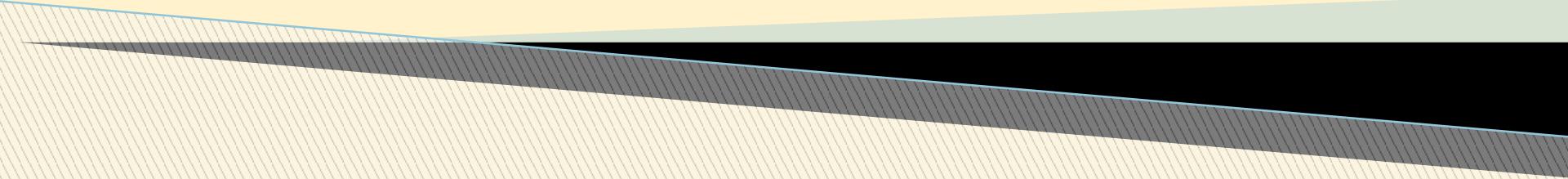


Applied Anatomy of the knee



The knee complex

► **3 joints for the price of one!**

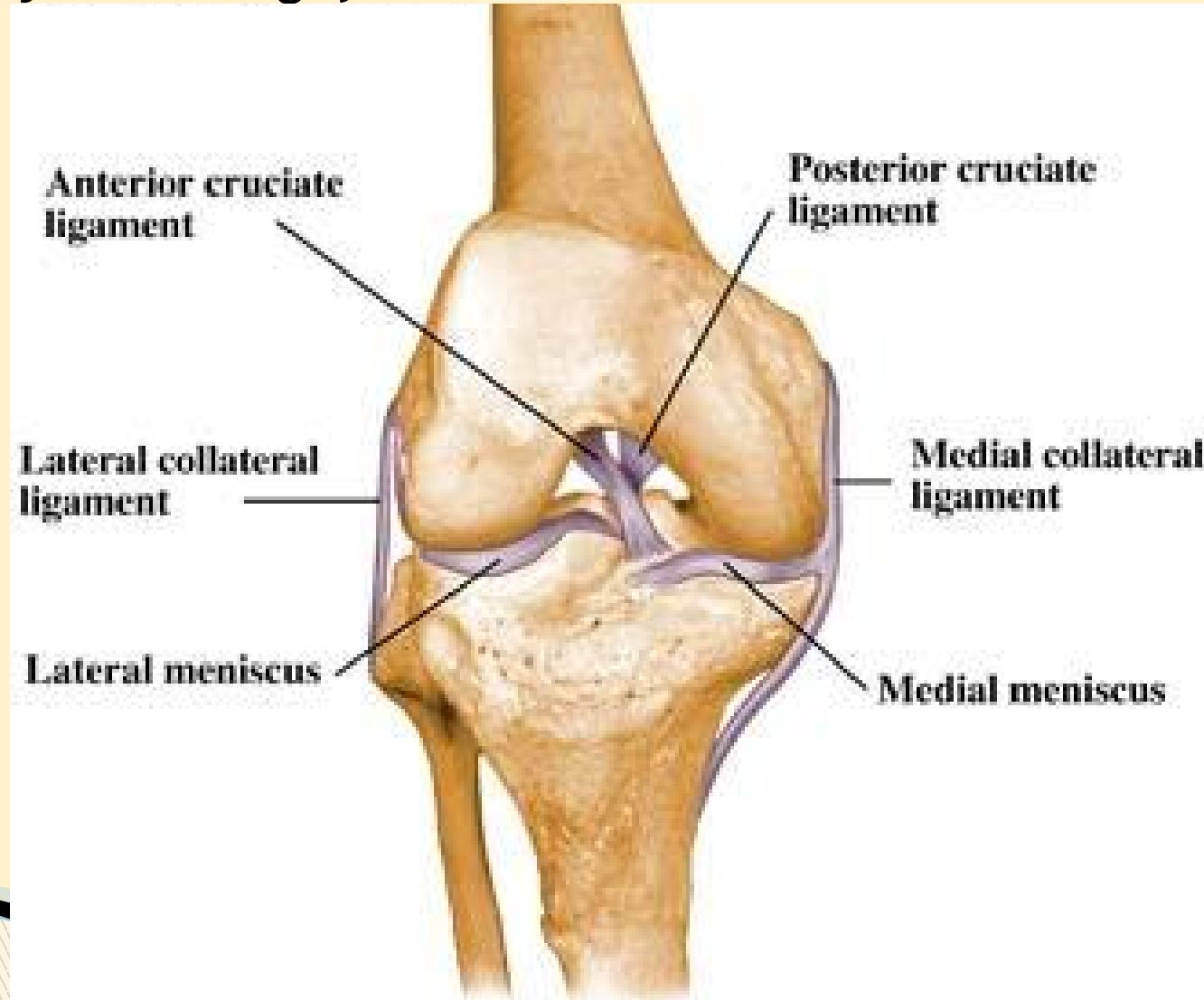
1. **Patella Femoral Joint (PFJ)**
2. **Tibiofemoral joint (TFJ)**
3. **Superior Tibiofibular joint (STFJ)**

Important Bony Points

- ▶ Tibial Tuberosity
- ▶ Medial and Lateral femoral condyles
- ▶ Patella
- ▶ Superior Tibiofibular joint
- ▶ Knee Joint line

Tibiofemoral Joint

- ▶ Modified synovial hinge joint.



