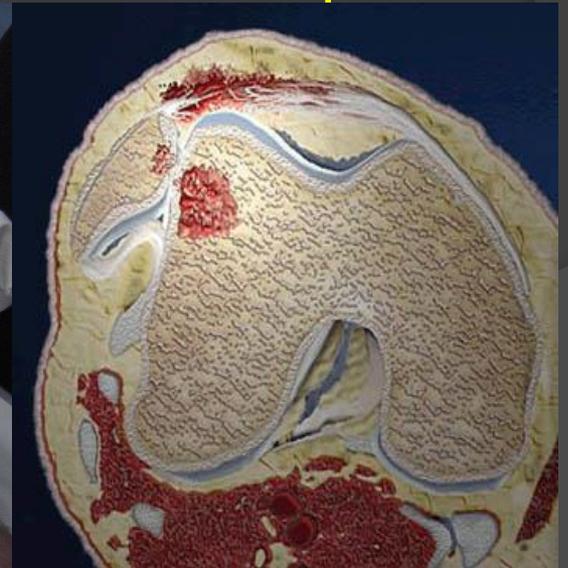
Traumatic Dislocation of the Patella

It occurs due to direct lateral violence with the knee flexed & relaxed, this leads to either subluxation or it is completely dislocated laterally. This injury usually associated with damage to the medial side of the extensor mechanism & haemarthrosis.



Clinical features:

1. Patient collapsed & unable to straighten his leg.
2. Swelling of the Knee (haemarthrosis).
3. Deformity is evidence but sometime misleading because the medial condyle may be prominent and mistaken for the patella.



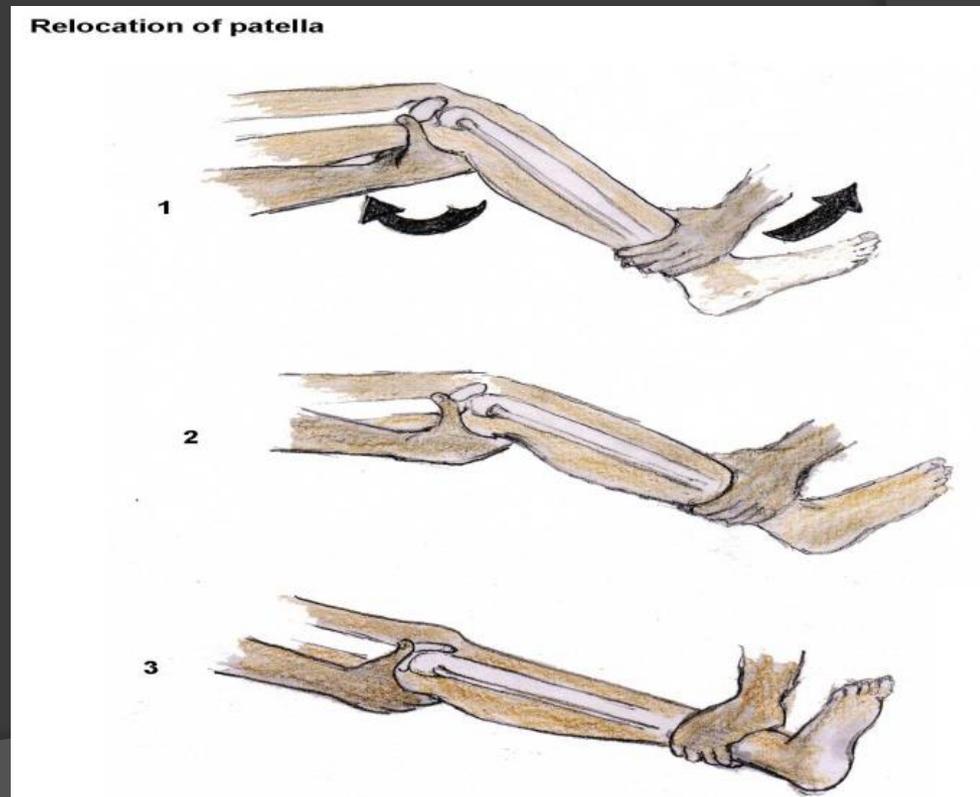
X-Ray:

It shows the displaced patella and the possible associated osteochondral fracture that occur in 15%.



Treatment:

1. Urgent reduction with or without anesthesia.
2. Immobilization by back-slab for 3-4 weeks followed by quadriceps exercises.
3. Operative treatment is indicated:
 - ✓ There is associated fracture.
 - ✓ When there is severe medial joint bruise.



