PLEASE CLICK ON THE FOLLOWING LINK TO WATCH THE LECTURE ONLINE:-

https://www.youtube.com/watch?v=0fvkICIRtJ8&list=PLuBRb5B7fa_eLlhgRt2DFNKetmQ5nDLZJ&index=3

LOWER LIMB SPORT INJURIES

Dr. Ashraf F Ayasrah

ACL

Anatomy :

- 2 bundles named of there tibial insertion site

Am bundle : more isometric , restraint to anterior drawer

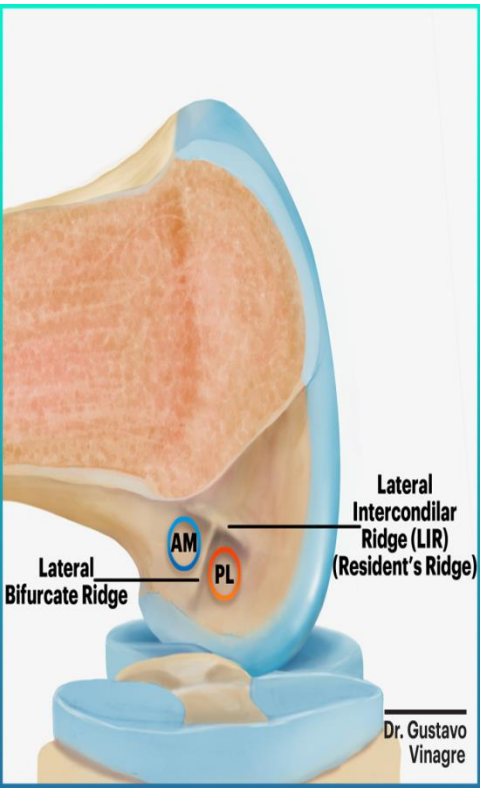
PL bundle : less isometric , restraint to rotational instability.

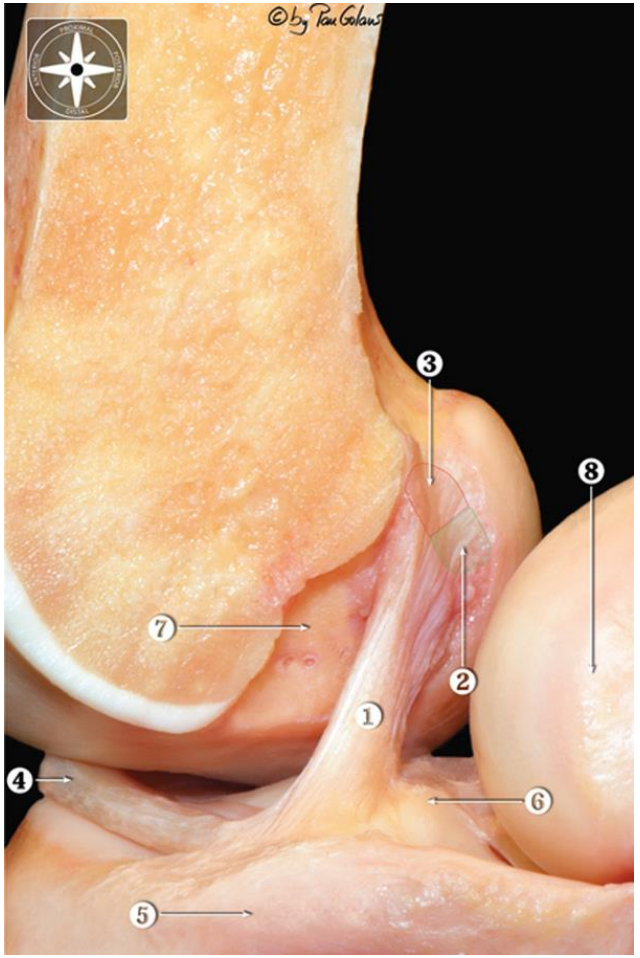
The ACL is an intraarticular structure encased by a thin synovial lining. Rupture of the ligament usually causes disruption of this synovial lining and

hematoma formation throughout the joint space

Presentation :

- ACL injuries comprise 40% to 50% of all ligamentous knee injuries, primarily as a result of sporting activity.
- Common in female athletes: due quadriceps dominant and more valgus lading mechanism, ligament laxity.
- Noncontact pivot injury.
- Direct blow to the lateral aspect of the knee.
- Immediate swelling: The most sensitive marker.
- Giving way


Lateral
Intercondilar
Ridge (LIR)
(Resident's Ridge)
AM
PL
Lateral
Bifurcate Ridge
Dr. Gustavo
Vinagre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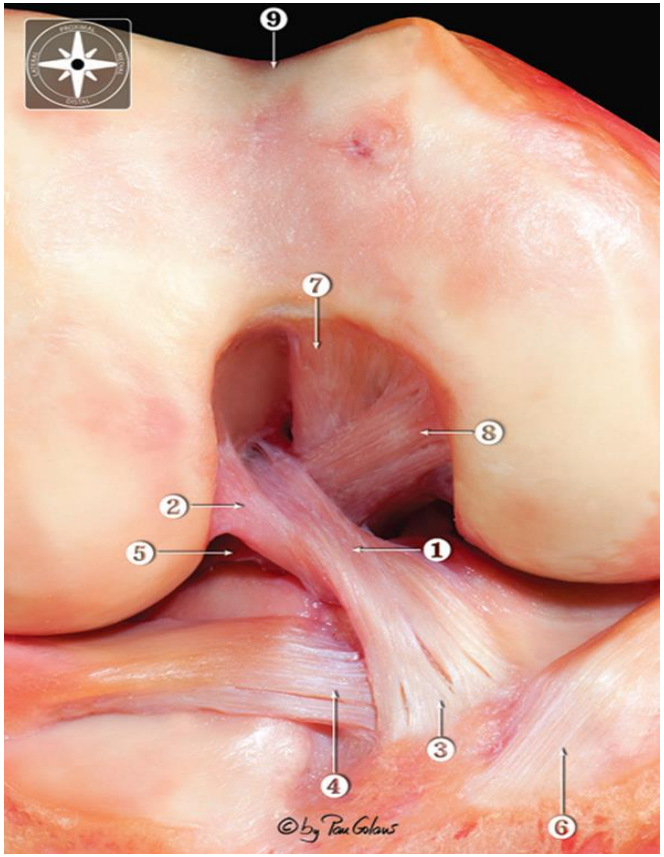
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Physical examination

- **Acute ACL injury:** severe hemarthrosis, decrease ROM, Apprehension and guarding are common.
- Evaluation after subsidence of hemarthrosis.
- **Special tests :**

Lachman : most sensitive, evaluates anterior laxity.

Anterior drawer test : applicable for obese patients.

Pivot shift test : Mimics the actual giving way symptoms.

Lelli's test (The lever sign).

KT-1000 : To qauntify the anterior laxity.

- **Imaging**
- Ap view : segond fracture

Anterolateral ligament avulsion

Lateral view : deep sulcus terminanlis sign (impaction fracture)

MRI

primary signs :

Increased ACL blumensaat line angle (too flat)

Fibers discontinuity

Empty notch sign

Secondary signs :

Bone contusion (middle one third of the LFC and posterolateral tibia)

- Anterior tibial translation : more than 7 mm; uncovering of the posterior horn of the lateral meniscus on sagittal MRI sequences.
- PCL buckling.
- the LCL, which is oblique in orientation and typically not visualized in its entirety, may be seen from its origin to insertion on a single coronal image.


PDWI

Associated injuries

- **Meniscal injuries** :

lateral meniscus more on acute conditions (52%) , medial more on chronic injuries(70%).

increased likelihood of successful repair with concomitant ACL reconstruction.

Ramp lesion is common (MRI sensitivity 48-86%)

Should always be prepared for repair

MCL injuries (%23): good results with conservative training programs prior to ACL reconstruction even for grade 3 injuries. (unhappy triad of O'Donoghue).

PLC injuries: common cause of ACLR failure if not addressed.

Chondral injuries: lowers patient reported outcomes post ACLR.

Management

- The desired activity level of the patient is the most important factor to be considered into the decision about whether to pursue non-operative management of an ACL rupture or ACL reconstruction.

Nonoperative: Persons older than 40 years can do well with a conservative training program, but should be advised that a return to their previous activity level is unlikely. (fewer than 20% of patients return to their preinjury activity level).

Operative: ACL RECONSTRUCTION

- Early V/S delayed: studies showed rehabilitation prior to the operation can decrease the risk of arthrofibrosis, suggesting that operative treatment should wait for 2 to 6 weeks when motion returns. Currently the only strong indications for immediate reconstruction are associated injury to the PL corner or a repairable meniscal injury.
- **Revision ACL:** The majority of failures in the past were due to technical errors, such as improper graft placement, inadequate notchplasty, inadequate graft fixation, improper graft tensioning, use of a graft with inadequate tensile strength, or failure to correct other causes of instability in the knee. However, more recent data have shown that traumatic re-injury, which occurs in 32% of patients, is the primary mode of failure.

plc

- **Anatomy:**

anterolateral bundle**:** tight in flexion most important for posterior stability at 90° flexion

posteromedial bundle**:** tight in extension

- **Presentation:**

History: dashboard injury

hyperflexion athletic injury with a plantar-flexed foot

Symptoms : posterior knee pain in acute injuries

anterior knee pain and difficulty ascending stairs in chronic injuries.

PCL

Mechanism of Injury

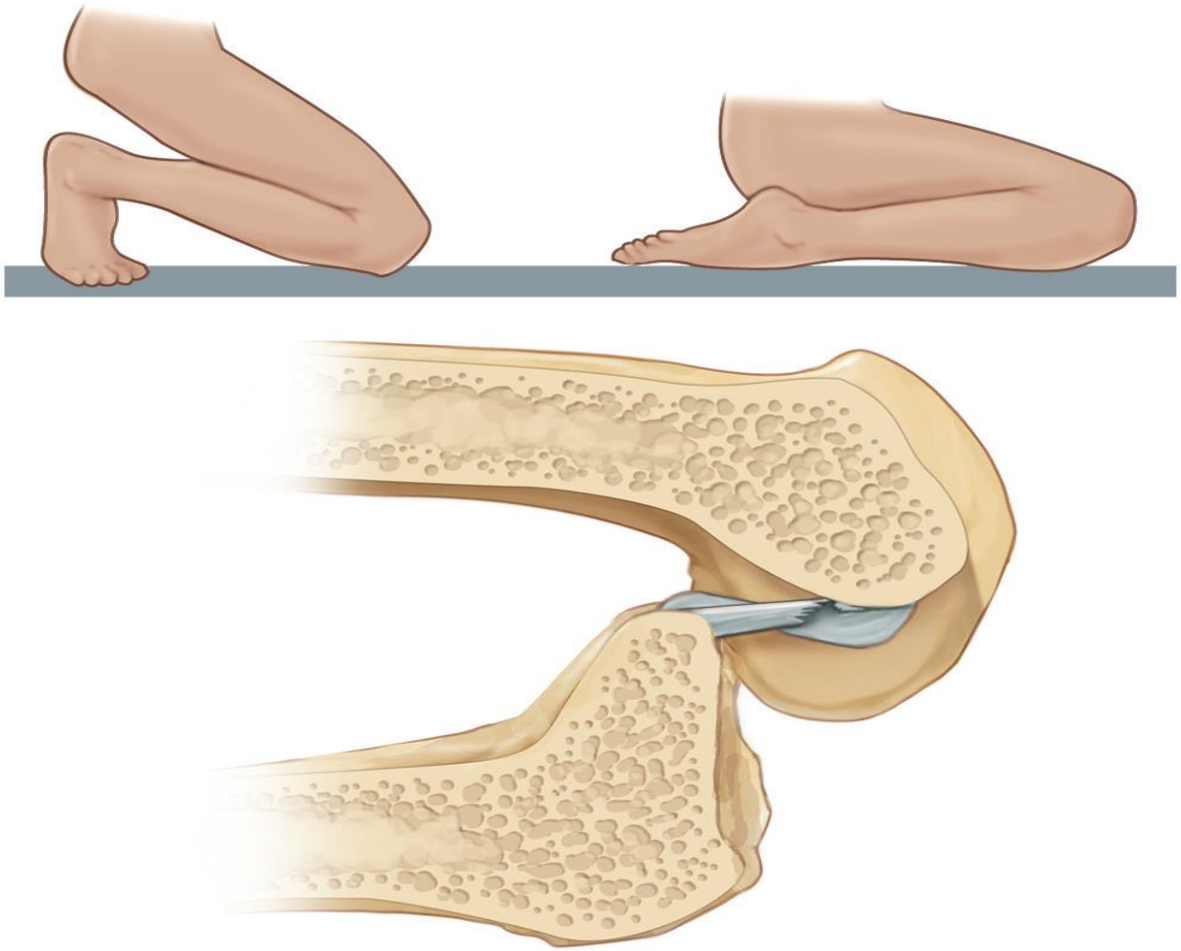
Direct blow to
Anterior tibia

Hyperextension injury

Dashboard injury

Fall onto a flexed knee with foot
In plantarflexion

Falling on a flexed knee with the foot in a dorsiflexed position spares injury to the posterior cruciate ligament (PCL) by transmitting the force to the patellofemoral joint



Physical exam

- Posterior drawer test:

Most accurate, sensitivity 90% specificity 99%

Grade 1 : 1-5 mm posterior translation (partial)

Grade 2 : 5-10 mm posterior translation (complete isolated PCL injury)

Grade 3 : more than 10 mm posterior translation (combined PCL and capsuloligamentus injury, often indicate associated PLC or ACL injury).