ARTICULAR SURFACES

Femoral condyles--note the asymmetry



PROXIMAL TIBIA



Lateral Condyle

Medial condyle

Movements: Tibio-femoral Joint

Large range of motion

- ▶ Flexion 130° – 150° (depends on hip)
- ▶ Extension 0° – 10°
- ▶ Medial rotation 30° – 35°
- ▶ Lateral rotation 40° – 45°

Closed packed position – full extension

Open packed position – 30° flexion

Stability!!

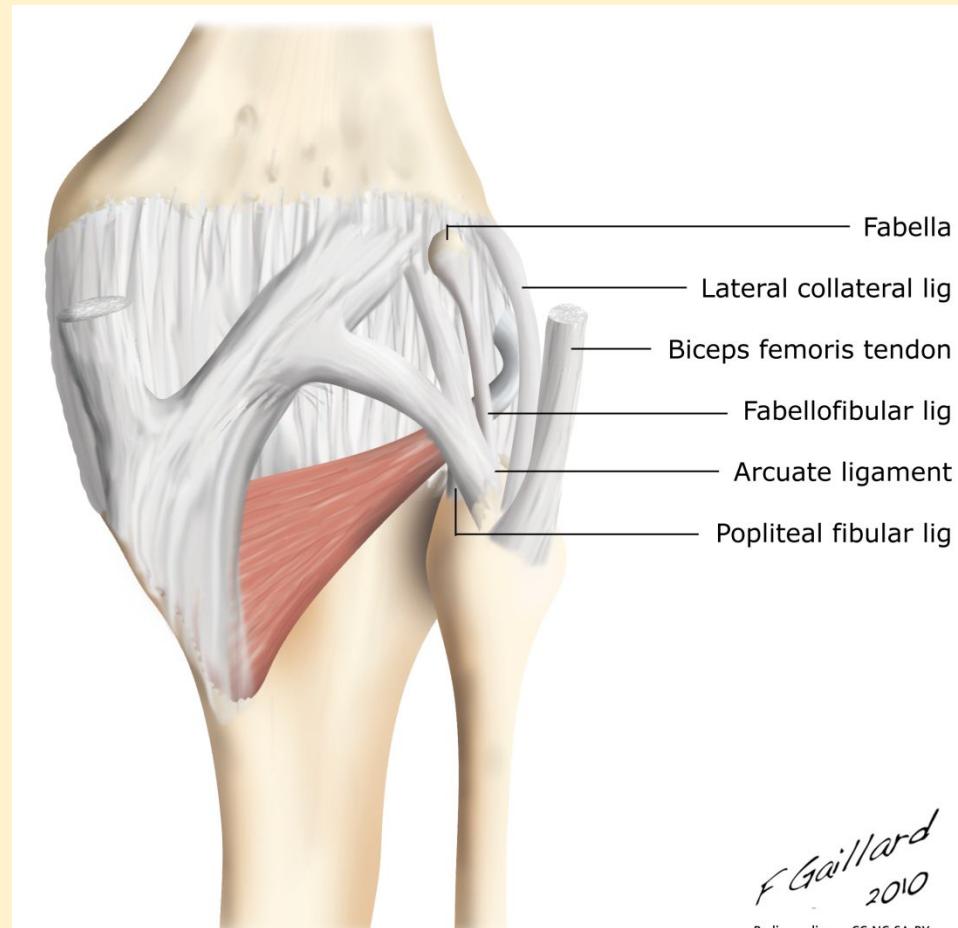
- ▶ The femoral condyles are round
- ▶ The tibial plateau is flat[--ish]
- ▶ This is a very unstable arrangement (a bit like you trying to stand on a football)
- ▶ A number of anatomical structures give stability, they can be divided into two types:
 - Passive stabilisers
 - Dynamic stabilisers