Fractures of the Patella

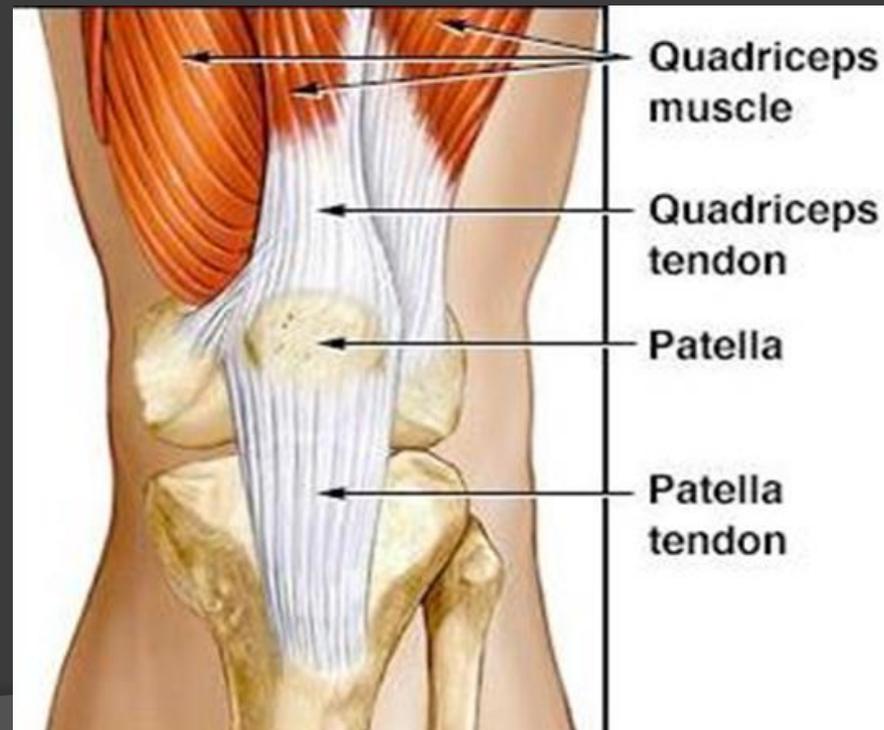
Morphology

The patella is the largest sesamoid bone in the body and lies within the fascia and fibers of the quadriceps tendon. The upper $\frac{3}{4}$ is covered with articular cartilage. The articular surface of the patella is divided into medial and lateral facets, which articulate with the anterior trochlea. As you can see from the diagram, the lateral facet is the largest. A vertical ridge near the medial facet defines the odd facet. Transverse ridges are present which further define the facets. The infero-medial odd facet does not articulate with the femoral condyle until 135 degrees of knee flexion.



Patellar Retinaculum:

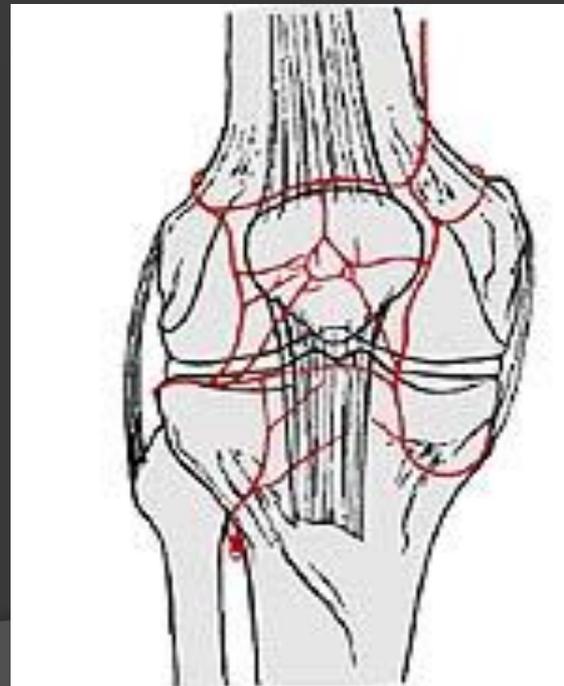
The patella is invested in a strong soft tissue envelope formed by the joining of the quadriceps tendon, the iliotibial band and distal quadriceps muscles and the patella tendon. The patellar retinaculum originates from the deep fascia along with fibers of the vastus medialis and vastus lateralis. There are also contributions from the iliotibial tract and patellofemoral ligaments of the joint capsule.



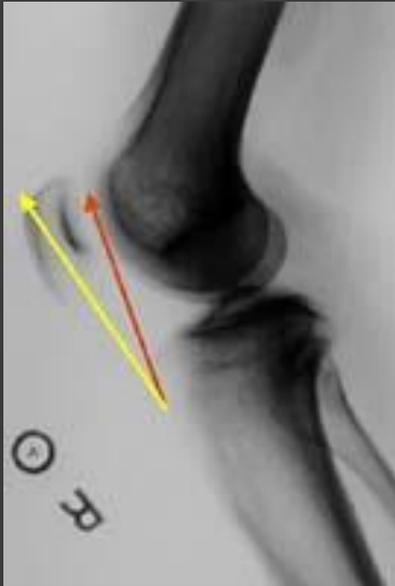
Blood supply:

The blood supply consists of an extraosseous and intraosseous vascular system. The primary blood supply is from branches of the geniculate arteries. The intraosseous blood supply enters the bone through the midportion of the patella and through distal pole vessels.

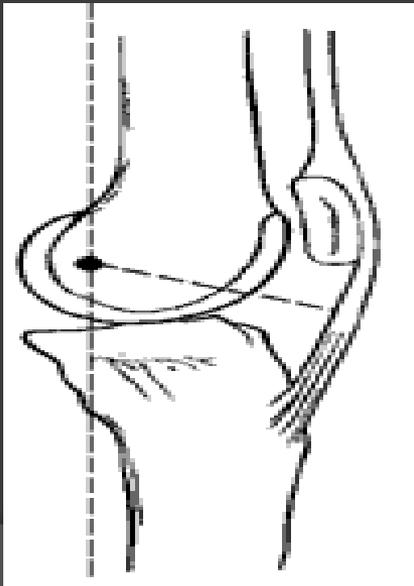
The primary blood supply is derived from a dorsal ring formed by geniculate arteries. The secondary blood supply enters posterior surface of distal pole.