The superficial medial collateral ligament and posterior oblique ligament act as a secondary restraint with the tibia in internal rotation.

- Posterior sag test (godfrey test)
- Quadriceps active test

Posterior drawer test

Posterior sag test

Imaging :

Lateral Stress view radiograph

MRI : 100% sensitive for acute injuries

less sensitive for chronic injuries

Management:

Nonoperative : recommended for grade 1 and 2 PCL injuries

Operative : recommended for grade 3 and for associated multiligaments injuries.

Lateral and posterolateral corner injuries

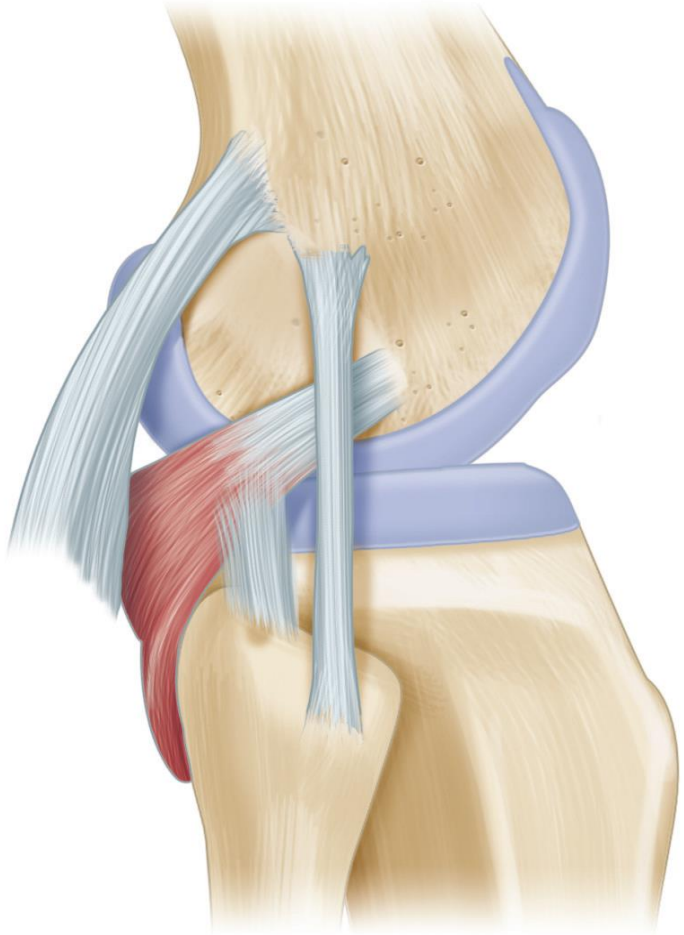
- **Anatomy**: the lateral collateral ligament, popliteus tendon, and popliteofibular ligament are the key structures contributing to PLC function and stability.
- **Presentation**: rarely isolated

History: posterolateral directed force to the proximal tibia or severe external rotation on partially flexed knee.

Instability most often with the knee in extension is the primary complaint in chronic phase. Patient experince difficulty ascending and descending stairs .

Concomitant injuries: usually includes ACL and PCL tears.

the anatomy of the posterolateral corner and the relationships of individual structures to
each other.



Physical exam

- Varus or hyperextension varus thrust at stance phase of gait.
- Varus stress test: laxity at 30° indicates isolated LCL injury and at 0° indicates PLC and PCL injury.
- Dial test: > 10° external rotation asymmetry at 30° consistent with isolated PLC injury and at 90° consistent with both PLC and PCL injury.
- Posterolateral drawer test.
- Reverse pivot shift test.
- External rotation recurvatum test.

Modified Hughston classification

TABLE Grading Scales for PLC Injuries of the Knee

Fanelli Scale for PLC Injury (location based)
A: injury to popliteofibular ligament, popliteus tendon
B: injury to popliteofibular ligament, popliteus tendon, and FCL
C: injury to popliteofibular ligament, popliteus tendon, and FCL, lateral capsular avulsion, and cruciate ligament disruption
Hughston Scale for Collateral Ligament Injury (instability based)
1+: varus opening, 0-5 mm*
2+: varus opening, 5-10 mm*
3+: varus opening, >10 mm*
Varus stress radiographs (sectioning based)
FCL: varus opening, 2.7 mm*
FCL, popliteus tendon: varus opening, 3.5 mm*
FCL, popliteus tendon, popliteofibular ligament: varus opening, 4 mm*

Abbreviations: FCL, fibular collateral ligament; PLC, posterolateral corner.
** Increased opening compared to contralateral knee.*

Varus stress testing performed at 30 degrees of flexion. Again, note the position of the examiner's fingers on the lateral joint line.

External recurvatum test

Dial testing performed with the patient supine at 30 degrees of flexion. The side-to-side difference in the angle between the foot and the axis of the tibia denotes degree of laxity of the posterolateral corner.

Imaging:

- Varus stress radiograph:>2.7mm lateral joint space widening indicates isolated LCL and 4mm widening indicates grade 3 PLC injury.
- Long leg standing radiograph: for triple varus evalaution in chronic cases.
- Arcuate sign.
- MRI :coronal oblique thin-slice through the fibular head can detect popliteofbular ligaments injury in 68% and FCL in 95% of cases.

Management

- Nonoperative: for grade 1 and grade 2 injuries
- Operative :

Repair : for avulsion injuries. (Arcuate sign).

Reconstruction : for grade 3 and multiligaments injuries.

MCL and posteromedial corner injuries

- **Anatomy:**
- Superficial MCL: primary stabilizer to valgus stress
- Deep MCL: secondary stabilizer to valgus stress
- Posterior oblique ligament: posteromedial rotational stability (resist internal rotation) and secondary stabilizer to valgus and posterior drawer stress.
- **Presentation:**
- Usually a history of direct force applied to the lateral knee and pop usually reported, skiers more prone to noncontact MCL injury.
- Medial joint line tenderness and Difficulty ambulating.

Physical exam

- Vaulting type gait (quadriceps activated)
- Valgus stress test: at 30 degree

Grade 1 : mild opening , Grade 2: up to 9 mm opening with end firm point , Grade 3: 10 mm opening with no end firm point(complete MCL injury).

Hughston modification of American Medical Association classification: based on joint laxity on valgus stess and injury severity.

Valgus laxity at 0 degree: indicates combined injury with cruciate tear or posteromedial complex injury.

Anteromedial drawer test and valgus stress test with the the knee in external rotation to test POL.

Hughston modification of AMA Classification

TABLE 1. Commonly used classification system for MCL injuries

	Valgus Laxity (at 30° of flexion)	Quality of Endpoint	Other Examination Findings	MRI Findings	Pathology
Grade 1	0 – 5 mm	Firm endpoint	Tenderness over MCL with no Instability	Grossly intact ligament with periligamentous edema	Microscopic tear of the superficial MCL
Grade 2	6 – 10 mm	Firm endpoint	Increased valgus laxity with 5-15°of valgus instability at 30° of flexion No rotatory instability or instability in extension	Partial tear of the superficial MCL with surrounding edema	Incomplete tear with microscopic and gross disruption of the superficial fibers of the MCL
Grade 3	>10 mm	No appreciable endpoint	Significant valgus laxity with more than 15° of instability to valgus stress at 30° of flexion with no definite endpoint There may also be rotatory instability, instability in extension	Full-thickness tear of the superficial MCL and periligamentous edema	Complete rupture of the MCL complex

Valgus stress testing performed at 30 degrees of flexion to assess the medial collateral ligament. Note the examiner's fingers on the medial joint line to assess tibiofemoral separation

Imaging

- Radiography:
- Pelligrini stieda lesion: chronic old MCL injury.
- Reverse segond fracture: avulsion of the tibial component of the MCL when associated with PLC tear.
- MRI: identify location of injury within the MCL and extension of injury toward POL and posteromedial capsule.

Management

- **Nonoperative**

For grade 1 and 2 injuries.

For isolated femoral side grade 3 injuries

Operative :

For isolated grade 3 tibial side or stener-type lesions.

Injuries extended toward POL and posteromedial structures (associated rotational instability)

Failed non-operative treatment.

MCL and ACL injuries : most common associated multiligamnet injury

Start with immobilization on brace and PT to regain motion then proceed to ACLR

MCL AND ACL reconstruction if MCL still unstable

Fall onto a flexed knee with foot
In plantarflexion

scenario 1

- A professional wrestler drops from the top ropes in an attempt to drive his knee into his opponent's back. His opponent quickly moves and strikes his flexed knee on the mat. He subsequently forfeits the match because of knee pain and swelling. One week later he presents to your office for evaluation.

Next step ?

Scenario 1

- Clinical examination reveals a mild effusion, a IA Lachman test, a positive posterior sag, a grade II posterior drawer, and a positive 90 degree quadriceps active test.
- **Next step ?**

Scenario 1

- Clinical examination reveals a mild effusion, a IA Lachman test, a positive posterior sag, a grade II posterior drawer, and a positive 90 degree quadriceps active test.
- The posterior drawer test with the foot in external rotation reveals no additional excursion. Varus and valgus stress at 30 reveals no instability. Prone external rotation at 30 degrees is symmetric. Reverse pivot shift is negative. Radiographs reveal no fracture. KT-IOOO demonstrates 8 mm of posterior translation.
- **your management ?**

Scenario 2

A 27-year-old professional rugby player is sprinting down the field during a game and sustains a twisting injury to his right knee with immediate onset of swelling, pain, and difficulty with ambulation. he presented to your clinic 3 weeks later for evaluation.

Scenario 2

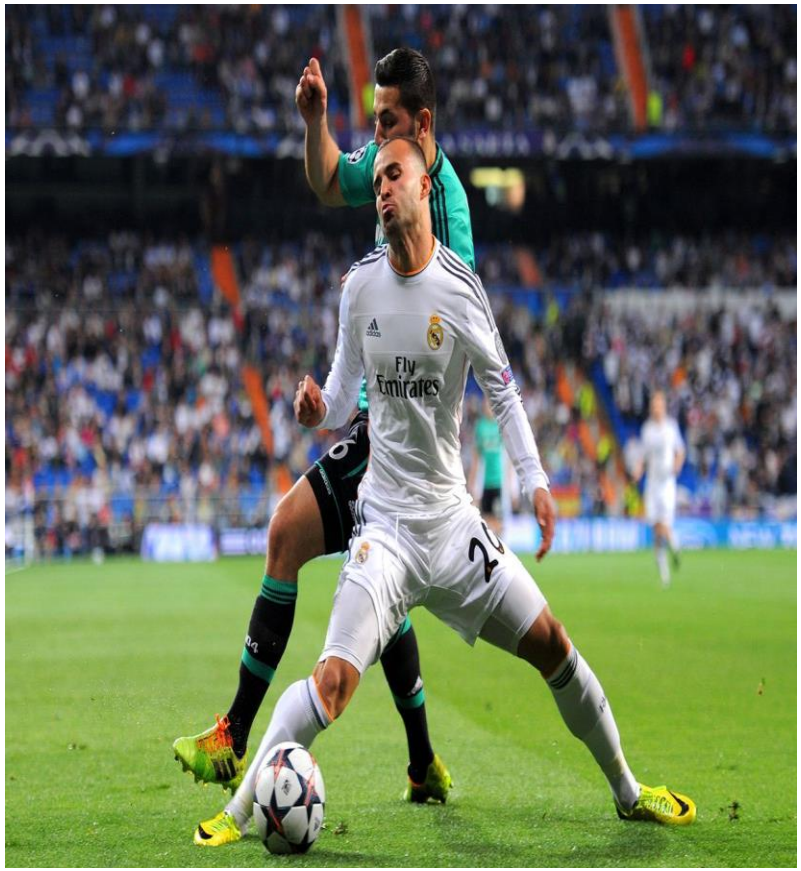
Clinical examination revealed grade 3 lachman test , positive anterior drawer test, negative pivot shift test with fully relaxed patient. Varus and valgus stress tests revealed grade 3 laxity with valgus stress test and normal varus stress test. Symmetrical dial test at 30 and 90 degree and negative posterior drawer test at 90 degree .