Passive stability system

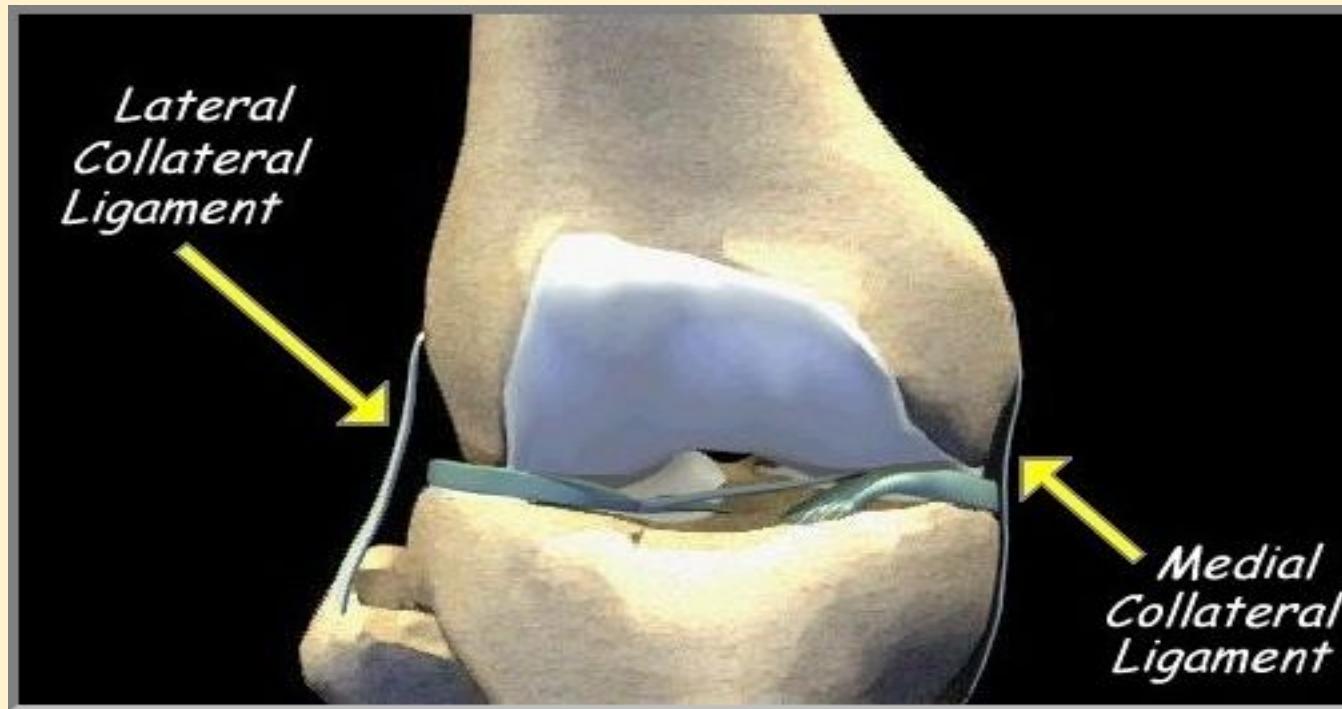
- ▶ A joint capsule
- ▶ Ligaments inside the joint (Intra capsular)
- ▶ Ligaments outside the joint (extracapsular)
- ▶ Extracapsular ligaments are thickenings of the capsule
- ▶ Menisci inside the joint

Extracapsular ligaments

- ▶ MCL-Medial collateral, broad, flat, triangular, composed of two bands
- ▶ LCL-Lateral collateral, narrow , round, cord like.
- ▶ Behind – oblique popliteal ligament, diagonally and up from medial to lateral
- ▶ Behind- Arcuate ligament.



THE COLLATERAL LIGAMENTS



Fibular Collateral ligament

or

Lateral collateral ligament

Tibial collateral ligament

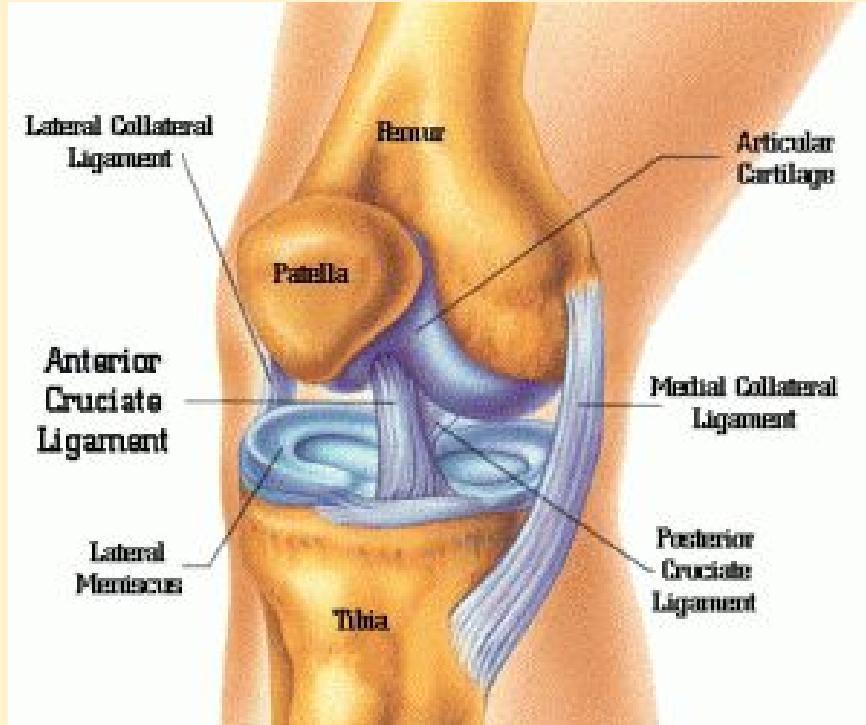
or

Medial collateral ligament

Collateral Ligaments – MCL

- ▶ Triangular in shape
- ▶ Blends with the medial meniscus
- ▶ Medial stability to the knee
- ▶ Stabilises and secures the medial meniscus
- ▶ Most effective in flexion
- ▶ Mode of injury.
 - Medial valgus stress – struck on the lateral side of the leg when the foot is fixed.
 - Kicking the foot laterally when going in for a tackle.

