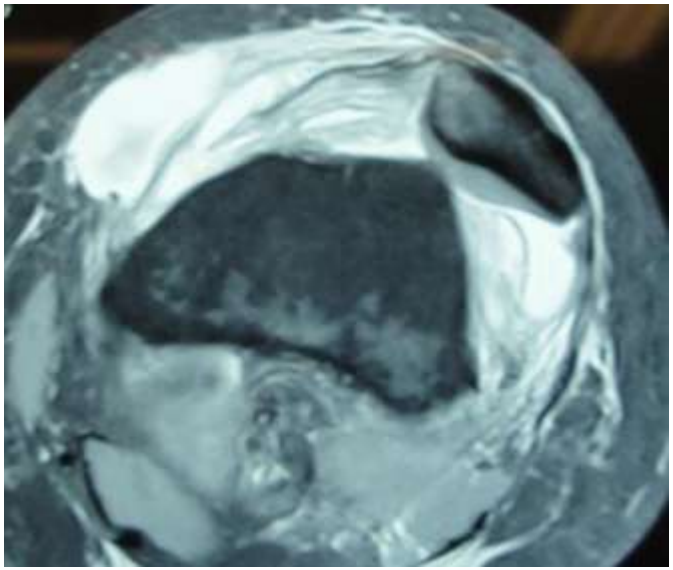
Clinical Evaluation and Imaging of the Patellofemoral Joint Common clinical syndromes



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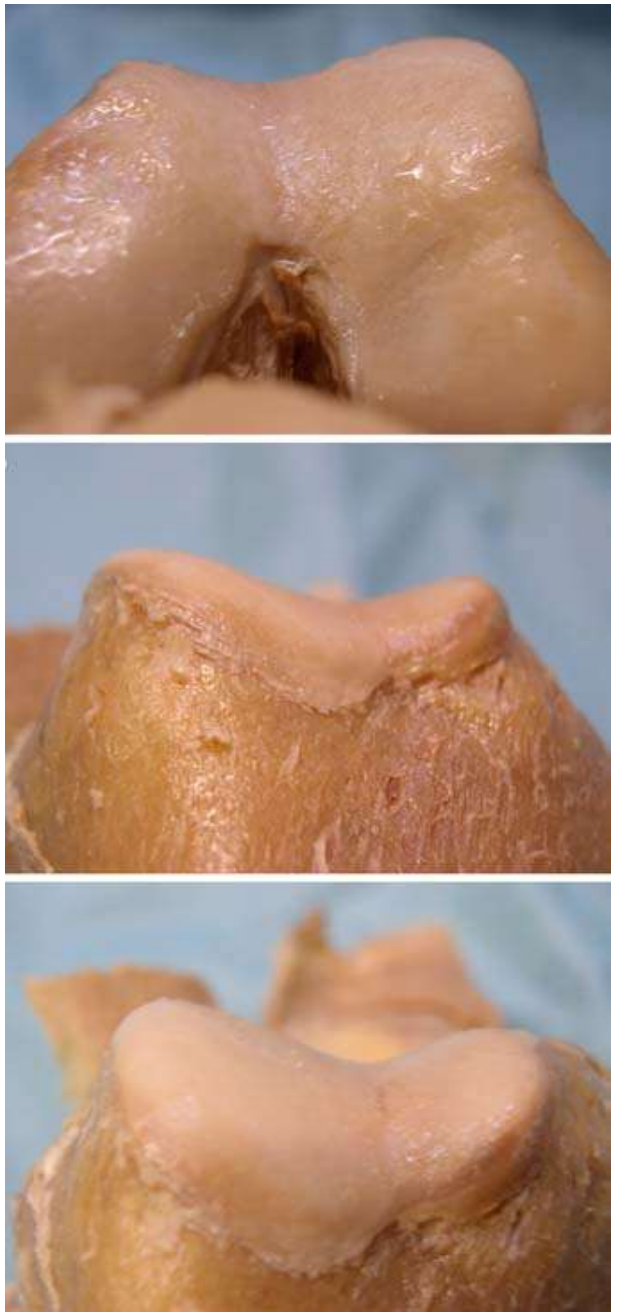
Objectives

- ✓ Anatomy of patellofemoral joint
- ✓ Basic biomechanics
- ✓ Clinical evaluation
- ✓ Radiological evaluation
- ✓ Common syndromes