SCENARIO 2

- Imaging : no fracture could be seen on plane x-ray
- MRI : complete ACL injury with grade 3 femoral side MCL injury
- Your management ?

Scenario 3

- A high school athlete sustained a noncontact injury to his right knee. He says that during a football game he felt a pop and his leg gave way. He attempted to continue to play but was unable secondary to pain. He presented to your clinic 5 days after the injury and radiographs of his right knee was normal.
- **Next step**



Scenario 3

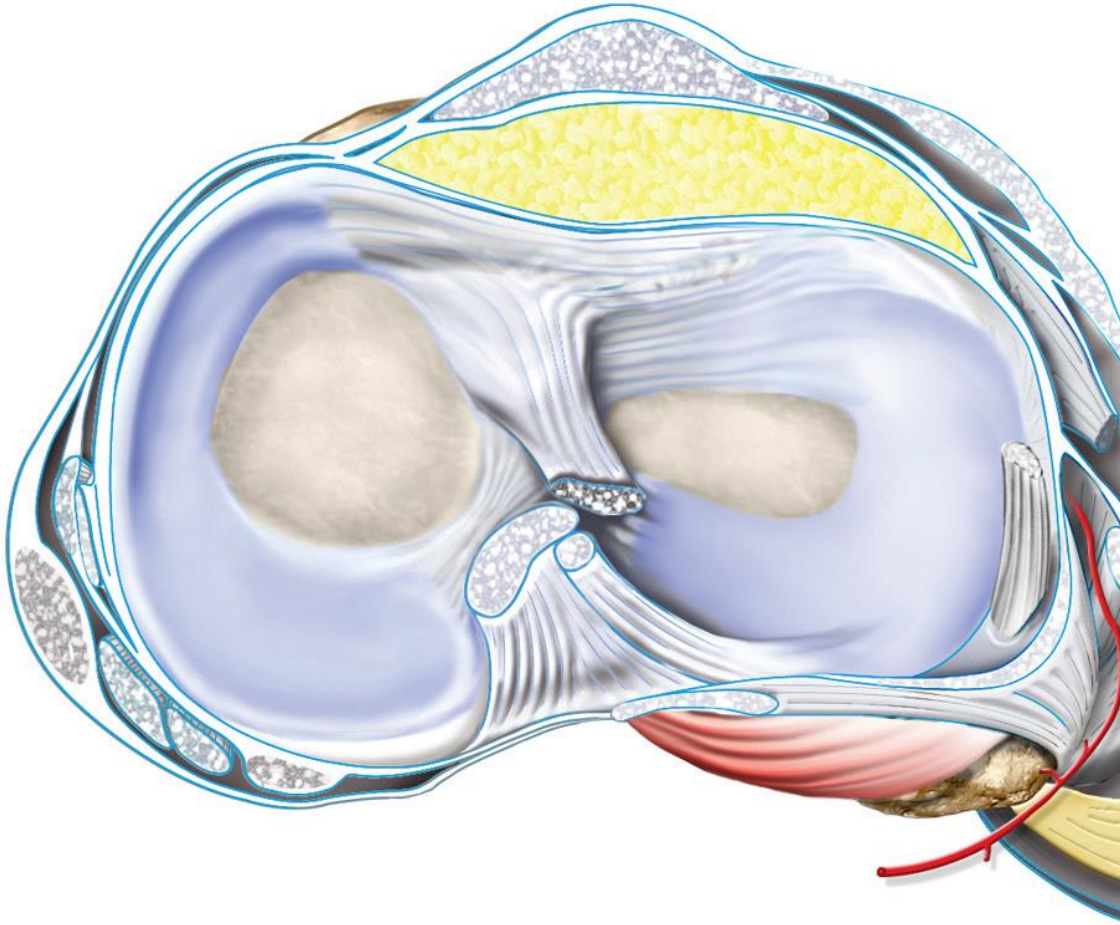
- Physical examination: positive anterior drawer test with grade 3 lachman test, and pivot shift test was positive. Negative posterior drawer test
- **Next step ?**

Scenario 3

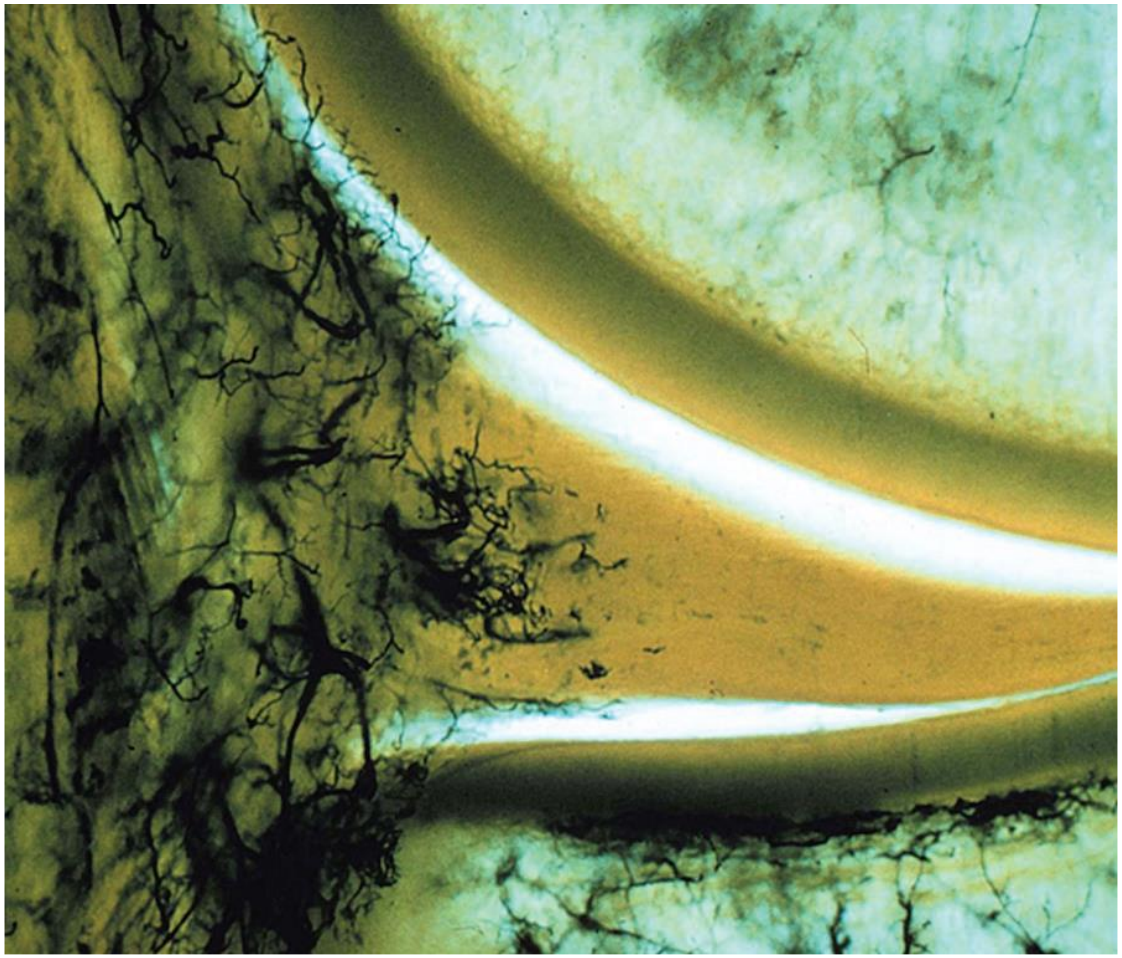
- Physical examination: positive anterior drawer test with grade 3 lachman test, and pivot shift test was positive. Negative posterior drawer test
- Dial test revealed 12 degree Increase in external rotation at 30 but normal at 90 degree. reverse pivot shift also was positive. Normal valgus stress test and moderate varus laxity at varus stress test.
- **Your management ?**

Meniscal injuries

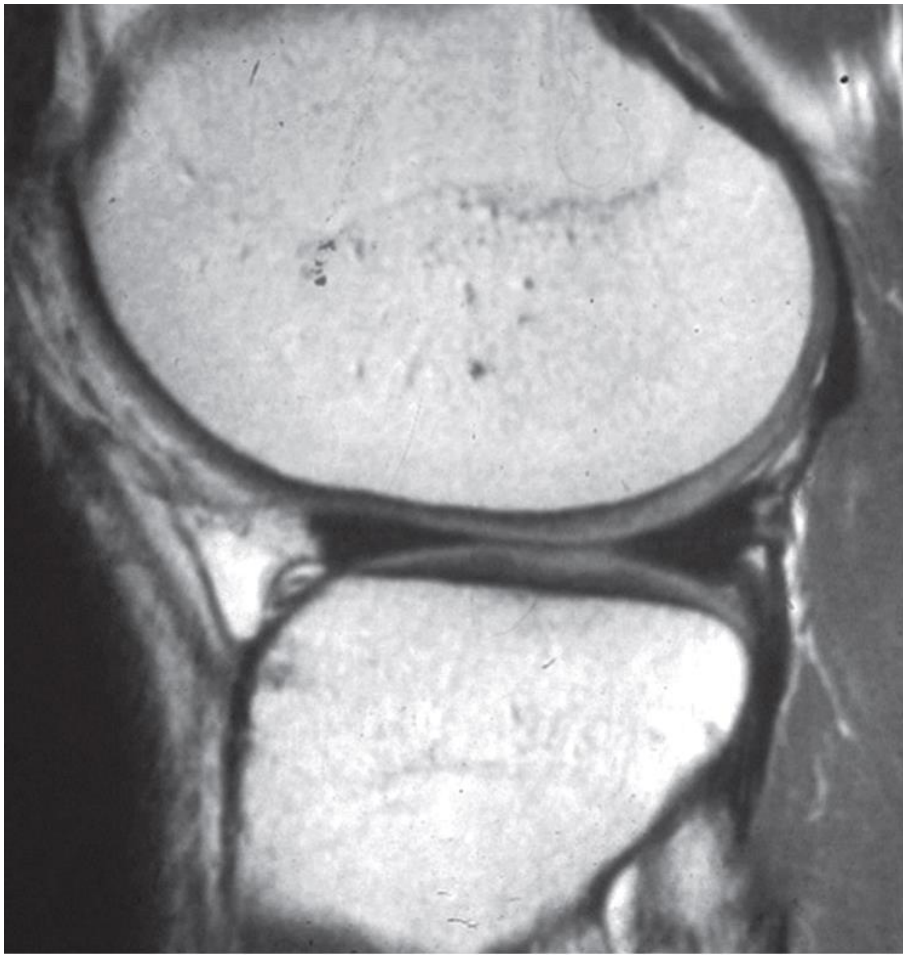
anatomy:
posterior horn of medial meniscus is the main secondary stabilizer to anterior translation
lateral meniscus is less stabilizing and has 2X the excursion of the medial meniscus



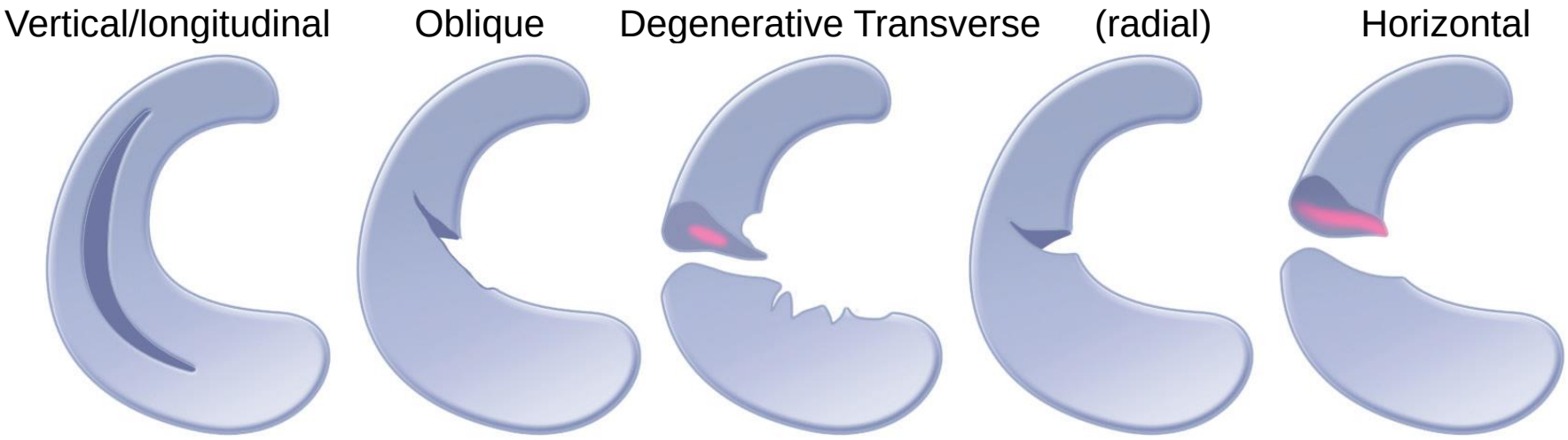
Adult meniscal microvasculature



Function : mechanical support and secondary stabilization, load distribution, shock absorption, proprioception and lubrication.