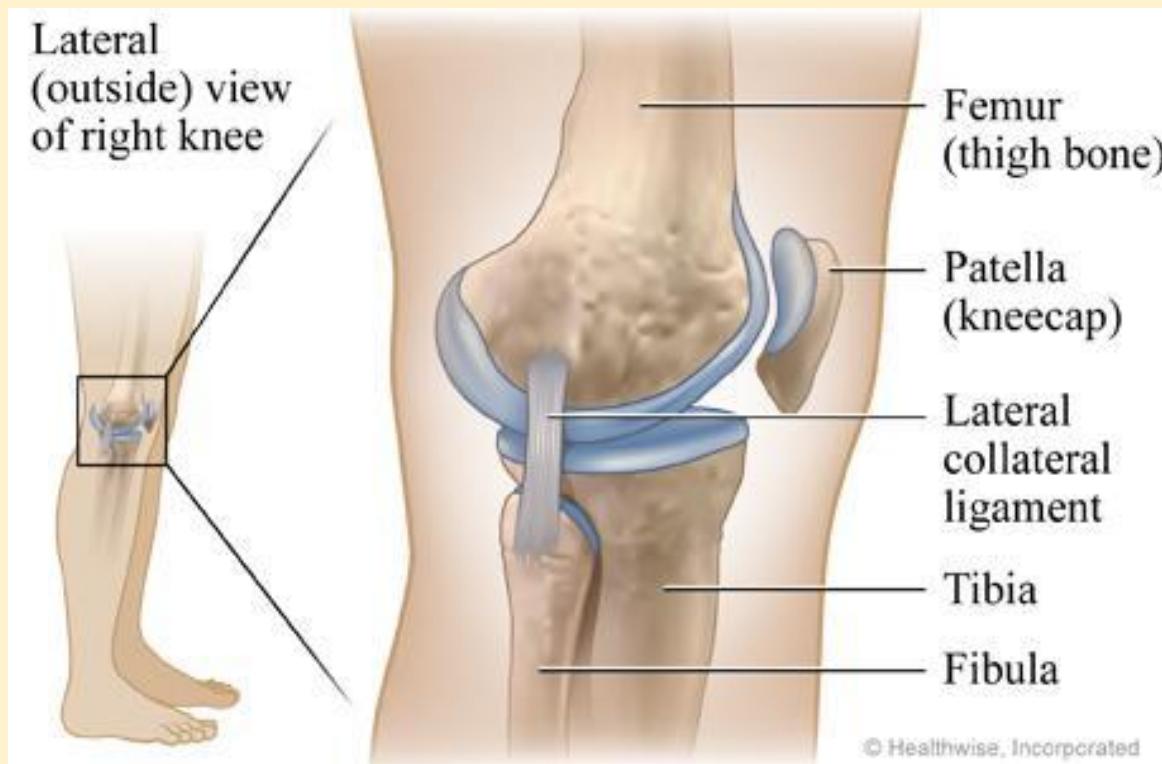
MEDIAL KNEE



Semi **m**embranosis!

Semi **t**endonosis!

FIBULAR COLLATERAL LIGAMENT (LCL)



Collateral Ligaments – LCL

- ▶ Thin and pencil like
- ▶ Associated closely with the insertion of the tendon of biceps femoris
- ▶ Prevents varus stress of the knee
- ▶ This is a much less common injury