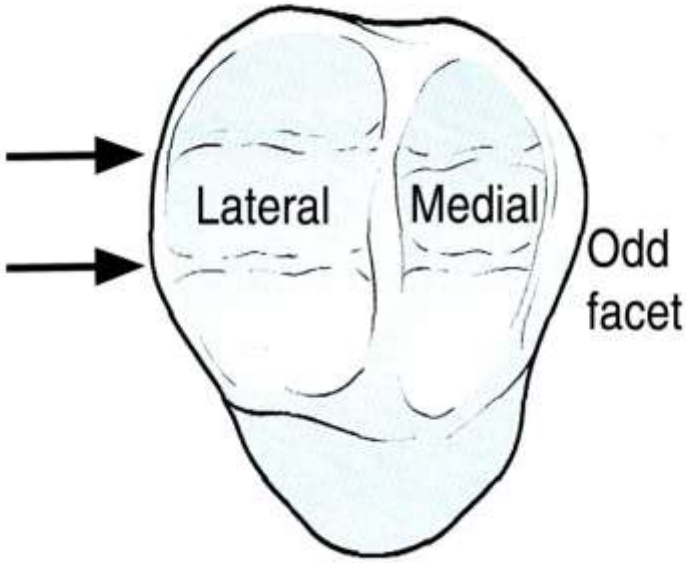
Bony Anatomy

largest sesamoid bone

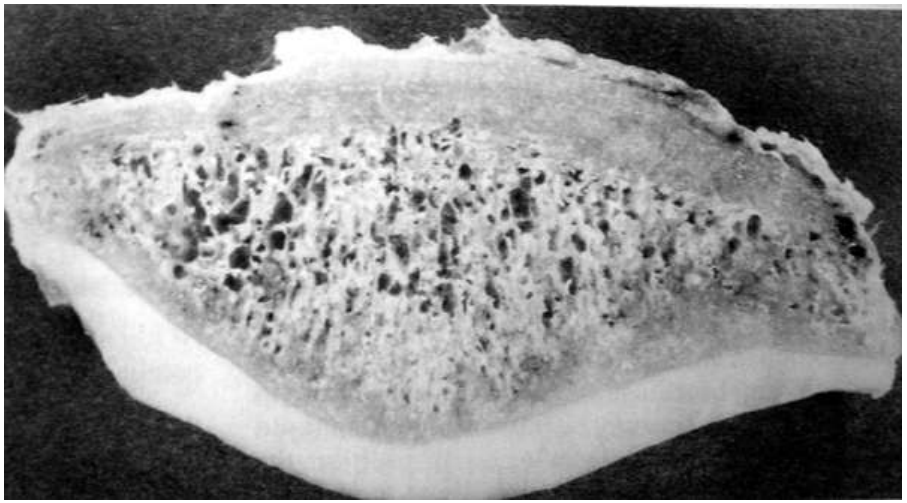
3 medial and 3 lateral facets articulate with femoral groove

The odd facet only articulates with the MFC in deep knee flexion

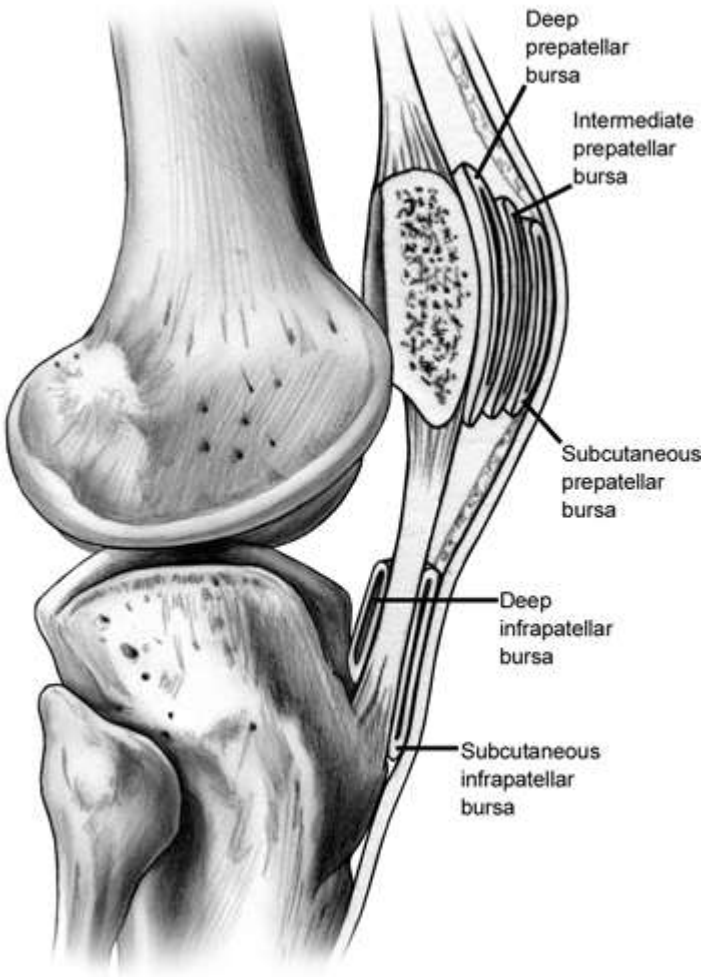
distal pole (extraarticular part)