Function:



1. Changing the direction of the pull of the extensor mechanism.
2. Provide a mechanical advantage to the knee extensor mechanism by increasing its moment arm from the axis of knee rotation.
3. In full flexion, the patella increases the lever arm of quadriceps by only 10 %. At 45 degrees of flexion patella increases the quadriceps lever arm by 30 %.
4. At terminal extension the patellar moment arm is critical as the last fifteen degrees (15 - 0) require twice the amount of torque from full flexion to 15 degrees. Post patellectomy patients will therefore have extensor lag and weakness.



Mechanism of injury:

1. *Direct trauma:* this usually causes either crack undisplaced fracture within an intact extensor expansion or comminuted minimally displaced fracture also with intact expansion.
2. *Indirect trauma:* avulsion fracture by powerful quadriceps contraction against resistance which causes transverse displaced fracture associated with rupture of the extensor expansion.

Clinical Evaluation:

One must complete a thorough history and physical examination of the patient. There may be pain, swelling and hemarthrosis. The defect may be palpable. The skin should be examined closely in those injuries sustained from direct trauma to evaluate for the presence of an open injury. The extensor mechanism is evaluated by the ability to extend the knee against gravity or to maintain the knee in full extension versus gravity (with or without knee joint aspiration and intra-articular lidocaine injection).



X-Ray:

It can show the fracture type & its displacement by AP, lateral & sunrise views



Differential Diagnosis:

An important one is the congenital bipartite patella it occurs due to failure of fusion of the two epiphyses of the patella leaving a radiological gap at the supero-lateral angle other x-ray features to differentiate bipartite patella are:

- ⦿ It is bilateral.
- ⦿ The margins are flat & smooth.
- ⦿ It is always at the supero-lateral angle.
- ⦿ The edges are



Classification:

Classification systems are ideally designed to allow communication between physicians, guide treatment and predict outcomes. For the patella, there is no universally accepted classification systems. Descriptive terms may be used to classify patella fractures and an example is demonstrated on the picture. ***Vertical fractures may not result in disruption of extensor mechanism.***



TRANSVERSE



LONGITUDINAL



COMMINUTED



IMPACTED



ARTICULAR
BONE LOSS

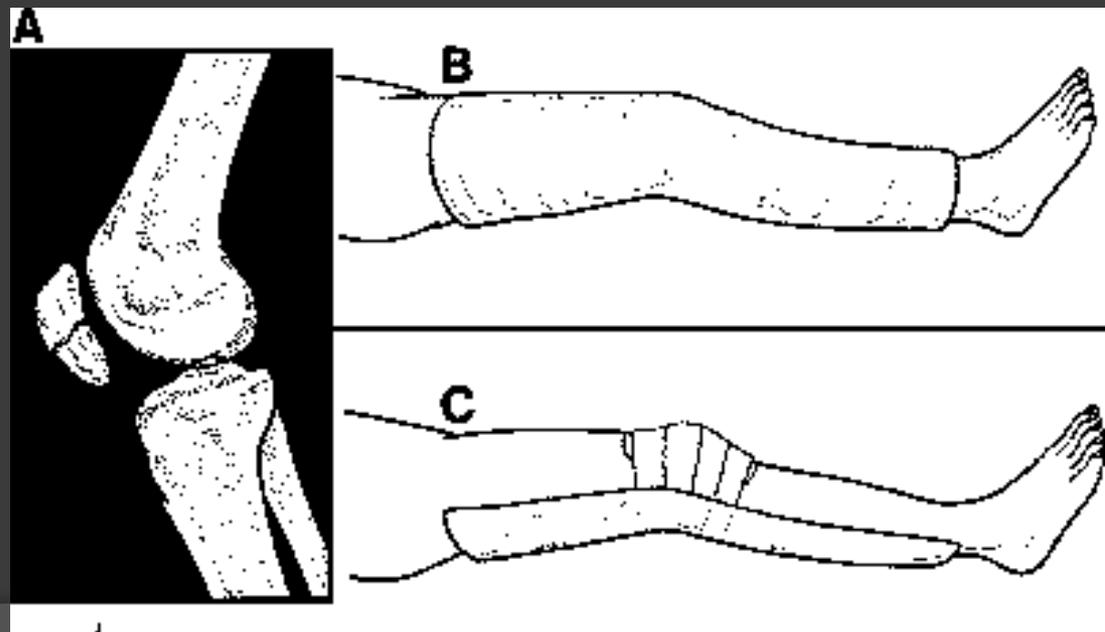


EXTRA-ARTICULAR

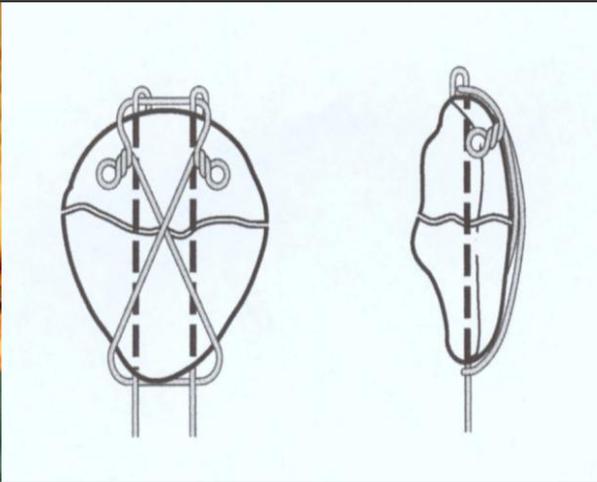
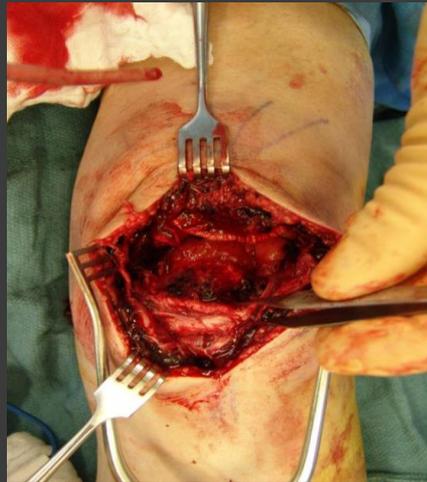
Treatment:

The key for the management is the integrity of extensor expansion mechanism. Treatment of patella fractures is based on the fracture type and physical examination. The ultimate goals are to preserve and/or restore extensor mechanism function and reduce complications of this articular fracture.