TENSIONING THE LCL

Ext: LCL under max tension

Flex : slackens slightly

FUNCTIONS

Resists adduction (varus) not strong

Helped by Iliotibial band and popliteus

Not a great deal in controlling rotary movements

Intracapsular ligaments

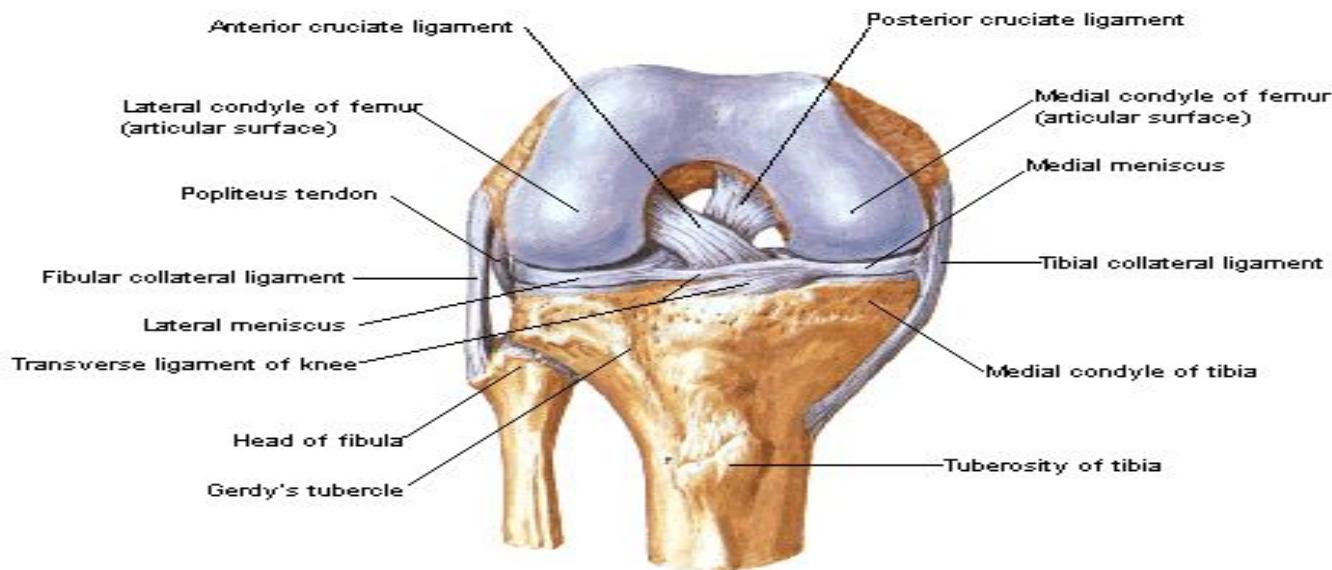
- ▶ These cross over so are referred to as the "Cruciates"
- ▶ From front to back –the Anterior Cruciate– ACL
- ▶ From back to front – the Posterior cruciate–PCL.

Cruciates- ACL

- ▶ Prevents anterior translation of the tibia on the femur
- ▶ Checks external rotation of the tibia in flexion
- ▶ Assists in controlling rolling and gliding in the knee
- ▶ Mode of injury.
 - Forced internal rotation of the knee, the foot is usually fixed.
 - Common in football and skiing.
- May be associated with medial collateral damage and meniscal damage- **the unhappy triad.**