Bursa & cartilage



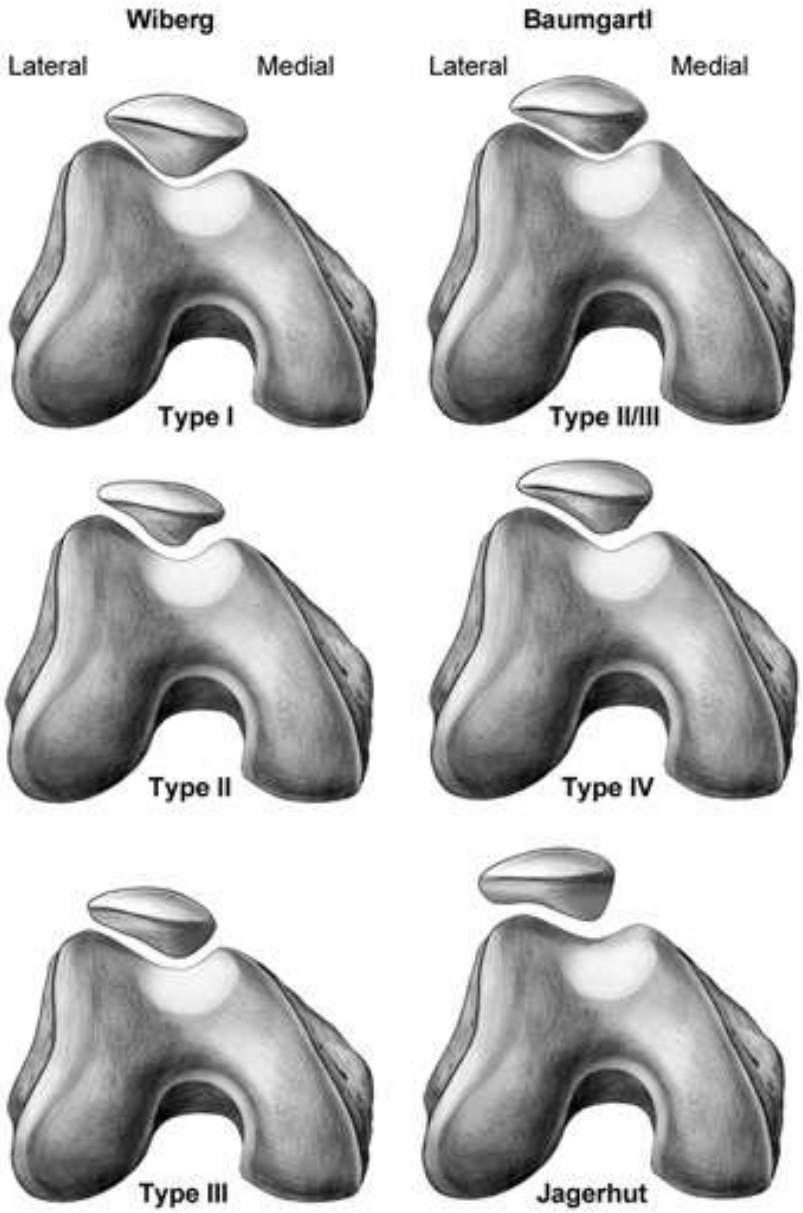
measuring close to 5 mm



Patella types

Wiberg & Baumgartl classification

Most common

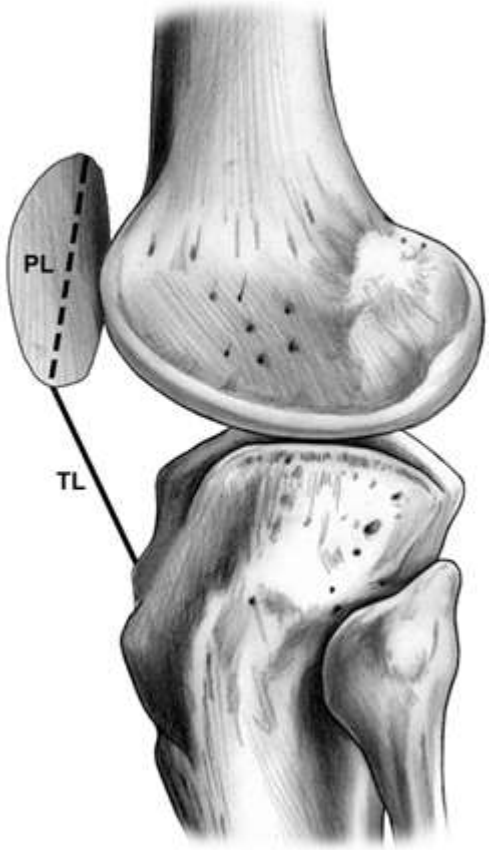


Patellar hypoplasia, aplasia, patella bipartite or multipartite, fragmentation, and duplication are some of the most common dysplasias

Ratio of Patella to Tendon

can block knee flexion and place excessive loads on the patella, resulting in pain and progressive OA

is often more mobile, resulting in an increased risk of instability

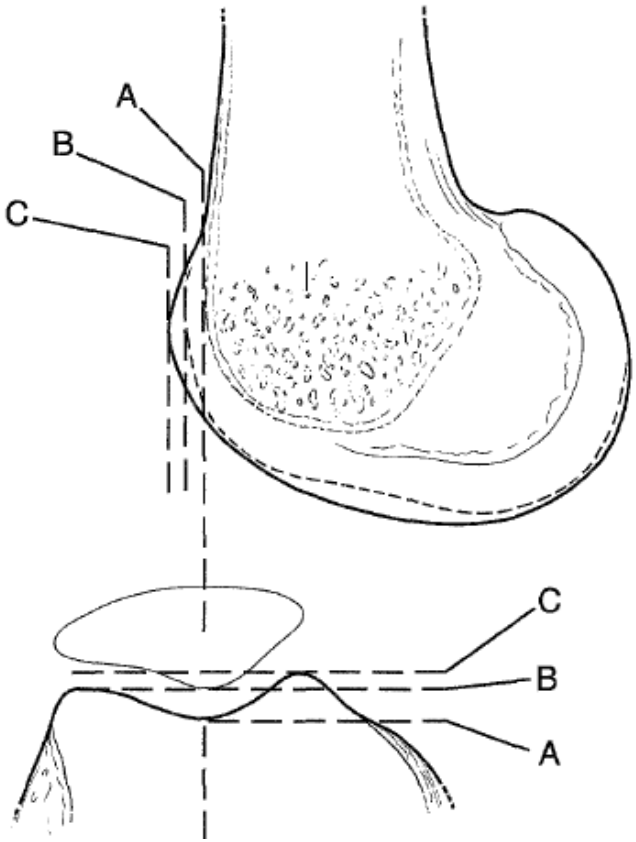


The Insall-Salvati ratio length tendon (TL)/length patella (PL) should normally be within 20% of 1.0.

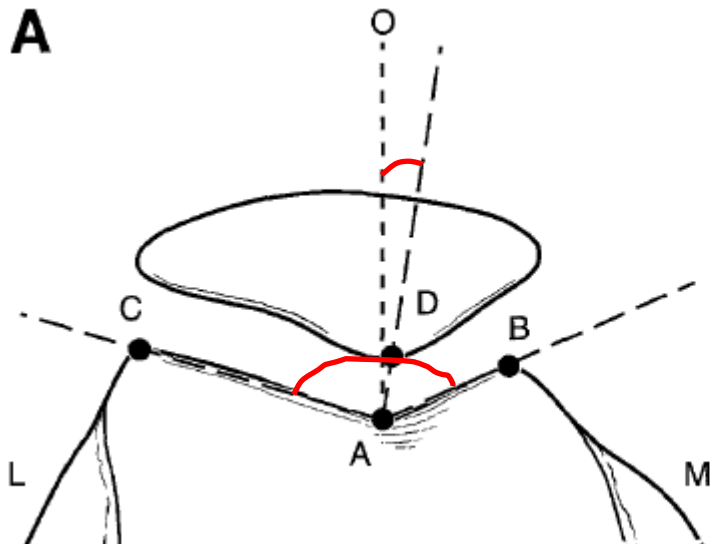
Throclear anatomy

lateral and medial facets of the femoral sulcus

the trochlea deepens from proximal to distal

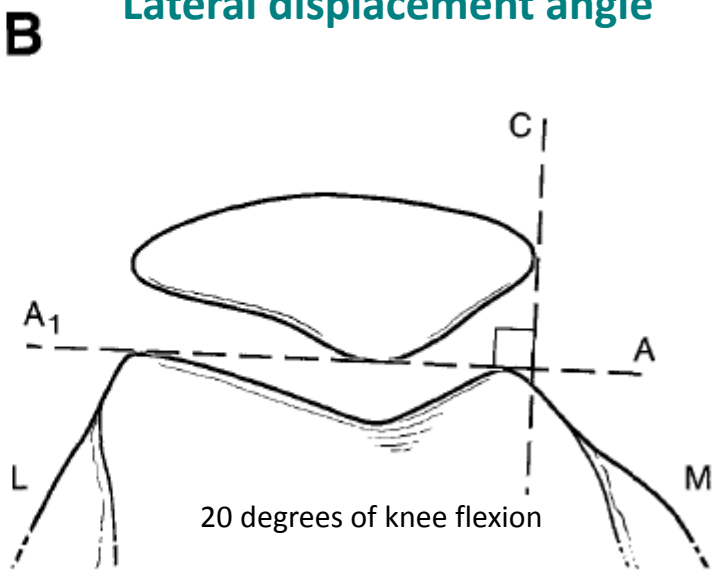


Merchant view



The more lateral, or positive, the angle, the greater the malalignment.