- Crack undisplaced fracture:- conservative treatment by aspiration of the haemarthrosis with **POP** cylinder cast and weight bearing as tolerated, for 4-6wk + Quadriceps exercise & physiotherapy.
- Minimal displaced fractures (less than 2mm of articular step off and less than 3mm of diastasis) with an intact extensor mechanism, nonoperative treatment is indicated. Nonoperative treatment also may be indicated for elderly patients or those patient with underlying medical co morbidities which preclude surgery.



- Transverse displaced fracture: ~~~~ **ORIF.**
- Comminuted fracture :
 - Patient below 40yr treatment is by **POP** cylinder for 4-6 weeks until healing then Physiotherapy & Quadriceps exercise.
 - Patient above 40yr we do patellectomy & suturing of the extensor expansion followed by early movements & exercise.



Fracture of Tibial Plateau:

The plateau fractures when the leg is subjected to VR or VL stress with axial compression such as in:

1. Fall from a height.
2. Car striking a pedestrian by its bumper (Bumper injury). It is fracture of adult at any age.



Clinical features:

Knee is swollen deformed with extensive bruising; it feels doughy because of haemarthrosis. Always check distal neurovascular function. Under anesthesia we may need to assess knee ligament injury.



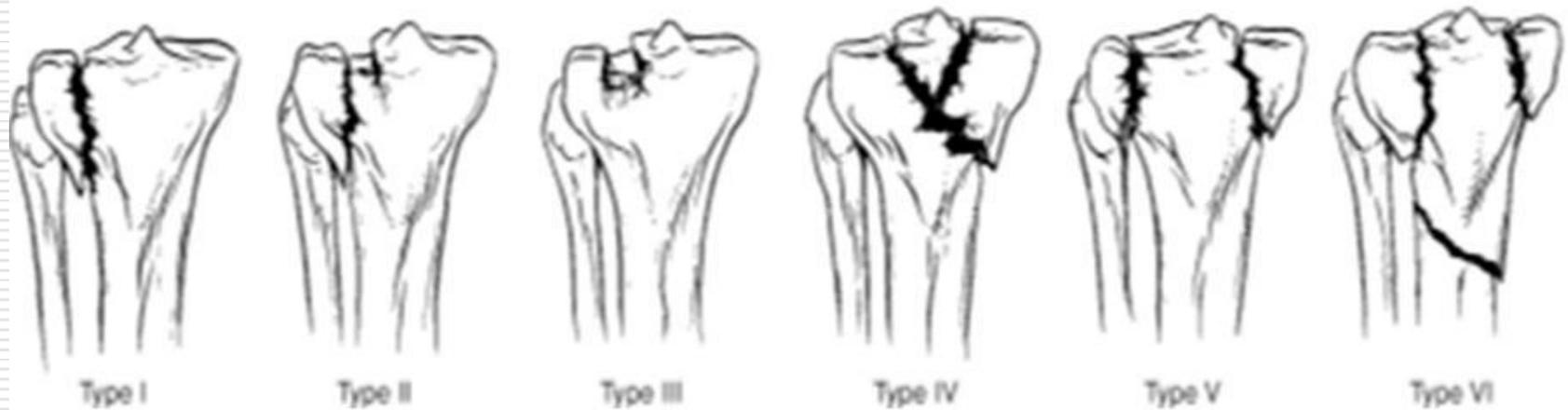
X-ray:

- ❑ Plane films AP, Lat., and Oblique.
 - ❑ Stress views under anesthesia to show associated ligament injury
 - ❑ CT scan is the best to show the fracture extension & degree of displacement.
-

Classification:

Called **Schatzker** Classification:

- ❑ **Type I:** lateral condylar fracture which is vertical split injury.
- ❑ **Type II:** lateral condylar fracture which is crushing comminuted depressed.
- ❑ **Type III:** lateral condyle fracture like type two with intact lateral cortex.
- ❑ **Type IV:** medial condylar fracture.
- ❑ **Type V:** bicondylar fracture.
- ❑ **Type VI:** bicondylar fracture with proximal shift comminution



Schatzker Classification



Treatment:

Conservative treatment can be used & gives good range of motion but angular deformity is common. Surgical treatment gives good and rapid results but associated with high incidence of stiffness. So the choice sometimes is difficult.