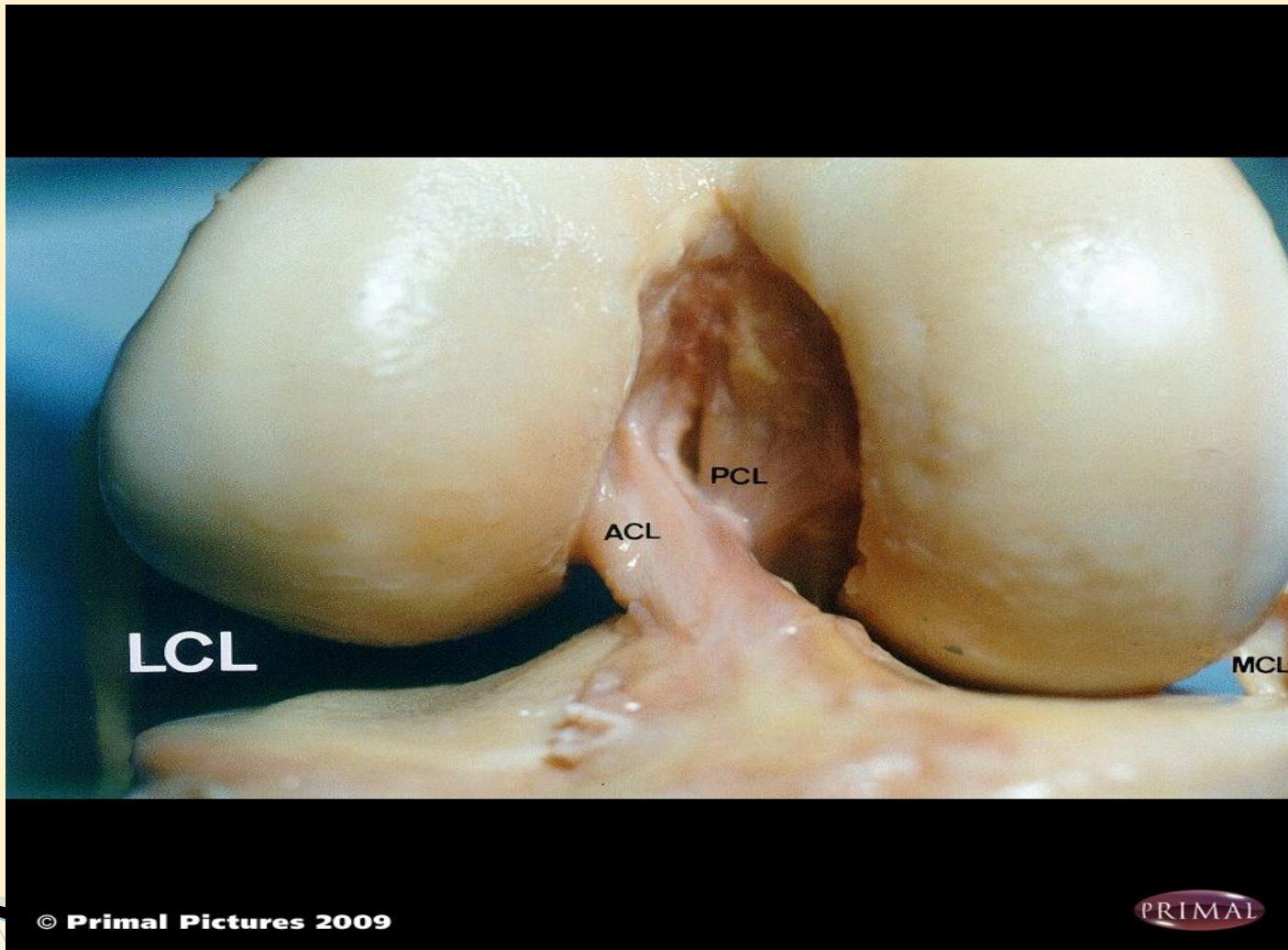
ANTERIOR ASPECT

Knee - Cruciate and Collateral Ligaments Right Knee in Flexion



Anterior View

Anterior Cruciate Ligament



Micheal Owen's ACL goes "bye-bye"

- ▶ <http://www.youtube.com/watch?v=LoFimQmMrbM>

Cruciates- PCL

- ▶ Strongest ligament in the knee
- ▶ Checks posterior translation of the tibia on the femur
- ▶ Prevents hyperextension
- ▶ This is rarely injured.
 - A positive sag sign may be seen – With the knees flexed you may see some posterior shift in the tibial tuberosity on the affected side – The Horizon Sign

POSTERIOR KNEE

MCL

LCL

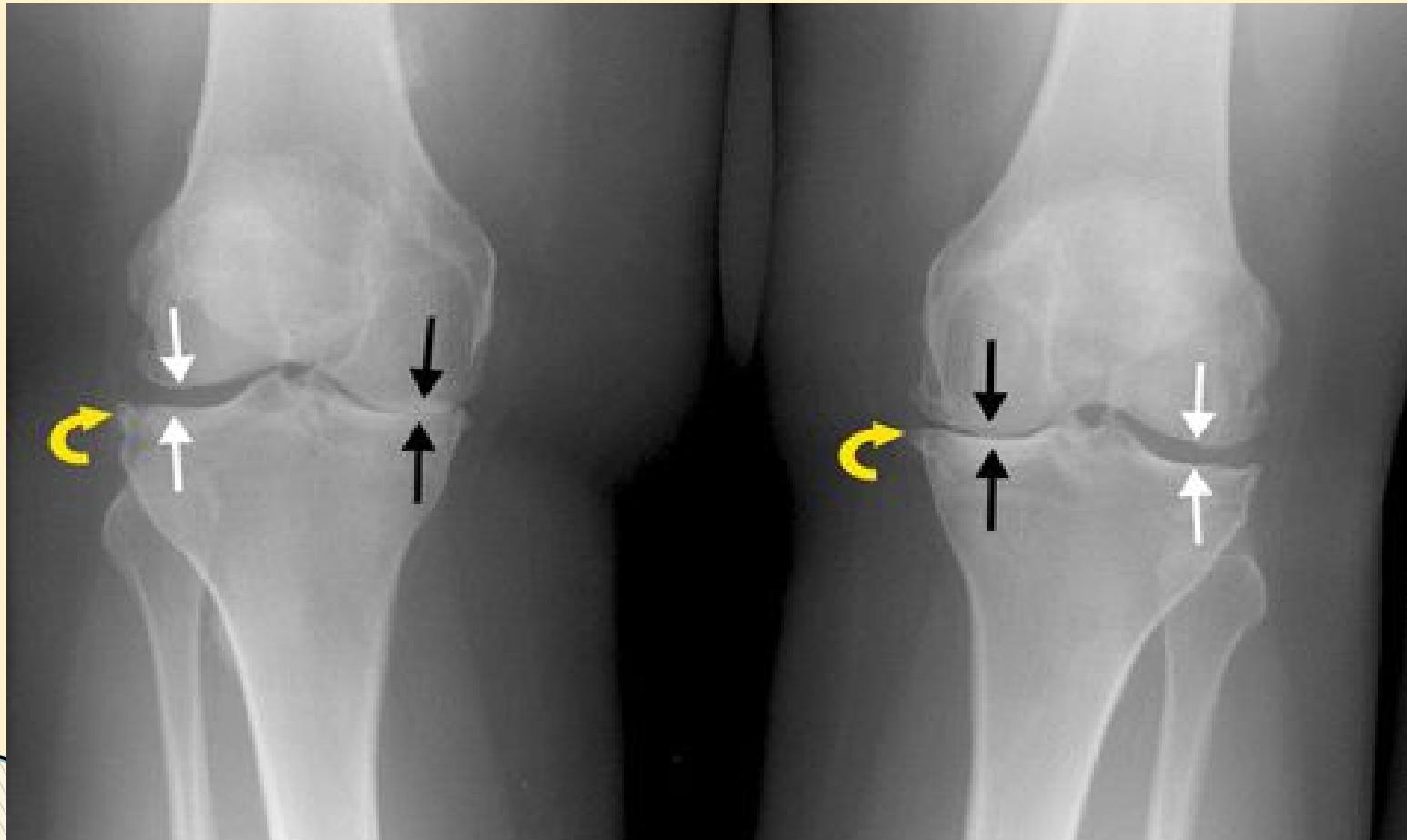
PCL



Have a look at this plain film



Have a look at this plain film



Have a look at this plain film



Have a look at this plain film



Have a look at this plain film

► .