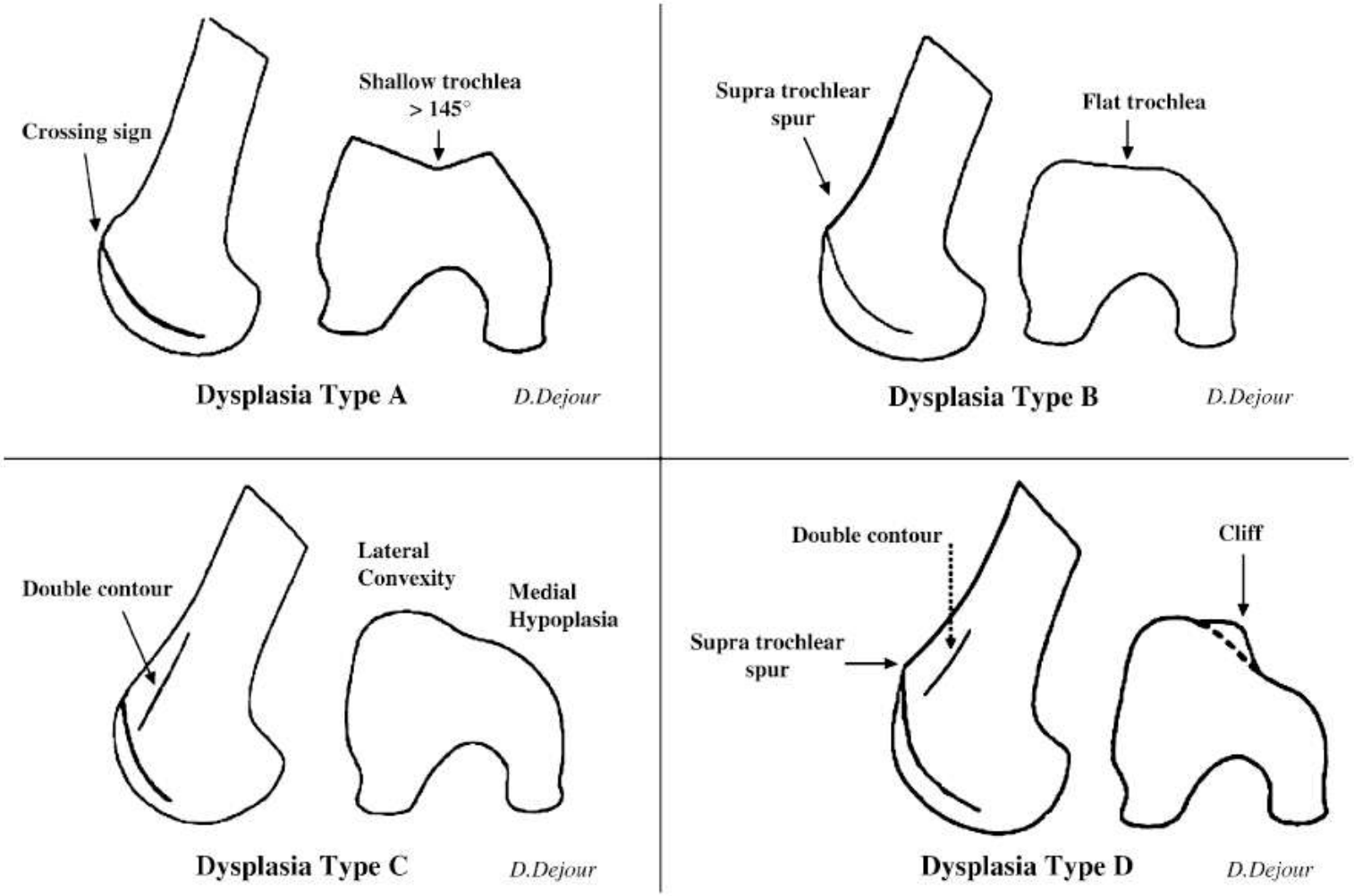
Lateral displacement angle



the femoral **sulcus angle** usually varies in the range 138±6^{o}

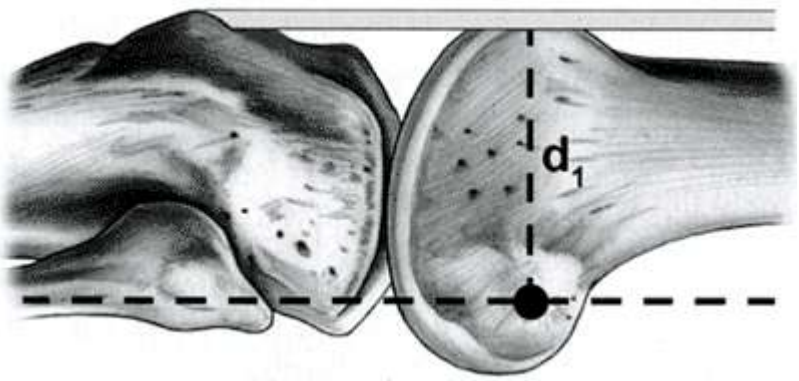
The **congruence angle** in 25 knees with proven recurrent dislocation the angle measured +23 ° whereas in 200 normal knees (100 individuals) it measured -6 ° (SD = 11°)