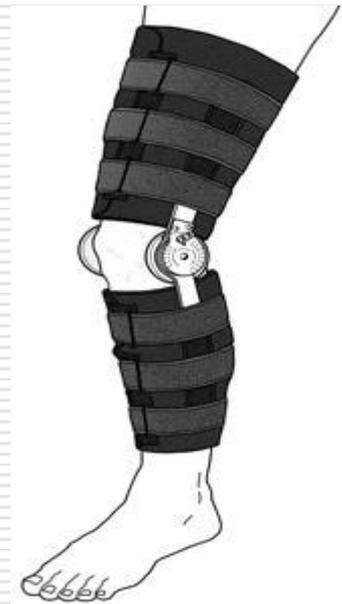
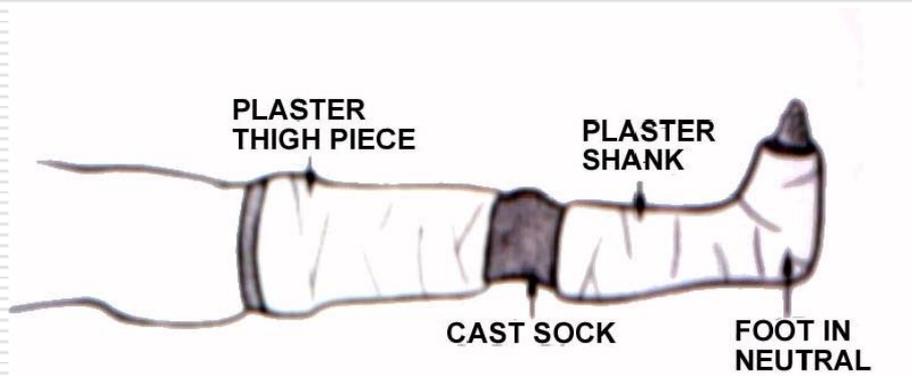
The fracture is said to be displaced or unstable

- ❑ If the fracture gap is more than 5mm.
- ❑ If there is associated knee ligament injury.

This is important to decide the treatment.

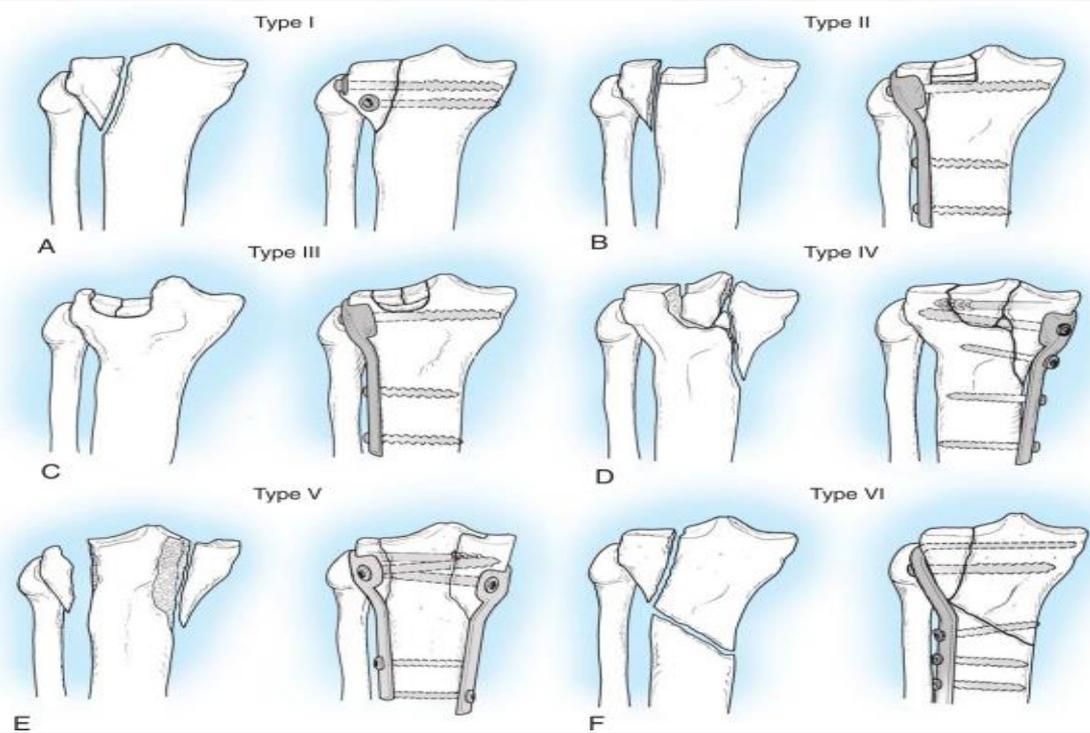
Treatment:

Undisplaced fractures: Treated with bed rest & skeletal traction with early physiotherapy & movements for 10-15 days until patient is pain-free and comfortable, we can use cast-bracing & partial wt. bearing for the next 4-6 weeks until healing.



Treatment:

Displaced fractures: Treatment is can conservative as above if there is contraindication for surgery which is the treatment of choice here. It is by ORIF followed by early mobilization & physiotherapy.



Complications:

Early:

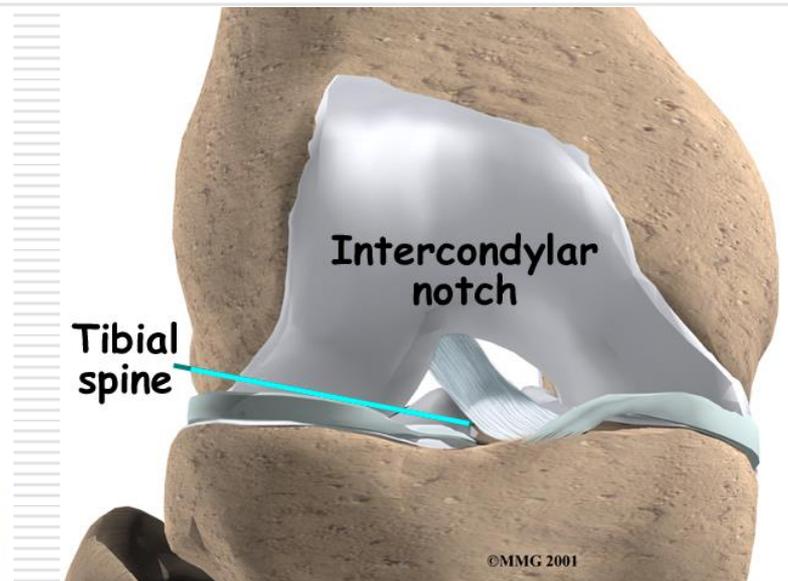
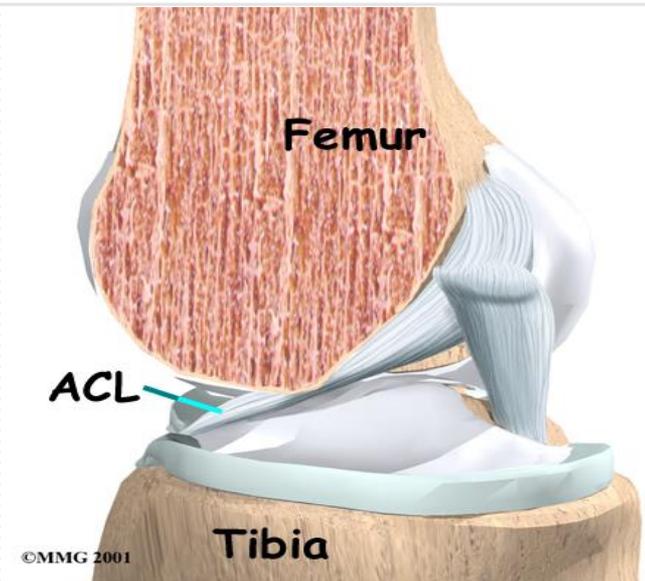
1. Nerve injury.
2. Vessel injury.
3. Knee ligament.
4. Compartment syndrome.

Late:

1. Joint stiffness.
 2. Varus or valgus deformity.
 3. Osteoarthritis.
-

Fracture of Tibial Spine:

It can be a type of avulsion injury of ACL when the knee is subjected to forces that stress the ACL. Also when the knee is subjected to varus or valgus stress with twisting.





Clinical features:

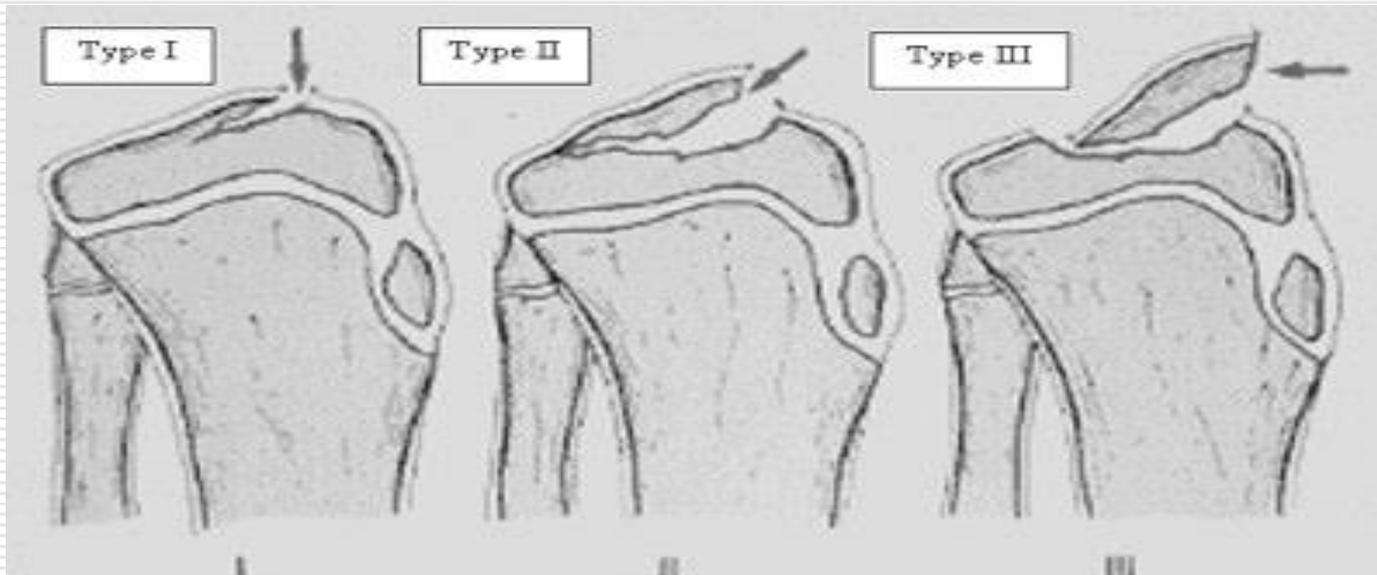
Knee swollen, tender, and doughy by haemarthrosis EUA may show associated ligament injury or ACL dysfunction.



classification:

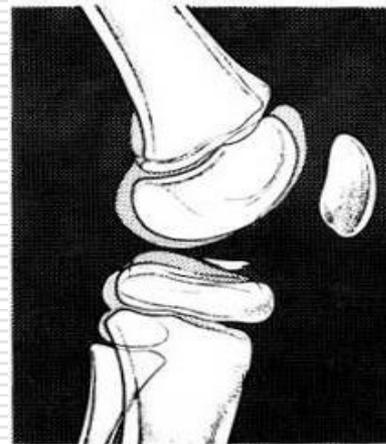
McKeever classification:

- ❑ Type I is minimally displaced.
- ❑ Type II shows anterior elevation,
- ❑ Type III has complete separation of the fragment.