Types of meniscal injury



presentation

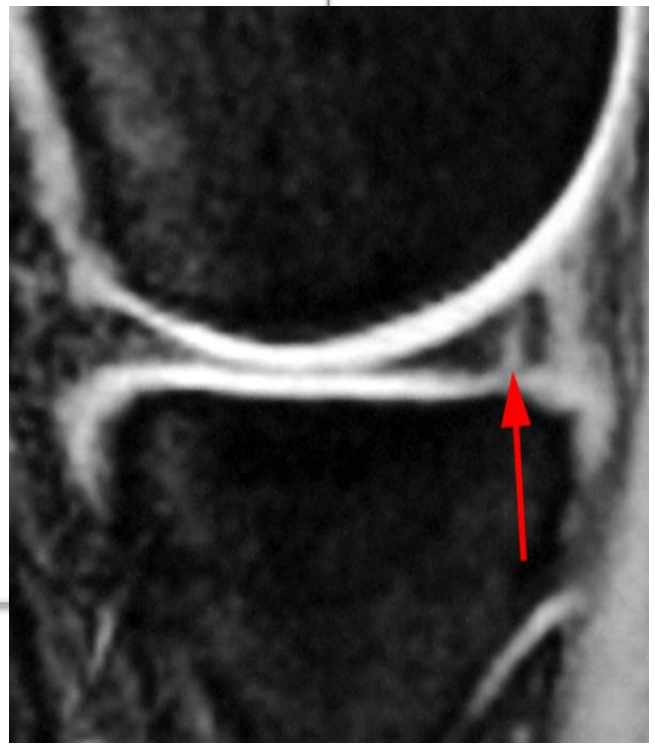
- pain in the medial or lateral side of the knee
- Intemittent swelling
- Locking or clicking (mechanical symptoms).
- **Physical exam:**
- Joint line tenderness: most sensitive
- Apply compression test
- McMurray's test
- Thessaly test

The McMurray meniscal test involves flexion, external rotation, and either varus or valgus stress with either medial or lateral joint line palpation for tears within the medial and lateral menisci, respectively.

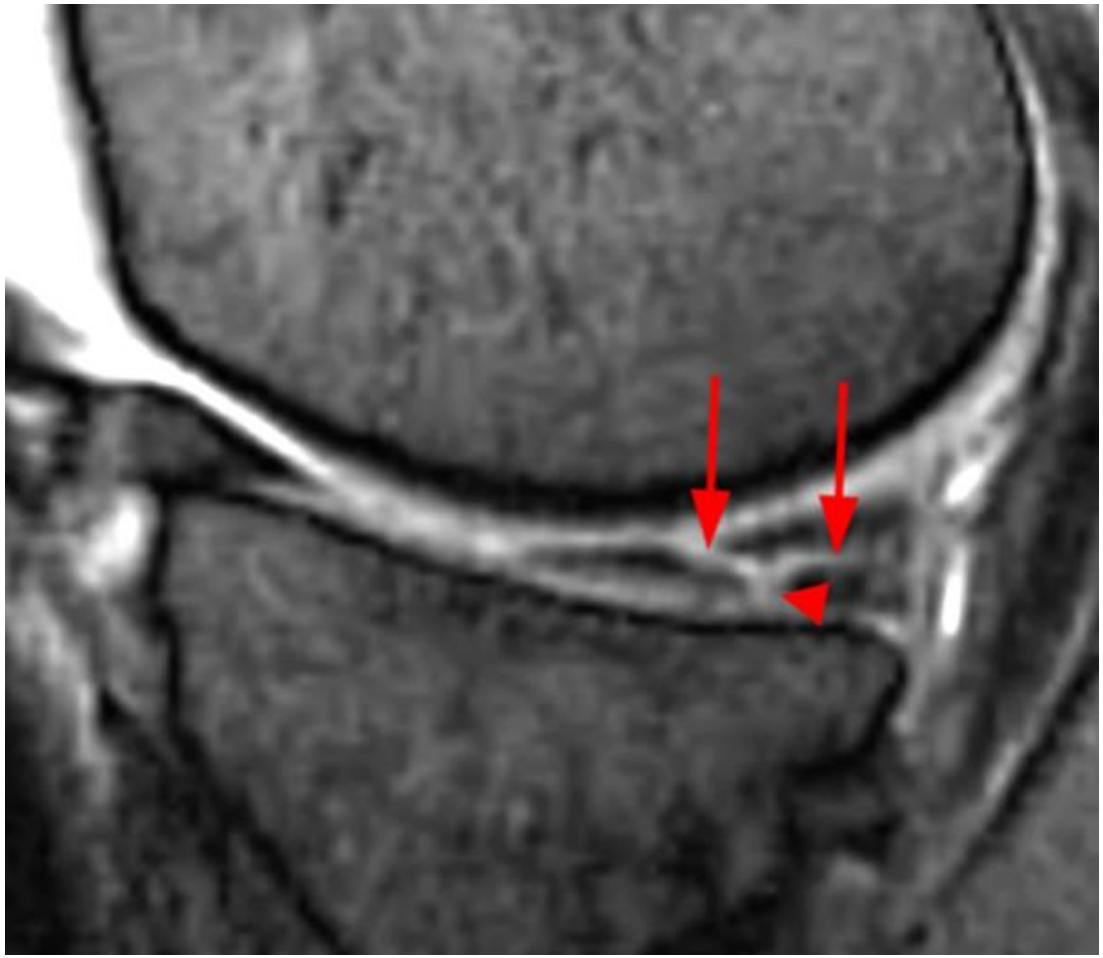
The Apley meniscal test involves prone positioning, flexion of the knee to 90 degrees, axial compression, and then internal and external rotatory movements

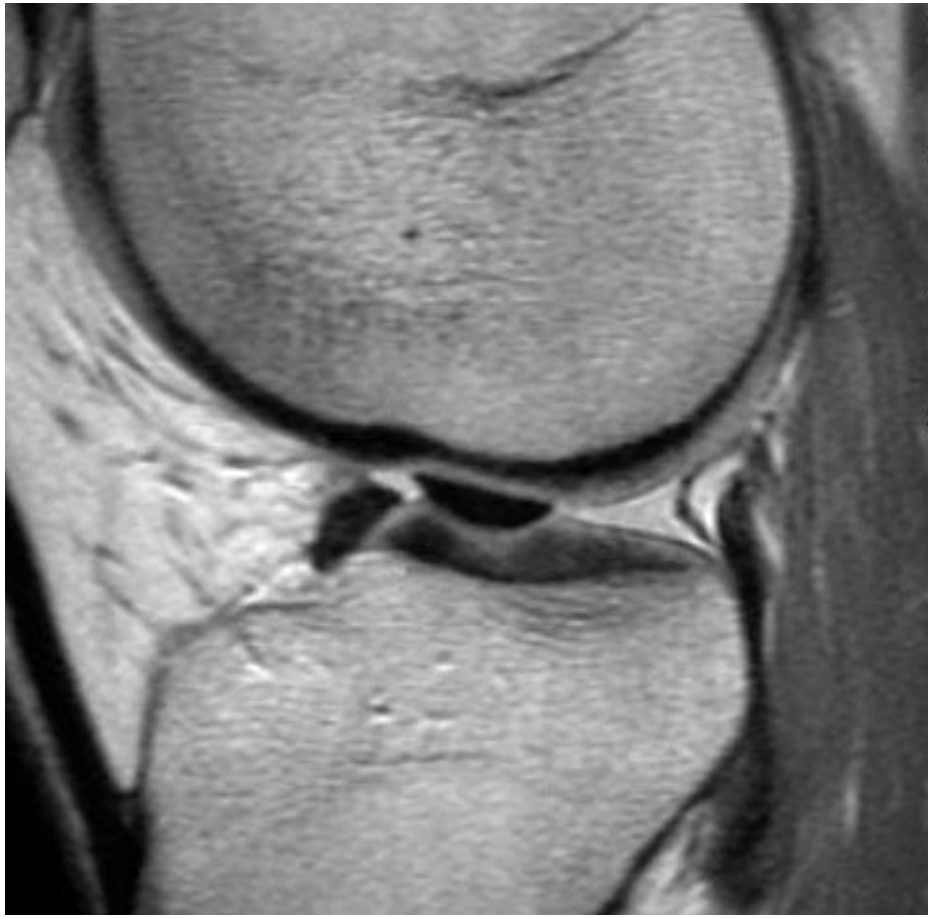
Imaging

- Radiography: fairbanks changes on chronic injuries
- MRI : the most sensitive with high false positive rates.



- T2 sagittal image





Management

- Non-operative: indicated as first line treatment for all meniscal injuries except displaced bucket handle injuries.
- Operative

Repair: indicated for

peripheral vertical or longitudinal tears (within 4 mm of the meniscocapsular junction).

Root tears: transtibial pullout technique

partial meniscectomy : for tears not amenable to repair (complex , degenerative, radial and flap tears)

Management

meniscal transplantation :

- indicated for

Young with near total meniscectomy

Contraindicated in cases of instability , inflammatory arthritis, obesity, and grade 3 to 4 OA.

Patellofemoral instability

- Patellar instability is a broad topic that encompasses a continuum of patellar abnormalities ranging from asymptomatic maltracking to debilitating recurrent dislocations.
- *Maltracking* occurs when the course of the moving patella deviates from the bony constraints of the trochlear groove ,which may or may not be symptomatic.
- The term *subluxation* is used to describe a specific episode in which the patella abruptly leaves the trochlear groove. Subluxation episodes are usually transient and uncomfortable.
- Patellar dislocations represent 2% to 3% of all knee injuries and are the second most common cause of traumatic knee hemarthrosis.

Patellofemoral instability

- Despite the prevalence of patellar instability, ideal management recommendations remain controversial, and evidencebased literature is limited. The great variability of patellar pathologies and patient symptoms makes it difficult to form global treatment recommendations.

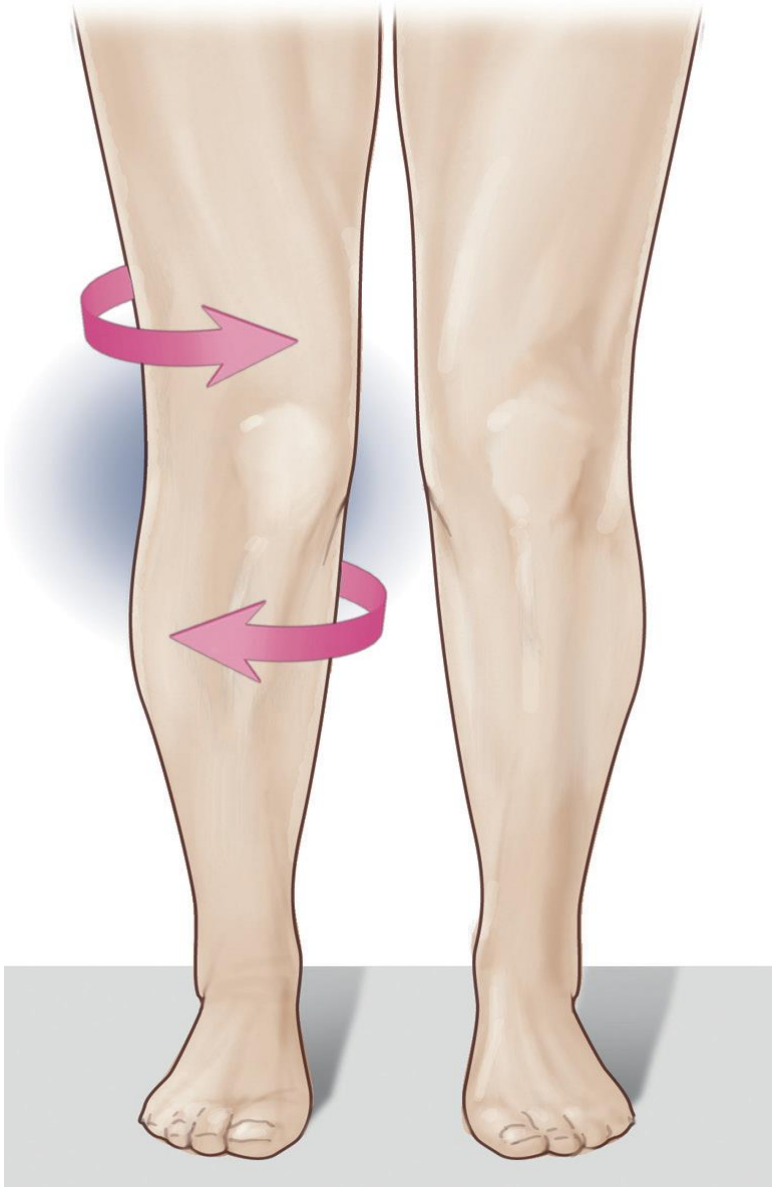
SO

- Understanding of the specific patellofemoral joint abnormality
- The level of functional disability
- The patient's desired activity level

must be taken into account when evaluating and assessing a patient with patellar instability.