Intracapsular stabilisers- The Menisci

- ▶ Two ‘c’ shaped structures
- ▶ Fixed at either end – otherwise free to move
- ▶ Thicker at the external margins
- ▶ Continuous with the capsule
- ▶ Lateral more mobile than medial, translated backwards during flexion by popliteus

MENISCI



The Menisci: Function

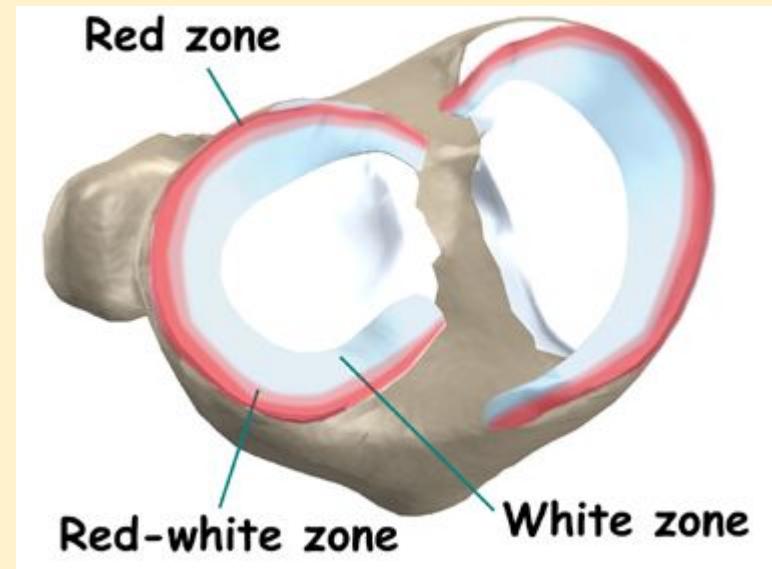
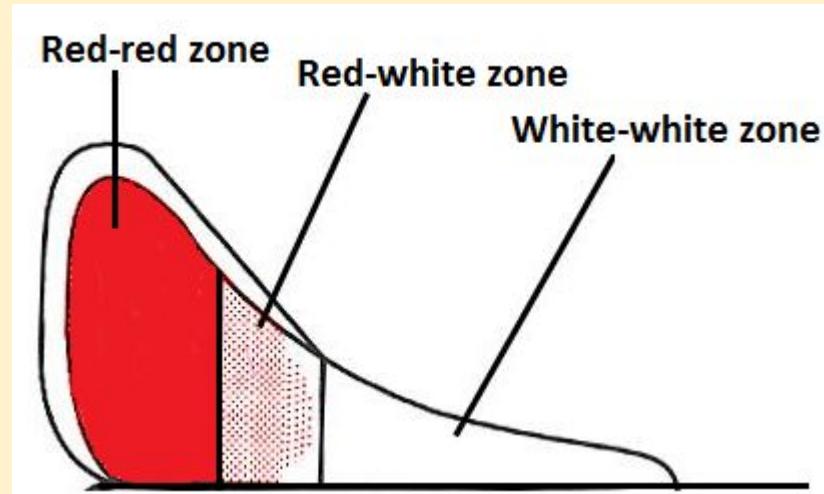
- ▶ Deepen the articular surface
- ▶ Shock absorbers –
 - transmit 50–70% of the load (Ghosh and Taylor, 1987)
- ▶ Provide stability – allows the rounded surface to fit to the flat surface.
- ▶ Proprioception
- ▶ Nutrition
- ▶ Removal may hasten arthritic changes

Meniscal Injury

- ▶ Mode of injury- twisting on a semi flexed knee with the foot fixed on the floor.
 - Football and tennis are the main culprits for injury
- ▶ Medial meniscus tears occur 10 times more frequently than lateral ones.
- ▶ Medial tears more longitudinal, lateral more radial

Meniscal Injury

- ▶ Outer rim of the meniscus has a good blood supply
- ▶ This reduces as we move inwards
- ▶ Implications for management?