Troclear dysplasia



Biomechanics

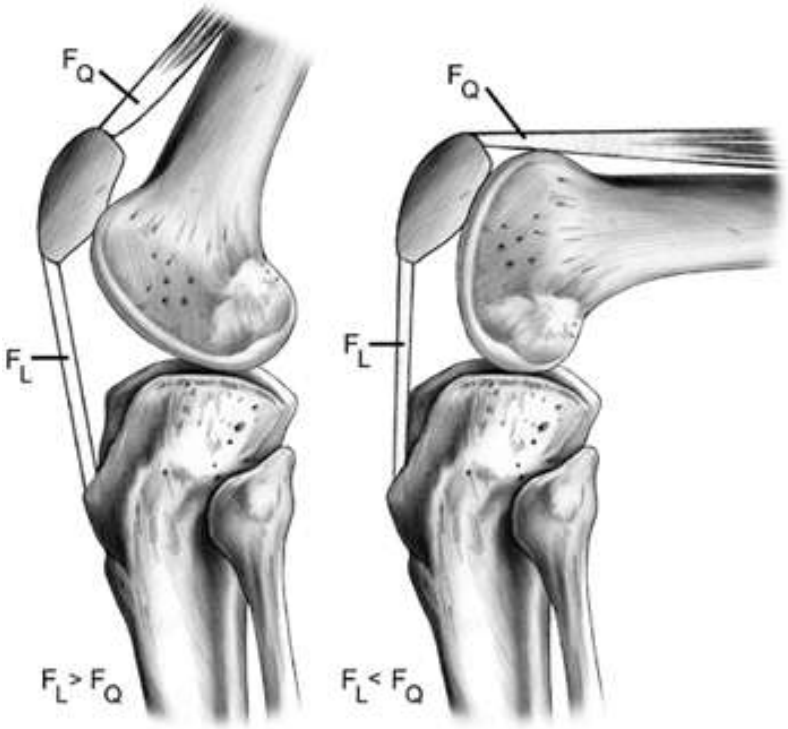
The main biomechanical function is to lengthen the extension moment arm of the knee at full extension



Change in patella tilt results in changing lever arm length between the patella tendon and quadriceps tendon.

As the lever arm decreases, force on the tendon increases, resulting in greater patella tendon force in extension and greater quadriceps tendon force in flexion.

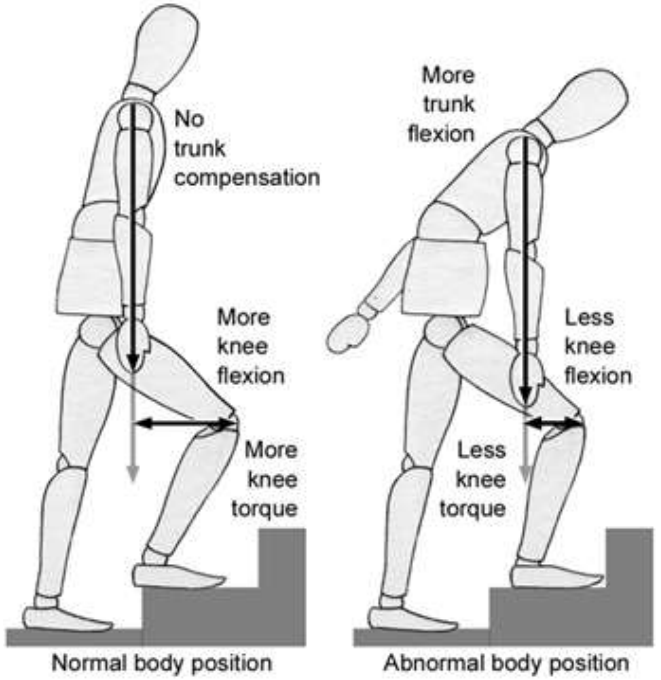
Due to changing lever arms, quadriceps force and patella tendon force also vary with knee flexion angle, with greater quadriceps force occurring at high flexion angles

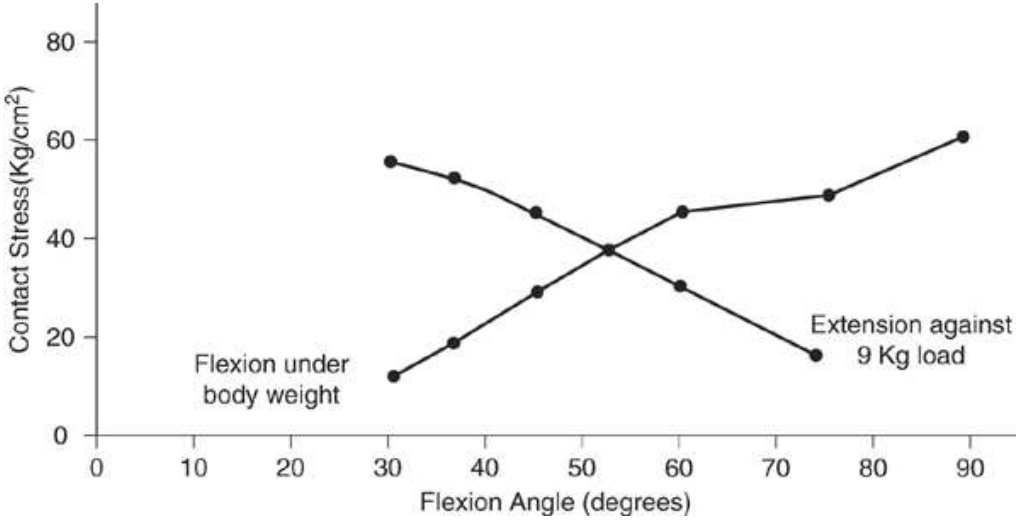


Patellofemoral compression force is the result of compression of the patella into the trochlea groove resulting from a combination of quadriceps and patella tendon forces.