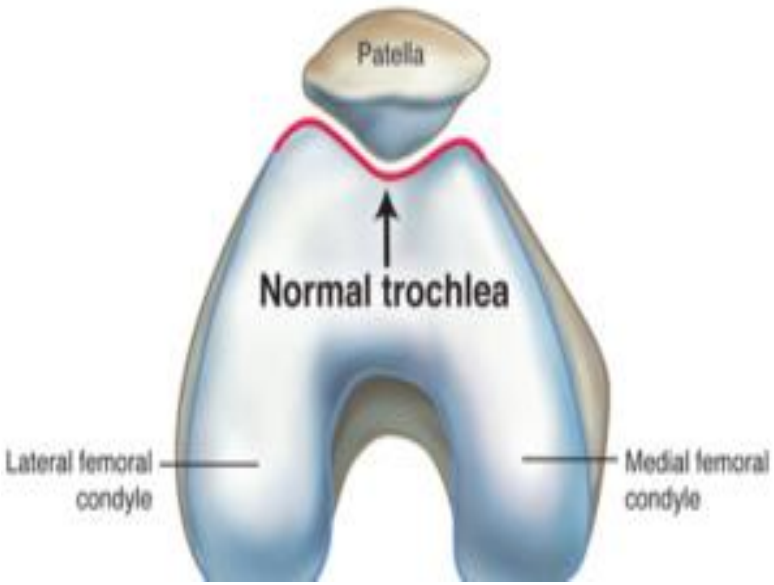
Relevant bony anatomy

- Normally, tibiofemoral angle is approximately 5 to 7 degrees of valgus. With excess knee valgus, or genu valgum, the mechanical pull of the quadriceps muscle changes, increasing the normal laterally directed force vector on the patella.
- The rotation of the femur and tibia also influences patellar stability. Normally, the femoral neck has 7 to 20 degrees of anteversion and the tibia has 15 degrees of external rotation. Increases in femoral anteversion and external tibial torsion will further increase the laterally directed forces on the patella. (miserable malalignment syndrome).



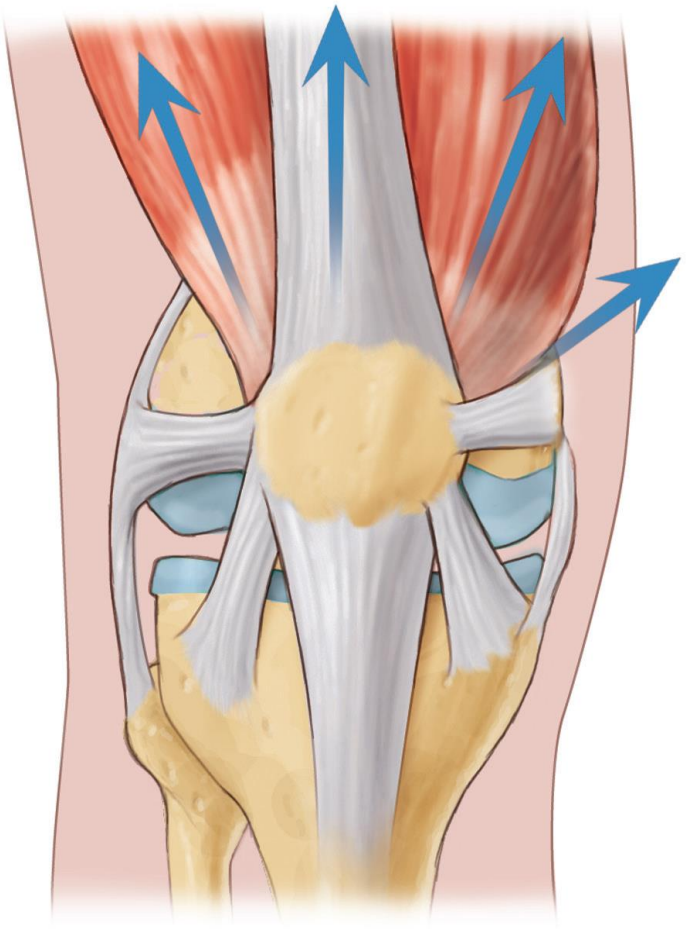
Relevant bony anatomy

- trochlear dysplasia: resulting in a shallow trochlear floor relative to the medial and lateral condyles.
- hypoplasia of the lateral condyle.
- Patella alta: more knee flexion is required before the patella is "engaged" and stabilized by the bony constraints of the trochlear groove.



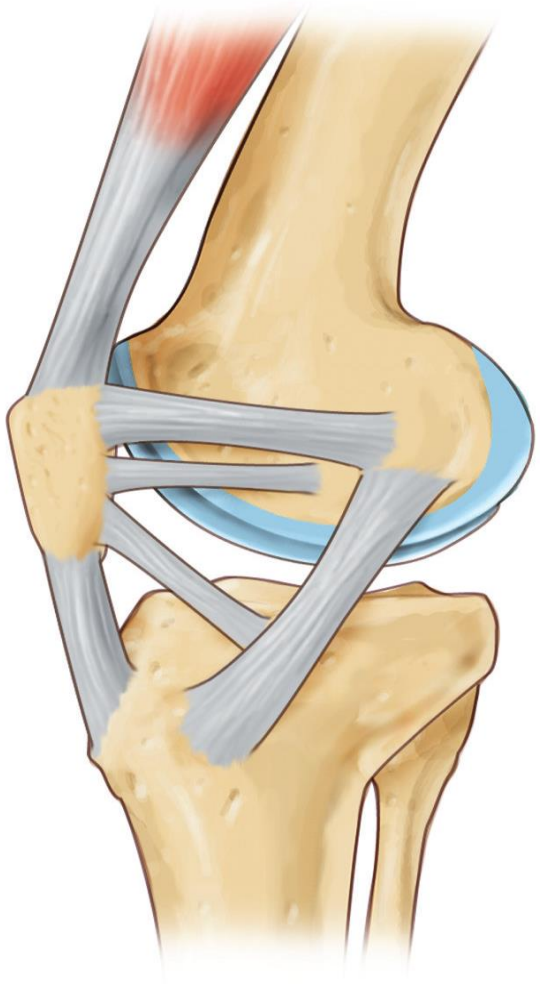
Relevant soft tissue anatomy

- The quadriceps complex is the most important dynamic stabilizer of the patella, Each of the individual muscles contributes a different force vector based on its angle of insertion. The vastus medialis
- oblique (VMO) is a distinct part of the vastus medialis muscle that originates off of the lateral intermuscular septum and inserts at a high angle, up to 65 degrees, on the proximal third of the medial border of the patella. In addition, the VMO may exert a force on the medial patellofemoral ligament (MPFL), adding additional medial stability to the patella.



Relevant soft tissue anatomy

- The primary soft tissue static stabilizers of the patella are the patellofemoral, patellotibial, and patellomeniscal ligaments.
- Studies have shown that the MPFL is the primary passive soft tissue restraint on the medial side of the patella, contributing 50% to 60% of the total restraining force against lateral patellar displacement. From its attachment near the medial epicondyle, the MPFL ligament courses anteriorly and laterally, inserting on the proximal two thirds of the medial border of the patella. It is 4.5 to 6.4 cm long and 1.9 cm wide



history

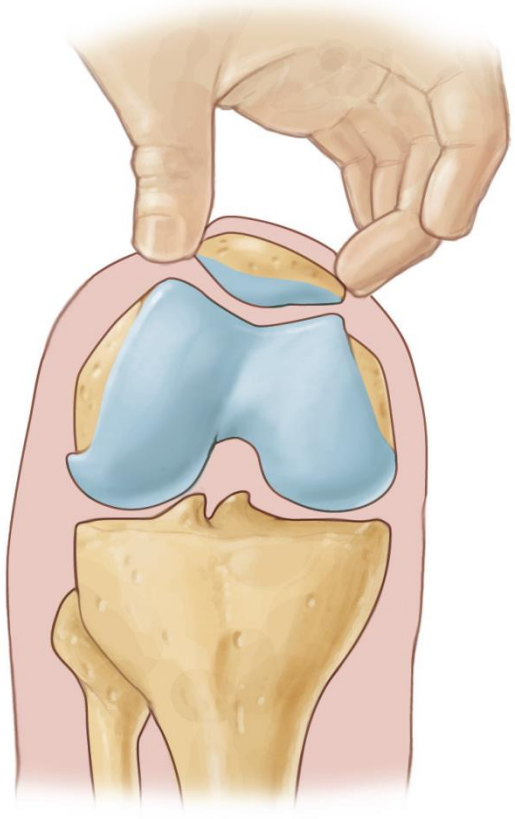
- Mechanism of injury: Sports related activities account for 61% to 72% of first-time dislocations.
- direct trauma to the medial knee or, more frequently, an indirect injury, such as when the leg externally rotates around a planted foot.
- Swelling will develop soon after the injury in most patients unless their patella is very unstable; in those cases, subsequent swelling and pain may be minor or absent.

Examination Overview

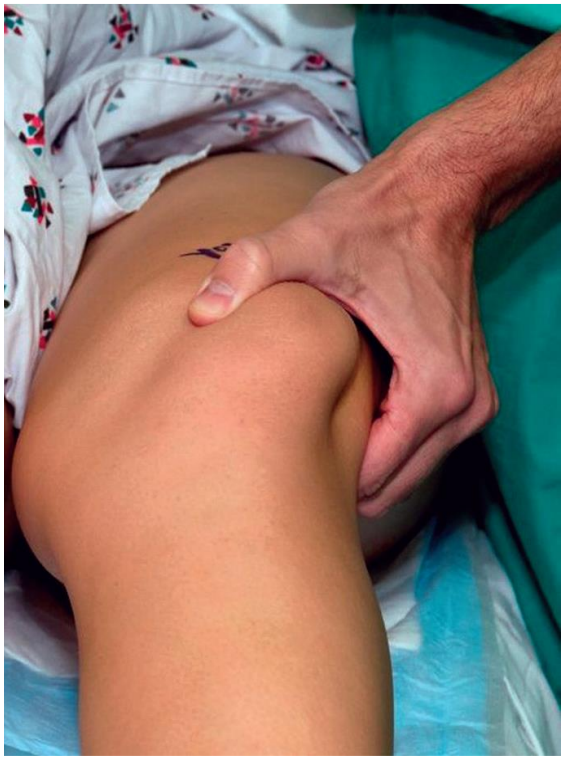
- Acute patellar dislocation: soft tissue swelling, joint effusion, and decrease range of motion. Bassett sign; Tenderness at the medial epicondyle, the most common site of MPFL failure.
- Standing Examination and Gait Testing: "squinting patella" (patellae that point toward each other). "kneeing-in" gait may be the result of increased femoral anteversion, external tibial torsion, or foot pronation.
- Sitting Examination: J Sign
- Supine Examination: Muscle bulk, especially of the VMO, should be evaluated. Tightness of the iliotibial band is examined with use of Ober's test. An excessively tight ITB can cause increased tension in the lateral retinaculum, resulting in patellar maltracking and instability.
- Quadriceps Angle: patients with patella alta, a positive J sign, or persistent patellar subluxation or dislocation may have falsely low Q angles. Cooney et al. showed a negative relationship between the quadriceps angle and the tibial tuberosity–trochlear groove (TT-TG) distance.
- Prone Examination: Femoral anteversion is measured using Craig's test.