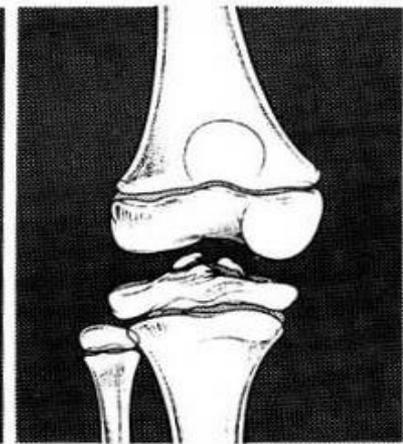


X-ray:

Sometime not obvious and there is only partial or undisplaced fracture.



Lateral view



AP view

Treatment:

Under anesthesia examination of the knee ligaments is done & aspiration of haemarthrosis. MUA of the knee in full extension & check x-ray, if reduction is good we do POP cylinder. If not good do Arthrotomy and ORIF with screw in adults or with sutures in children followed by 4-6 weeks of POP cylinder & physiotherapy.

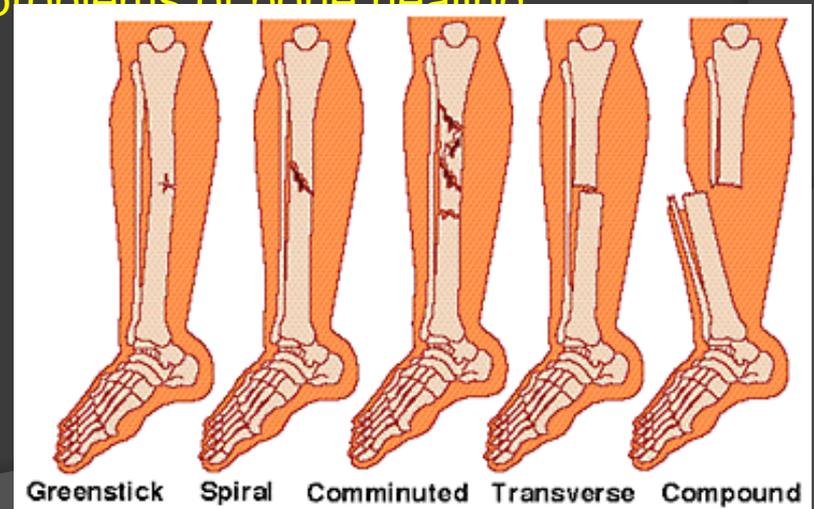
Fractures of Tibia & Fibula

The tibia is a subcutaneous bone; it is commonly fractured & can be associated with skin damage or loss leading to open (compound) fracture.



Mechanism of injury:

- Twisting force leads to spiral fracture of both bones at different levels.
- Angulatory force or direct trauma causes transverse or short oblique fracture of the bones at the same level.
- Comminuted or associated with butterfly fragment.
- Open fracture: can be from the primary injury or the skin may get punctured from within by the sharp bony fragments.
- Closed Fracture: but there is severe soft tissue damage & necrosis which makes the skin in danger of sloughing and there are associated problems of bone healing



Clinical features:

Skin condition is important sometimes it get damaged or lost; sometimes it's severely bruised and ischemic & can sloughs later on. The limb is swollen and deformed. Always assess the distal neurovascular function and look for sings of compartment syndrome.



X-ray:

Show the fracture its type & its displacement.



Treatment:

Principles:

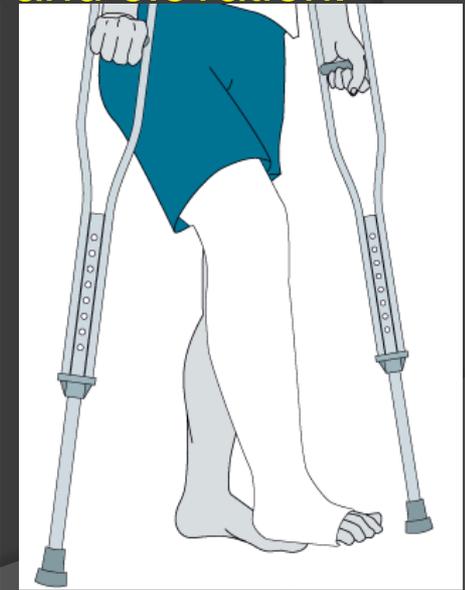
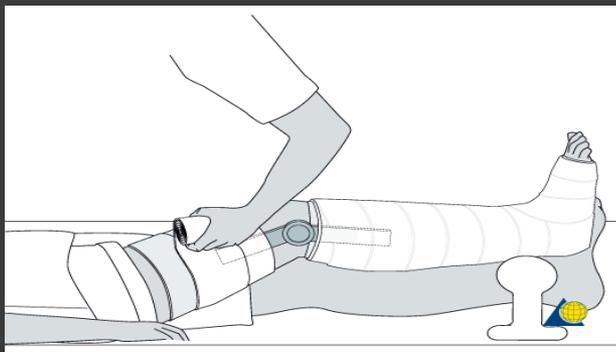
1. Preserve skin and limit soft tissue injury.
2. Recognize and prevent compartment syndrome.
3. Obtain good fracture alignment.
4. Early wt. bearing to enhance fracture healing.
5. Early joint movement to avoid stiffness.