With standard weight bearing activities, maximum patella femoral contact force is thought to occur at approximately 70 to 80 degrees of knee flexion

Patella femoral contact force is affected by body position, decreasing as patients forward flex at the hip during stair climbing



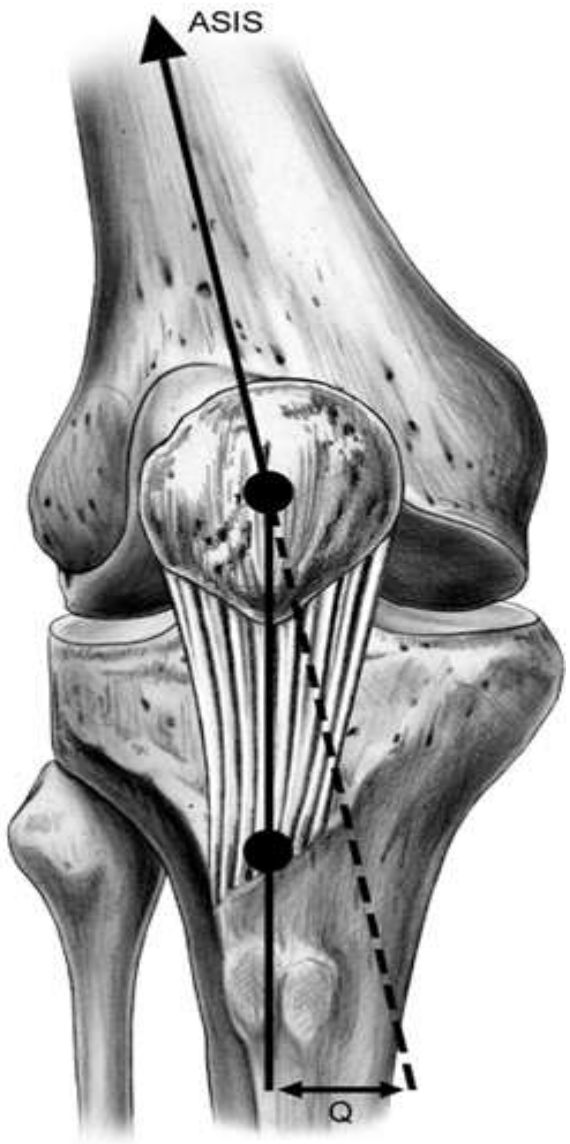


Patella femoral contact force increases **four fold** with leg extension exercises at 30 degrees

Q angle

The Q angle is defined as the angle between the quadriceps mechanism and the patella tendon and is a helpful measure of patella tracking.

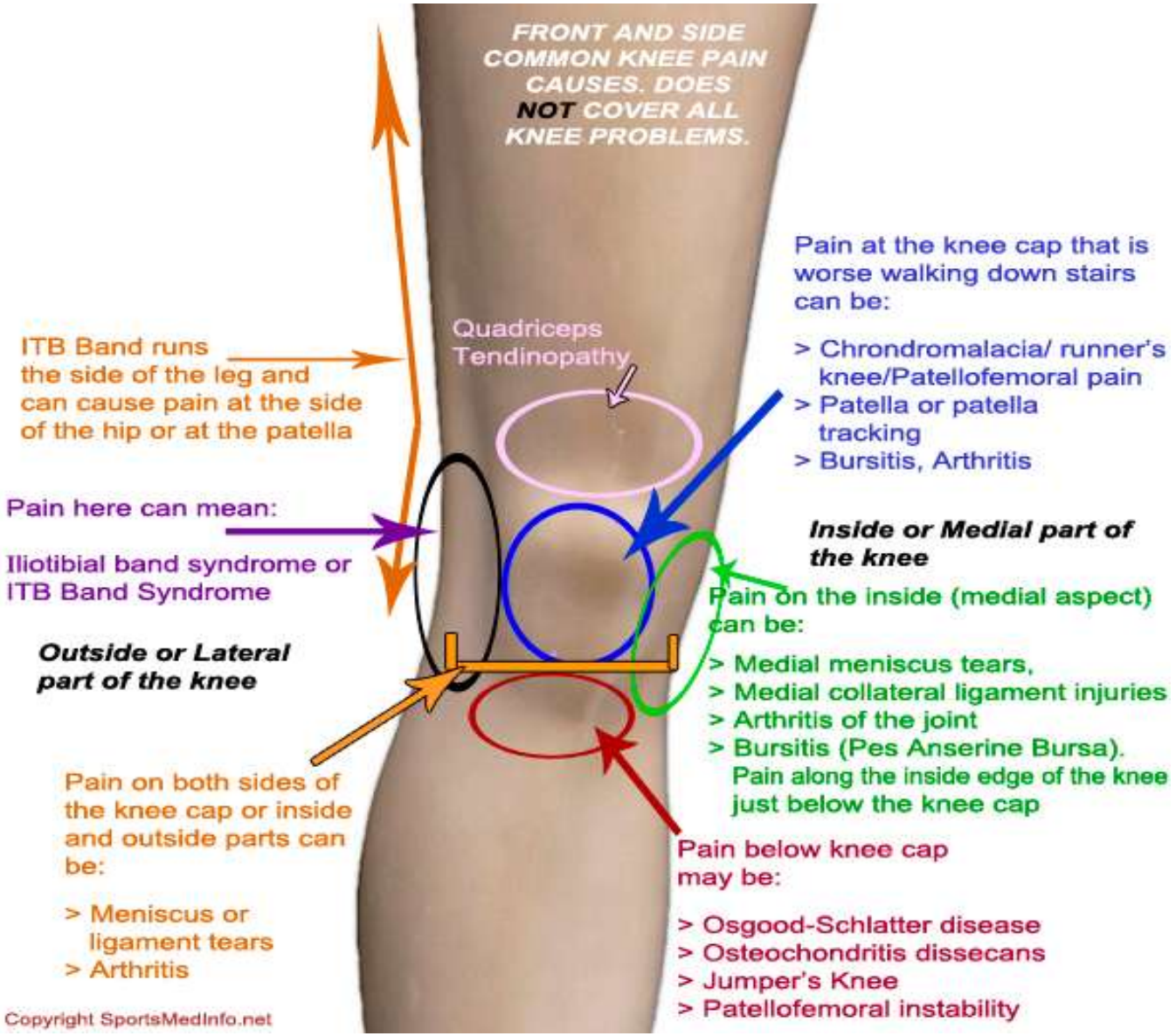
The greater the anatomic valgus, or the greater external rotation present in the tibia, the larger the Q angle will be, resulting in laterally directed force vector