Examination Overview

- Patellar Tilt Test



- Patellar Glide Test



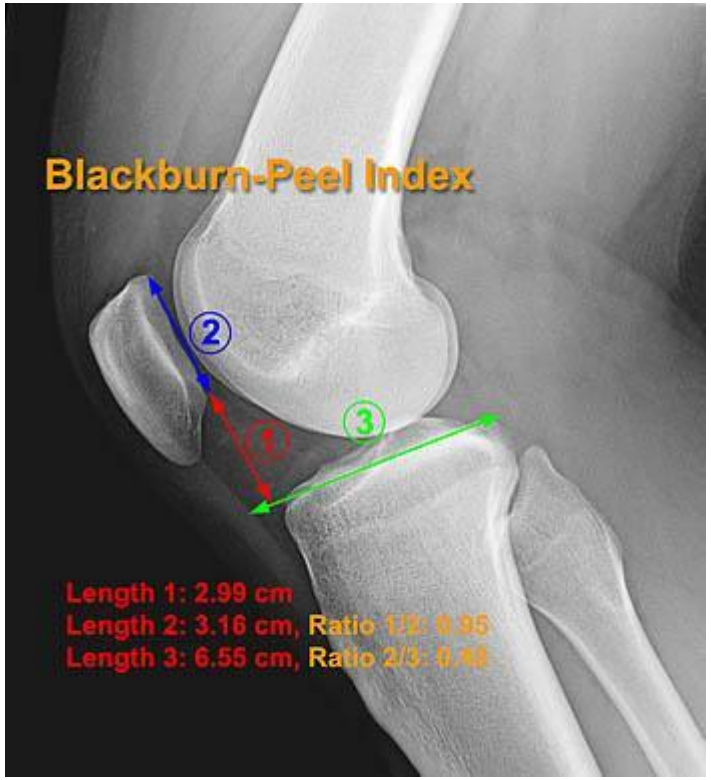
- Patellar Apprehension Test

Imaging

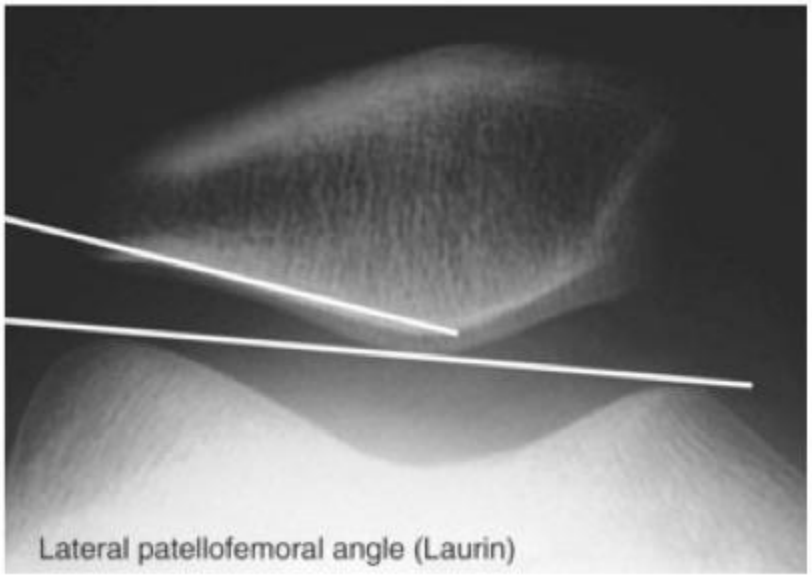
- AP view: lower extremity alignment and version
- Lateral view; best to assess trochlear dysplasia and patellar height:
- crossing sign: the trochlear line prematurely cross the anterior aspect of the femoral condyles(%96)
- supratrochlear spur (trochlear prominence)
- Double contour (medial condyle hypoplasia)

all measurements at 30 degree of flexion

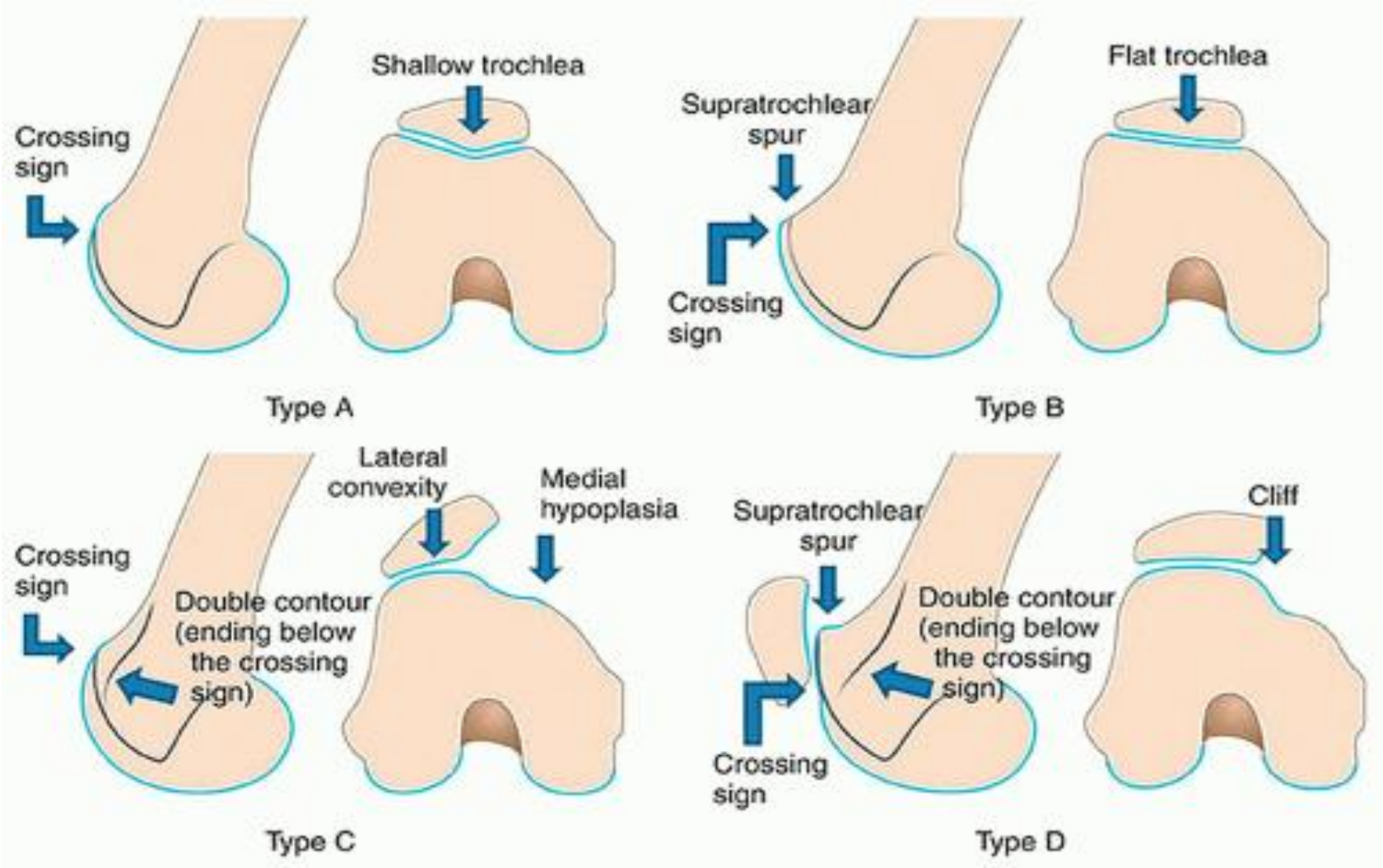
- Insall-Salvati >1.2
- Blackburne-Peel >1.0 : was found to be the most reproducible with the least inter-observer error. It is defined as the ratio of the perpendicular distance from the lower articular margin of the patella to the tibial plateau divided by the length of the articular surface of the patella
- Caton-Deschamps >1.2



- Sunrise/Merchant views best to assess for lateral patellar tilt;
- Lateral patellofemoral angle
- Sulcus angle



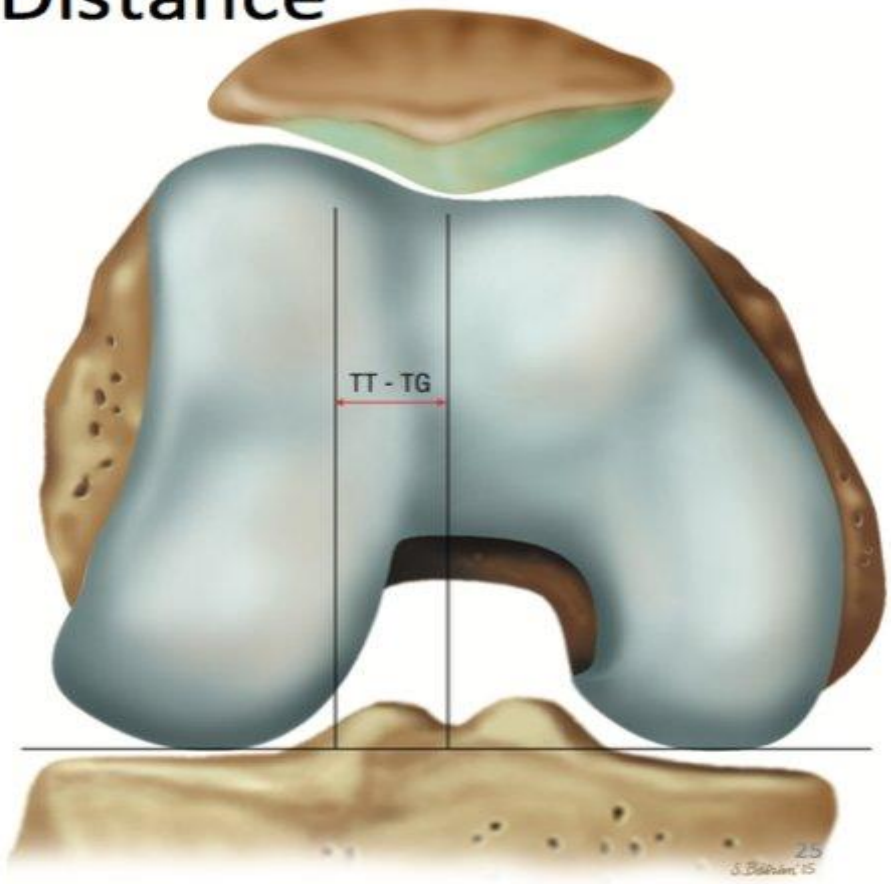
Dejour's classification of trochlear dysplasia



CT-scan

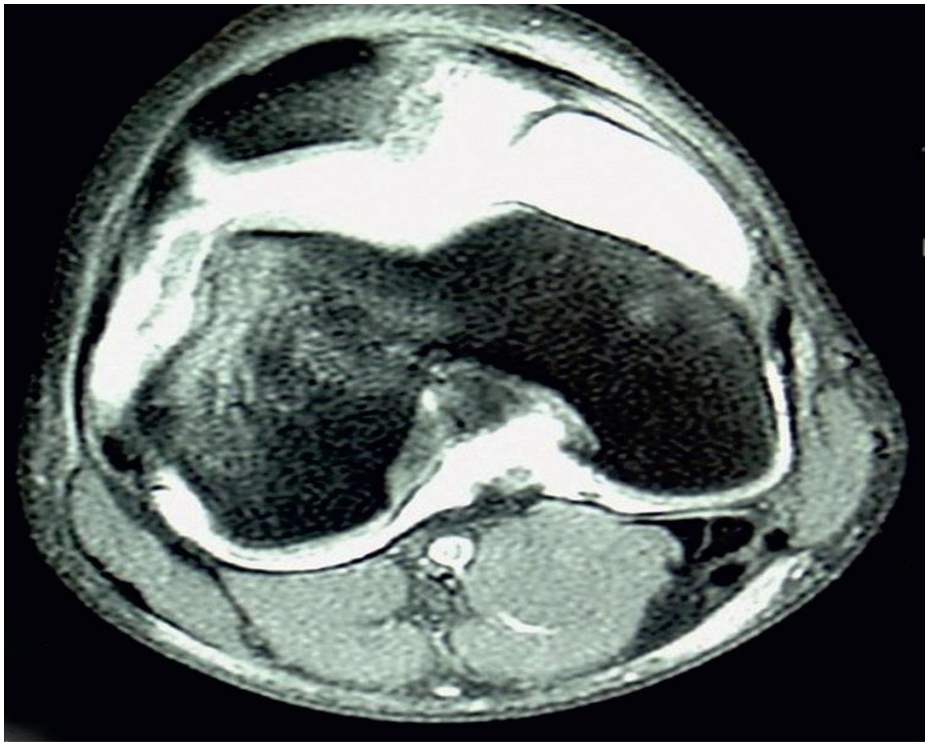
- ## Tibial Tubercle (TT)-Trochlear Groove (TG) Distance

- The distance between lines drawn through the deepest point of the TG and the anterior prominence of its TT attachment of the patellar tendon is the TT-TG distance (value in millimeters).
- The normal TT-TG distance is in the range of 10 to 15mm.
- Greater than 20mm is abnormal.
- The TT-TG distance is a method to assess extensor mechanism valgus alignment in patellar instability.