Priorities:

- ⦿ Compound fracture: debridement, antibiotics & anti-tetanus, external fixation, delayed wound healing with rehabilitation.
- ⦿ Compartment syndrome: treated by fasciotomy sometimes external fixation & fasciotomy.
- ⦿ Suspected skin damage: external fixation & antibiotics with follow up.

Priorities:

For closed fracture good alignment: we do full POP cast from metatarsal necks up to upper thigh, if alignment is poor we improve it by MUA under screen then we do POP as above. Limb must always be elevated to avoid swelling, if the swelling is severe we split the POP and properly check the circulation in the first 2-3 days, after 2 weeks we do check x-ray and 12 weeks in adults all with graduation of weight bearing, exercises and elevation.



Priorities:

- Internal fixation: this is by intramedullary nail (locked or unlocked), or plate and screw.



Postoperatively physiotherapy and muscle exercises with graduation of wt. bearing are important.

Complications:

Early:

1. Infection.
2. Vascular injury.
3. Compartment syndrome.
4. Nerve injury.

Late:

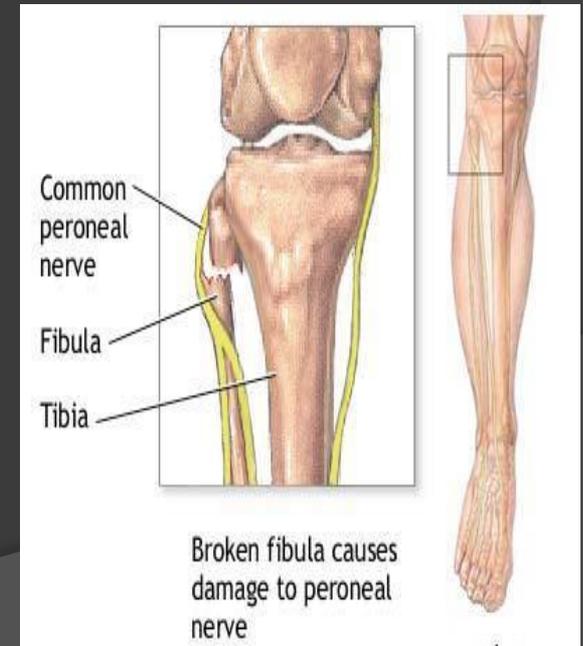
1. Malunion.
2. Delayed union & nonunion.
3. Joint stiffness.
4. Algodystrophy.

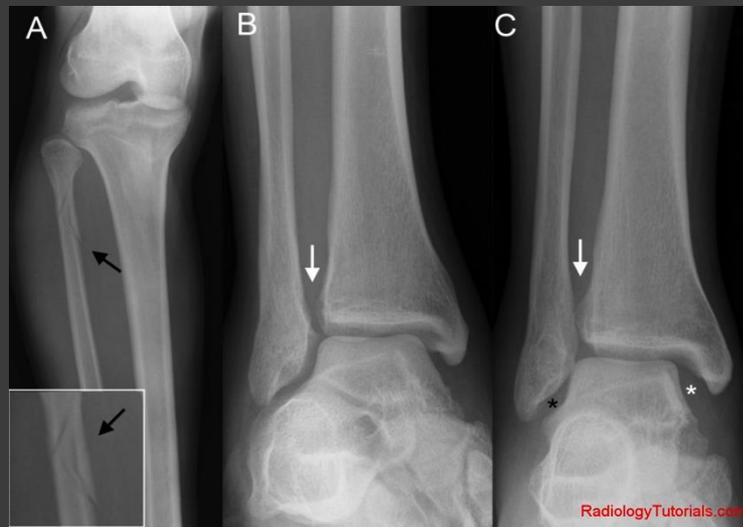
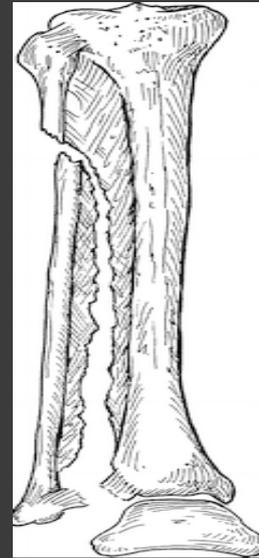
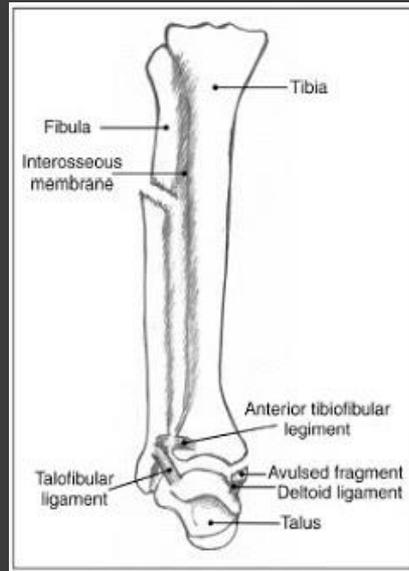
Single leg bone fracture:

Tibia fracture alone follows the same principles of both bone fracture but when non-union occurs we need to do fibular osteotomy to allow tibia to heal (remove the intact fellow bone).

Single leg bone fracture:

Fibula fracture specially neck or upper third spiral fracture must always raise the possibility of POTTs fracture dislocation around the ankle joint. If single fracture occurs it's treated by pressure bandage, analgesia & allows the patient to walk as soon as possible.





Thank You!