Clinical evaluation

Typically, all patients complaining of anterior knee symptoms are lumped into a general category by physicians and therapists and treated with a standard, nonspecific, “patellofemoral” protocol

Location of pain



Standing Evaluation: Static

leg length assessment,
pelvic balance,
Q angle,
varus-**valgus** alignment,
knee recurvatum,
flexion deformities,
foot position

Increased foot pronation

Standing Evaluation: Dynamic

Single leg loading

Stresses P/F joint (Pain, crepitus)

Step up / step down

Supine evaluation

Inspection

Q angle

Swelling

Effusion

Old scars

Osgood Schlatter

Passive Rom

Provocative tests

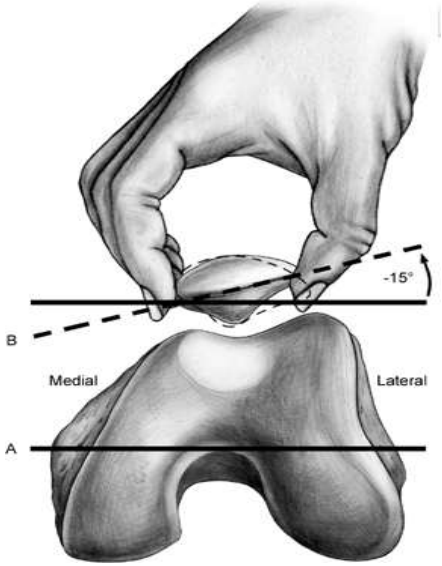
Patellar compression test

Patellar grind test

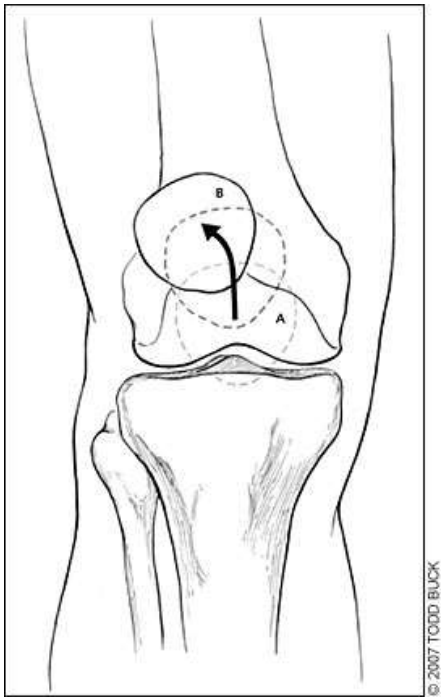
Patella apprehension test

Provocative tests

Patellar tilt test: inability to lift the lateral facet more than 15 degrees = tight lateral retinaculum



The **J sign** indicates the presence of severe lateral translation of the patella in terminal extension of the knee and suggests instability.