Magnetic Resonance Imaging

- MRI allows assessment of the articular cartilage, trochlear geometry, and soft tissue structures, including the MPFL. The classical MRI findings after an acute episode of patellar instability include impaction injury to the lateral femoral condyle, osteochondral damage to the medial patella facet, and disruption of the medial retinaculum and MPFL. Furthermore, MRI can be used effectively to calculate the similar measurements made on radiographs and CT imaging, including TT-TG distance, without radiation exposure



Management

- First-Time Patellar Instability Episode: initially immobilize the knee for several days and then begin range-of-motion exercises once the quadriceps muscle function returns. Rehabilitation protocols typically include strengthening of the quadriceps, gluteal, and core muscles. Taping and bracing of the patella have been theorized to provide patellar stability by increasing the strength of the quadriceps muscle and by activating the VMO earlier than the vastus lateralis muscle during use of stairs.
- indications for surgical intervention in the acute setting: including an irreducible patellar dislocation and a large or displaced osteochondral fracture with an associated loose body.

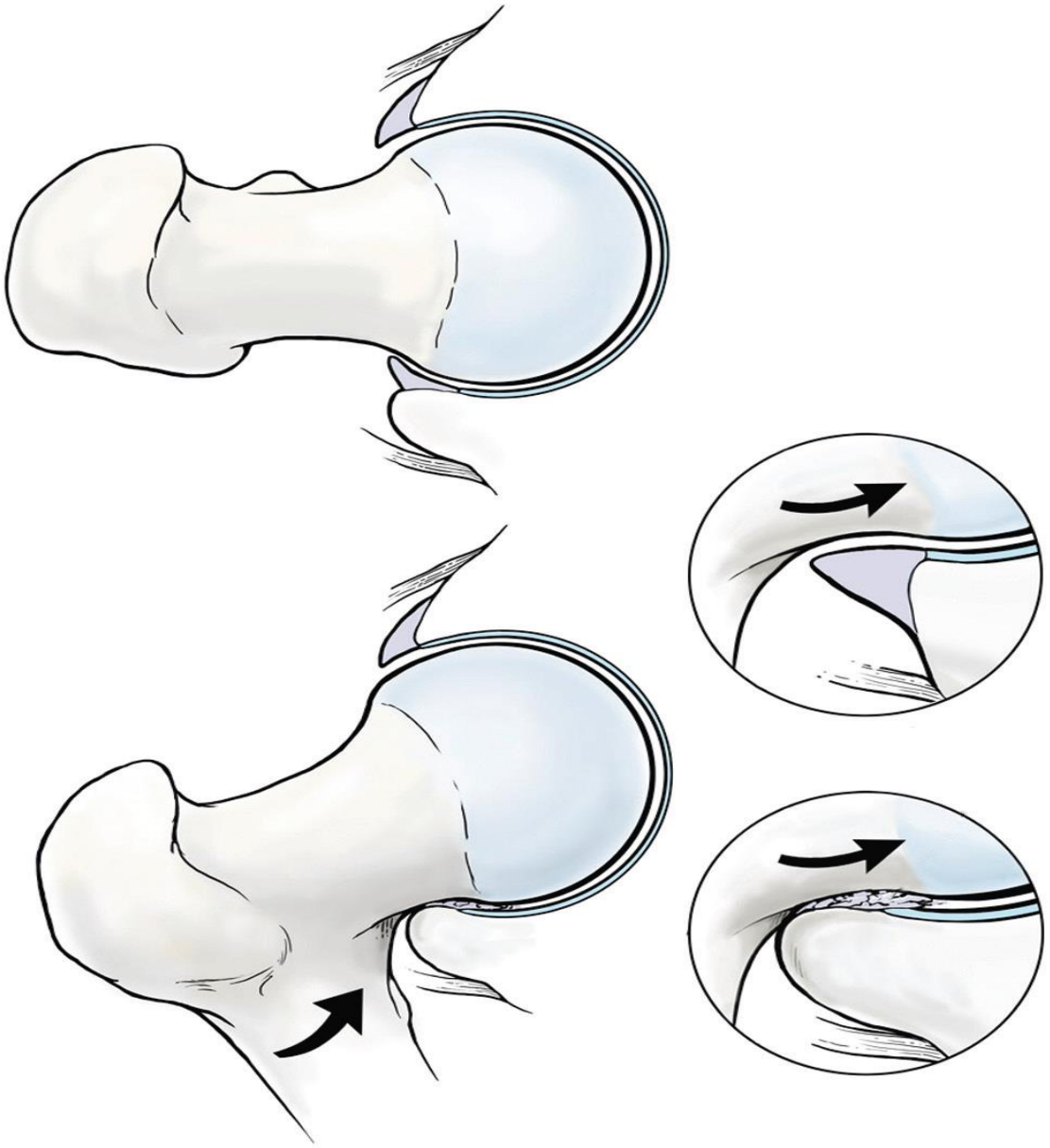
Management

- Recurrent Patellar Instability Episode:
- MPFL reconstruction: indicated for recurrent instability with no significant underlying malalignment.
- Fulkerson-type osteotomy: indicated for TT-TG >20mm.
- tibial tubercle distalization: indicated for patella alta.
- Operations that deepen the trochlea (trochleoplasty) or elevate the anterior portion of the lateral femoral condyle (trochlear osteotomy) were developed to treat trochlear dysplasia
- femoral osteotomies : Excessive femoral anteversion can be corrected with a proximal derotational osteotomy, most frequently in the pediatric population. Excessive valgus alignment can be corrected through distal femoral osteotomies
- lateral release: never alone, indicated for excessive lateral tilt or tightness in association with other procedures.

Femoroacetabular Impingement in Athletes

- FAI refers to the process by which a misshapen hip joint secondarily leads to breakdown of the intraarticular structures causing pain and associated dysfunction, followed by the premature development of osteoarthritis. Three types of FAI have been identified: a pincer type, a cam type, and combined impingement.
- Pincer impingement is caused by an excessive prominence of the anterolateral rim of the acetabulum. This condition can occur simply from overgrowth of the anterior edge (Sometimes a separate piece of bone is found referred to as an *os acetabulum)* or as a result of retroversion of the acetabulum, which is a condition in which the face of the acetabulum tilts slightly backward instead of being in its normal forward position. Other risk factors are acetabular protrusio and coxa profunda
- With hip flexion, the prominent rim of the acetabulum crushes the labrum against the femoral neck, and Secondary articular failure occurs over time. contrecoup cartilaginous injury on the posteroinferior acetabulum may encountered in severe cases.
- occurs just about equally in males and females and more commonly starts to cause symptoms in middle age.

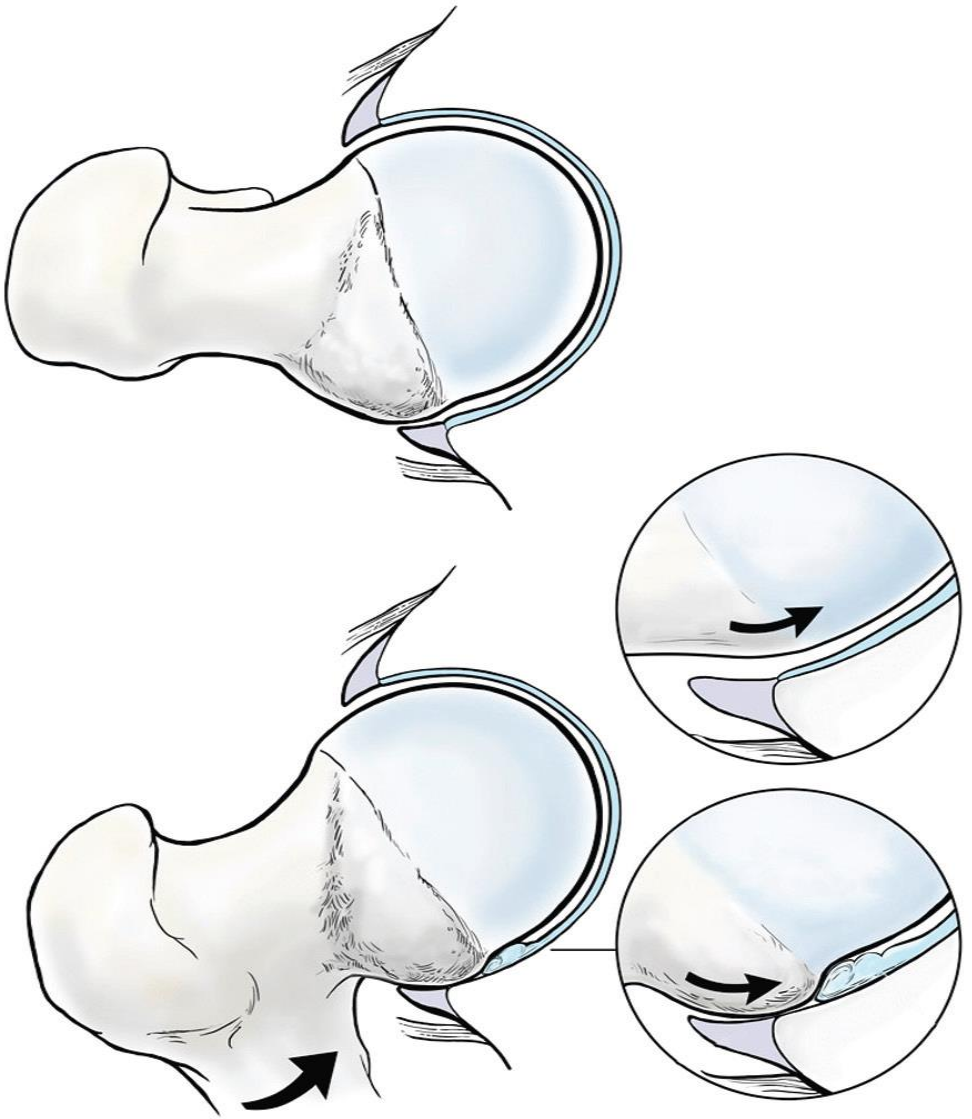
Pincer impingement



Cam impingement

- Cam impingement refers to the cam effect caused by a nonspherical femoral head rotating inside the acetabulum (pistol-grip deformity). This condition has long been recognized as a sequela of a slipped capital femoral epiphysis in which posterior displacement of capitis leaves a prominence of the anterior neck, resulting in severely limited internal rotation of the hip. Operations performed to excise this bony prominence have been referred to as a *cheilectomy.*
- *New theory:* premature eccentric closure of the capital physis in adolescence, resulting in the nonspherical shape of the femoral head. And this premature closure may be caused by intense physical activity at a young age.
- With flexion, the nonspherical portion of the head rotates into the acetabulum, creating a shear force on the anterolateral edge of the acetabular articular surface. Over time the labrum eventually starts to fail, but only after the process is advanced on the articular surface.
- Cam impingement has approximately a 3:1 predilection for males and often presents with problems in young adulthood.