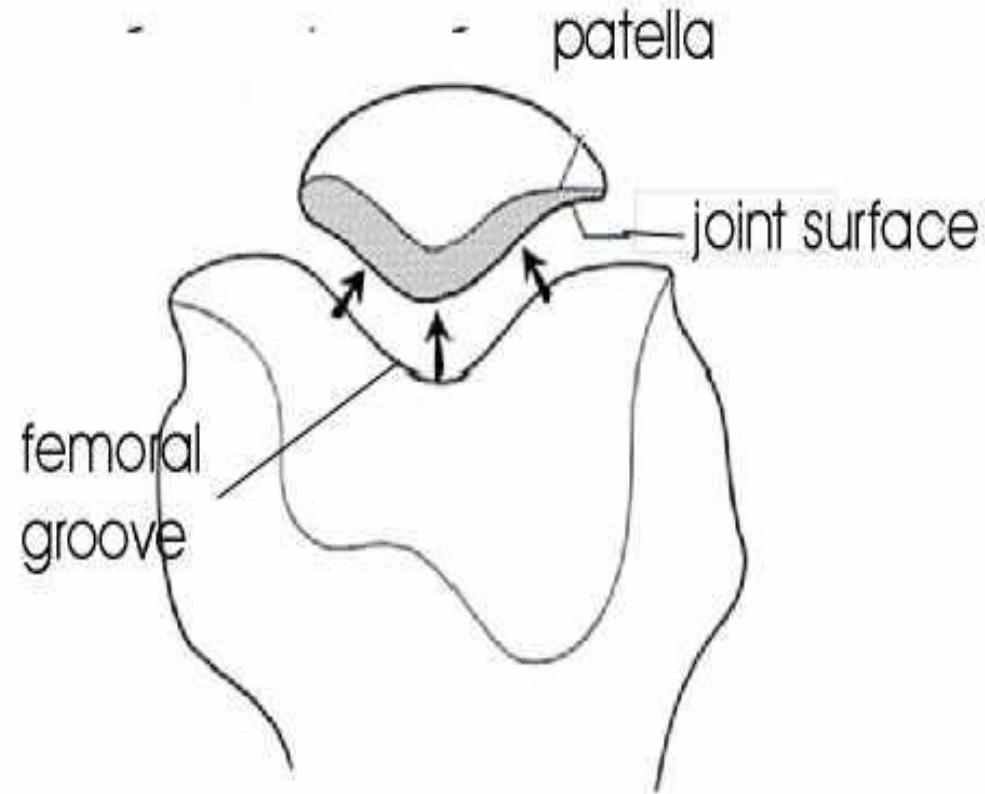


Dynamic Stability – Muscles

Physiological Movement	Group	Primary
Flexion	Hamstrings	Semimembranosis Semitendonosis Biceps femoris
Extension	Quadriceps	Rectus femoris Vastus lateralis Vastus medialis Vastusintermedialis
Rotation Internal		Popliteous unlocks
Rotation External		Biceps femoris locks

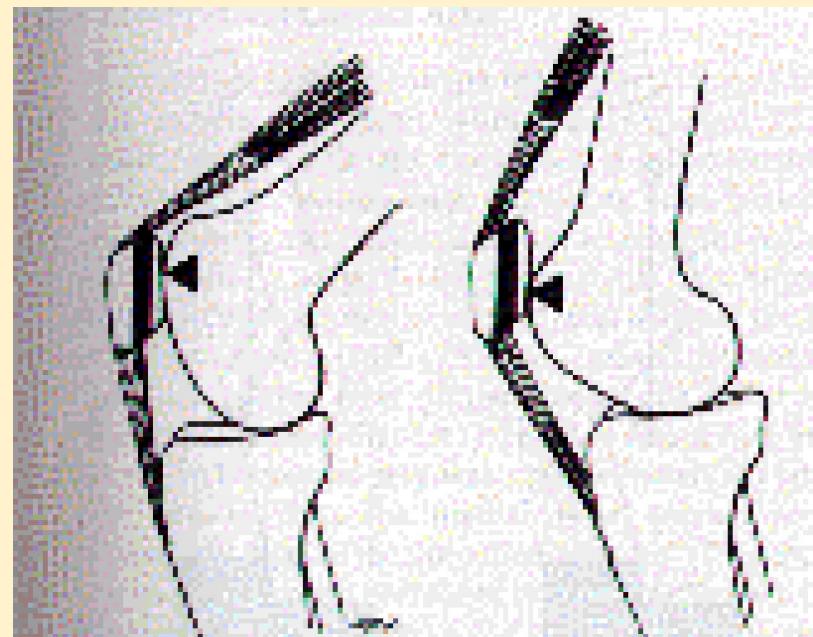
Patello -femoral Joint

- ▶ Modified synovial plane joint
- ▶ Sellar (saddle)
- ▶ Patellar tendon attaches apex of patella to tibial tuberosity



The Patella- Femoral joint - Movements

- ▶ Shift – tilt – rotate
- ▶ Moves up (cephalad) on femur with knee extension
- ▶ Moves down (caudad) on femur with knee flexion



Patellar Tracking

- ▶ During knee flexion and extension the patella is not static but undergoes a degree of shift, tilt and rotation on the patellar surface of the femur as well as supero-inferior movement.
- ▶ Different parts of the patella will articulate with the femur at different parts of the flexion/extension range.
- ▶ The posterior surface of the patella has different facets for changing areas of articulation.

. Bursa of the knee