Cam impingement

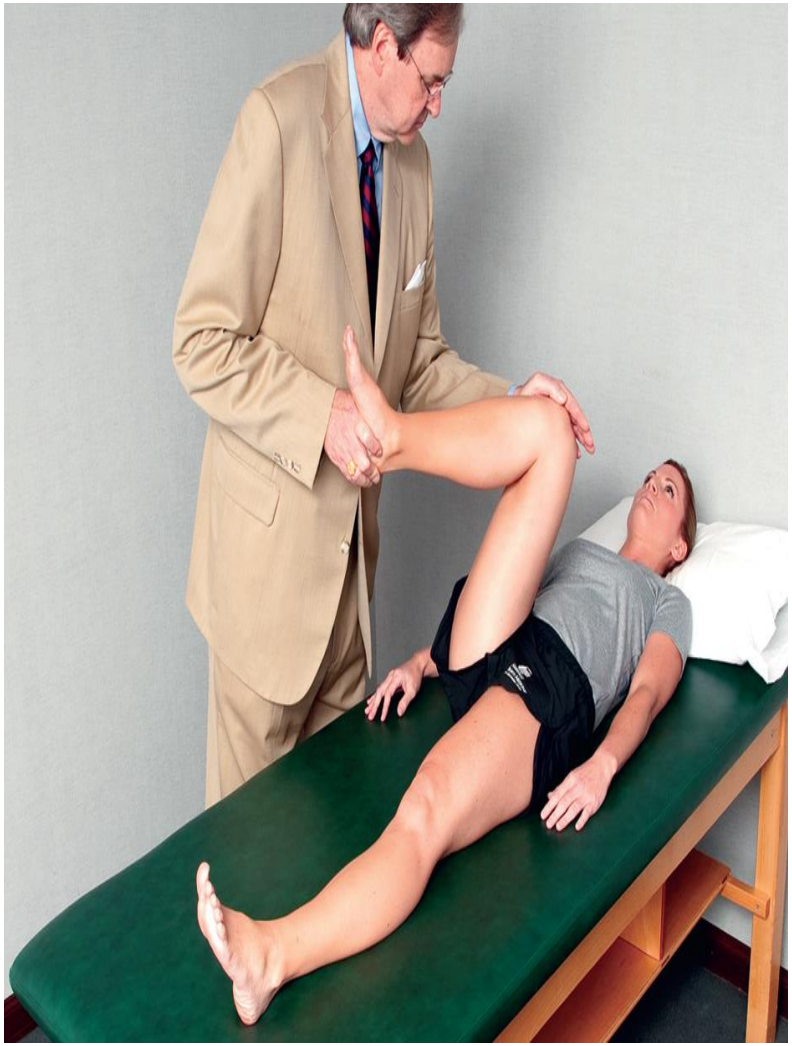


History

- The onset may be gradual, but athletes often recount an acute precipitating episode or event.
- Hip joint symptoms typically emanate from the anterior groin and may radiate to the medial thigh. Athletes often demonstrate the C sign when describing deep interior hip pain.
- As the athlete attempts to compensate for the damaged joint, he or she may experience symptoms associated with secondary disorders created by compensating for the hip. For example, chronic gluteal discomfort or lateral pain from trochanteric bursitis.

Physical Examination

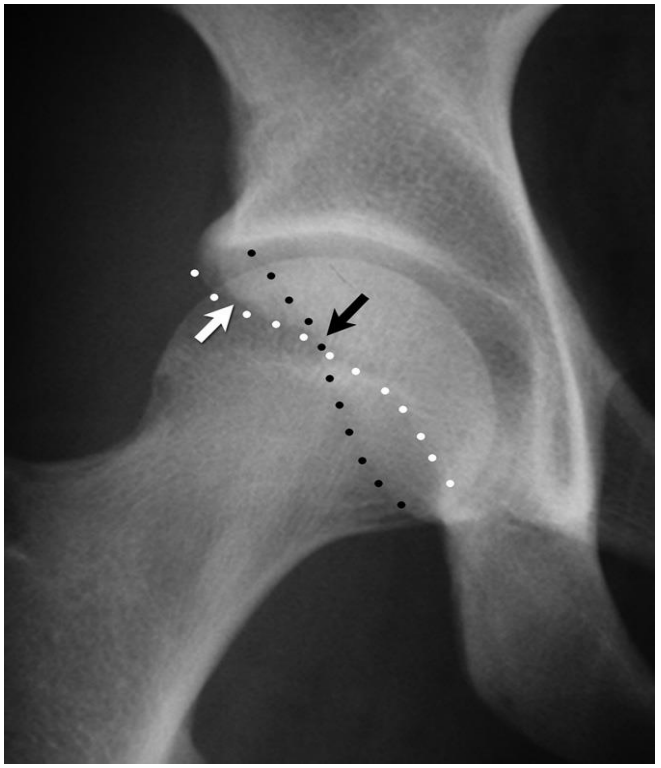
- The trademark feature of FAI is limited internal rotation.
- The log roll test, although not sensitive, is the most specific test for hip joint pathology independent of its etiology.
- *impingement test:* Forced flexion, adduction, and internal rotation. Thus although it is quite sensitive, It is not necessarily specific for impingement. Most important is whether this maneuver recreates the characteristic type of pain that the athlete experiences with activities.

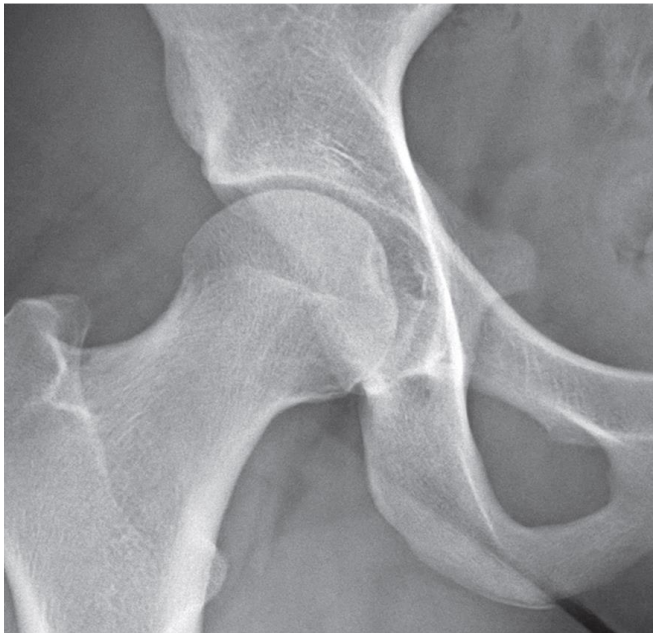


Imaging

Pincer impingement: radiography

- Cross over sign: The superior portion of the anterior rim lies lateral to the posterior rim (*white arrow*), indicating (acetabular retroversion) of the acetabulum.
- Posterior wall sign: posterior rim of the acetabulum lies medial to the center of rotation of the femoral head.
- Prominence of the ischial spine





Imaging

pincer impingment radiography

- Coxa profunda: Coxa profunda exists when the floor of the acetabular fossa touches the ilioischial line
- Acetabular protrusio: when the medial aspect of the femoral head is medial to the ilioischial line

Imaging

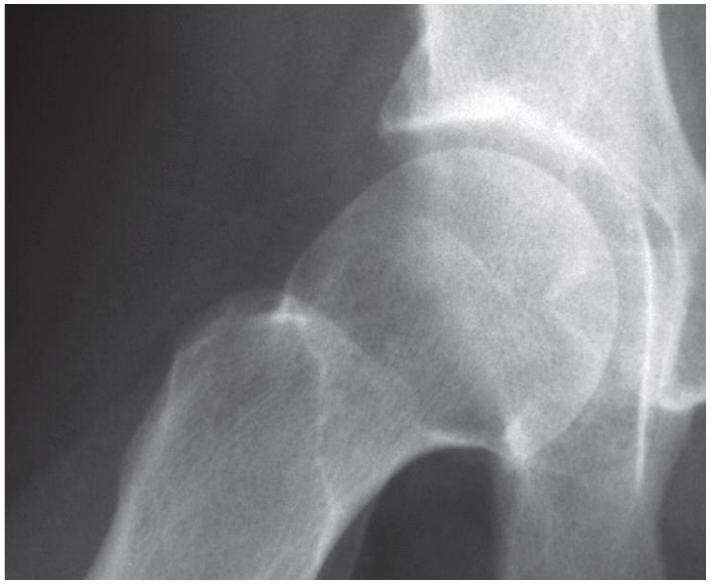
Cam impingment

- AP view: used to measure ateral center-edge angle (angle of Wiberg) and acetabular index or Tonnis roof angle

Imaging

Cam impingement

- False profile view or dunn view
- Frog-leg lateral view: used to measure alpha angle (>55 degree) and head-neck offset ratio(<0.17)



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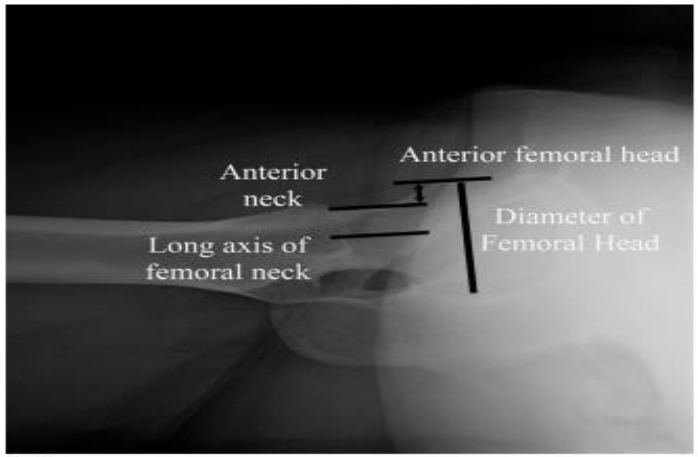
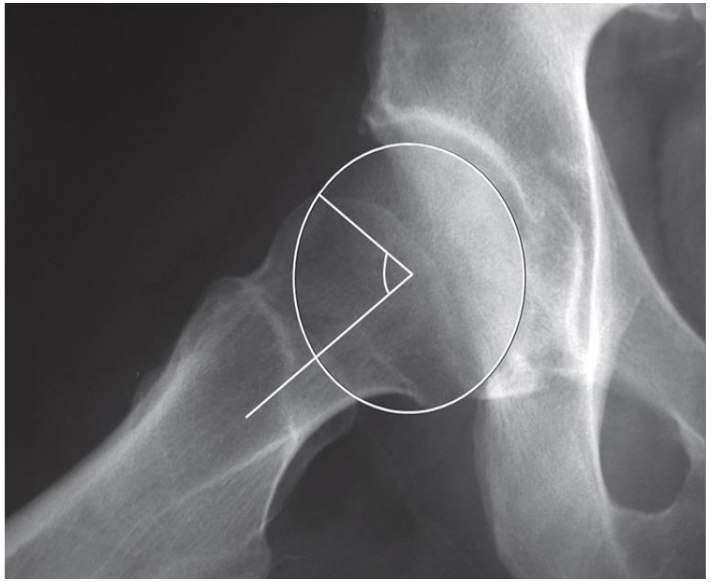


Fig. 19

The technique for calculating the head-neck offset ratio. Three parallel lines are drawn, with line 1 drawn through the center of the long axis of the femoral neck, line 2 drawn through the anteriormost aspect of the femoral neck, and line 3 drawn through the anteriormost aspect of the femoral head. The head-neck offset ratio is calculated by measuring the distance between lines 2 and 3 and dividing by the diameter of the femoral head[3]. If the ratio is <0.17, a cam deformity is likely present.



Imaging

MRI

- best modality to evaluate for articular cartilage and labral damage.
- Increased signal on T2-weighted images in the anterior acetabulum, which is indicative of subchondral edema, must be carefully evaluated.
- paralabral cyst, which is pathognomonic of associated labral pathology, and subchondral cysts, which usually indicate associated articular damage.

Management

Conservative treatment

- The mainstay of conservative treatment is identifying and modifying offending activities that precipitate symptoms. Like Squats, which have long been a mainstay of most weight training programs, are especially deleterious to a hip at risk. Squats can at least be modified, limiting hip flexion to 45 degrees and thus protecting the joint from the forces encountered with greater amounts of flexion.

Surgical Treatment

- Open Surgical Dislocation: This method is still preferred for persons with severe deformities when periacetabular or proximal femoral osteotomy is required.
- Mini Open Procedure with Concomitant Arthroscopy: The intraarticular pathology is addressed arthroscopically, and the cam lesion is corrected through the limited open anterior exposure.
- Arthroscopic Technique: recently became the mainstay for the surgical treatment of FAI.

Arthroscopic Technique

- Arthroscopic management of FAI begins with arthroscopy of the central compartment. The patient is positioned supine and traction is applied. Three standard portals are created to provide optimal access for surveying and accessing intraarticular pathology
- Pincer impingement: The labrum is sharply dissected from the overlying bone to expose the pincer lesion. The acetabulum is then recontoured with a high-speed burr, taking care to preserve the mobilized labrum. It is then refixed with suture anchors.
- Cam impingement: A capsular window is created by connecting the anterior and anterolateral portals. While maintaining these two portals just outside the joint, the traction is released and the hip is slightly flexed, which brings the cam lesion within the peripheral compartment into view. After fully defining the lesion, its overlying fibrous and fibrocartilaginous tissue is removed. The bone is then reshaped, recreating the normal concave relationship at the junction of the articular surface and eliminating the cam lesion

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Thank you