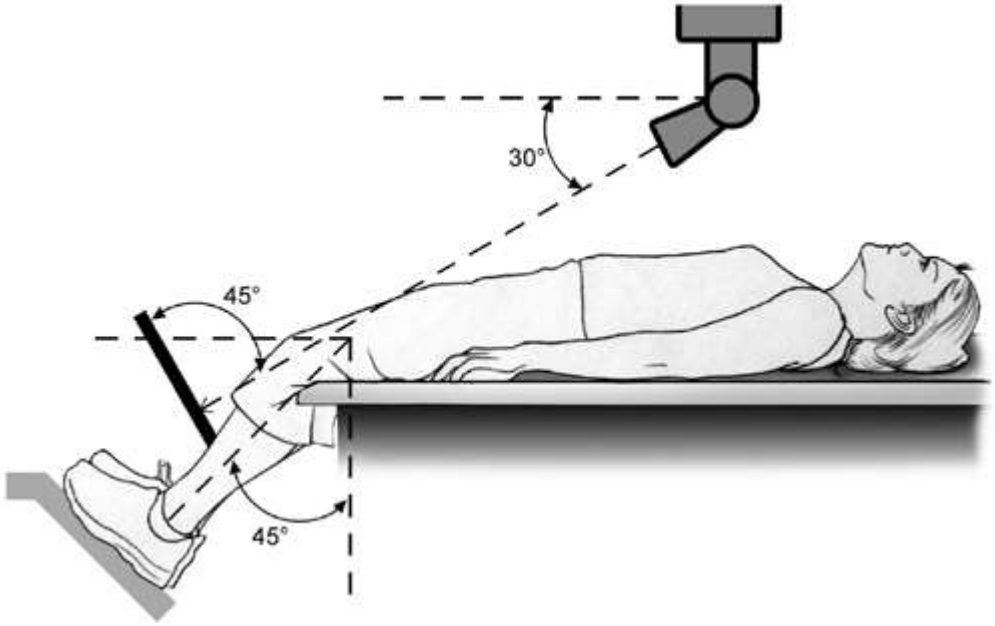


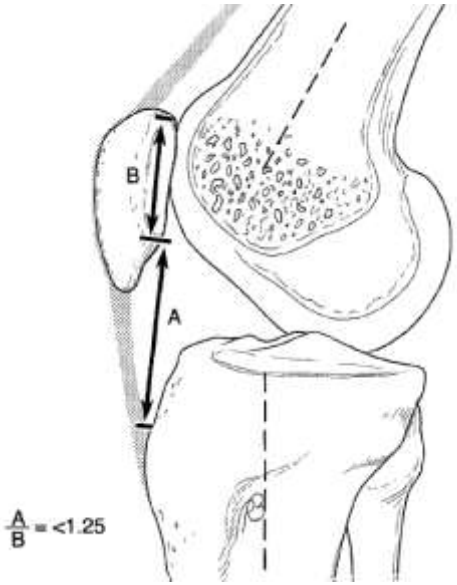
Radiological evaluation – X-rays

AP view,

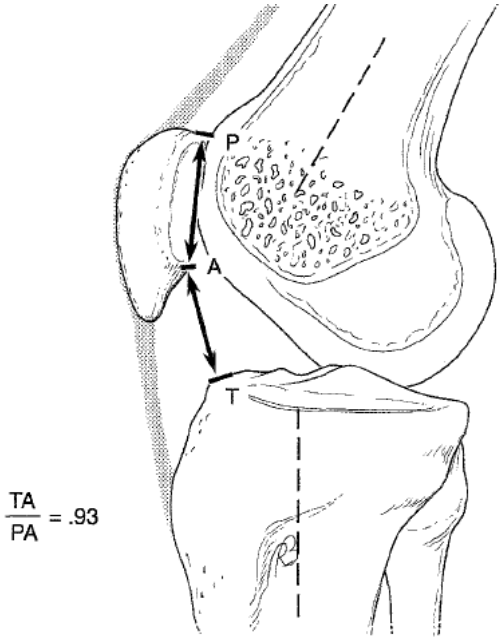
Lateral view

Merchant view

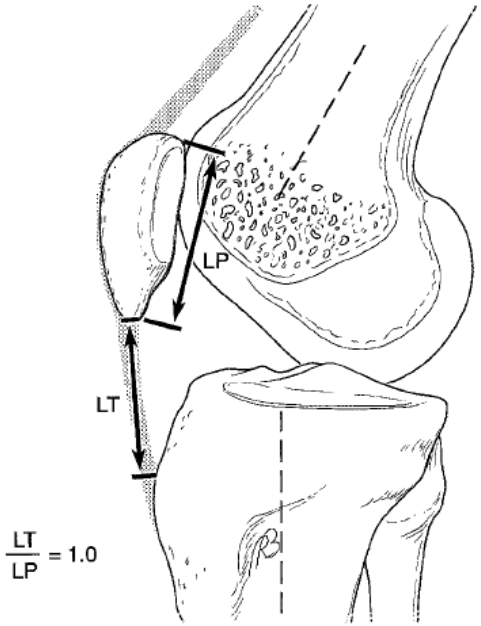




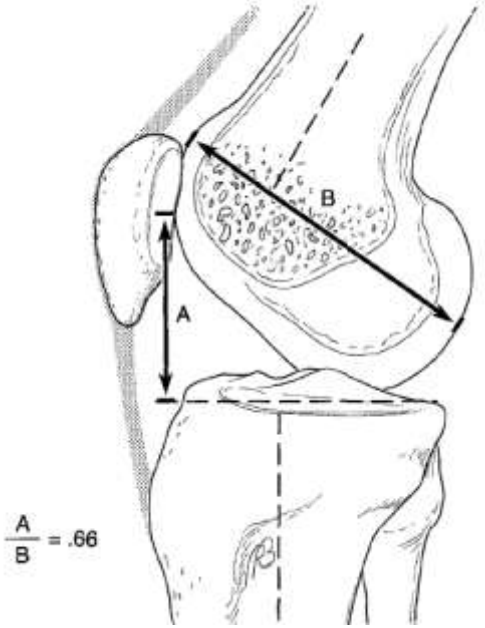
Grelsamer & Meadows modified Insall and Salvati A/B ratio (averaged 1.5) whereas a ratio of 1.25 is the cutoff between normal and patella alta.



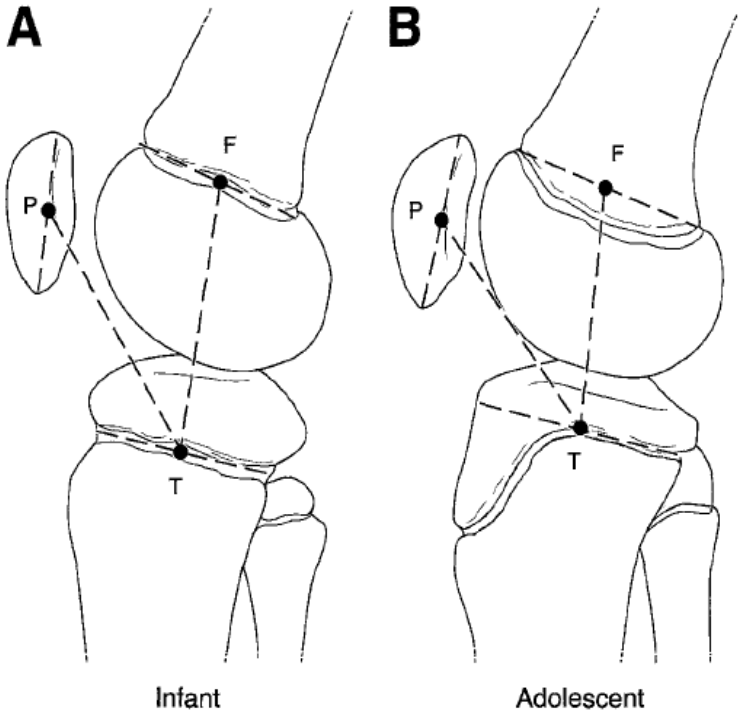
Caton index



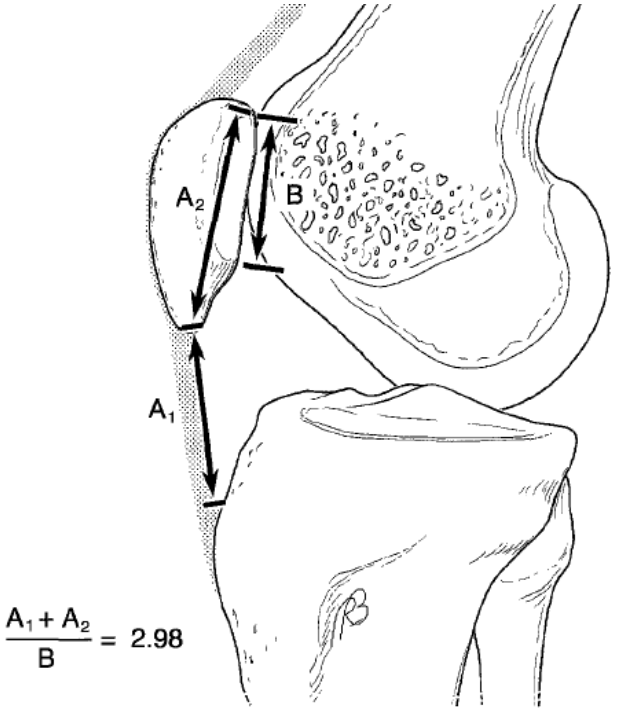
Insall-Salvati ratio



Burgess ratio

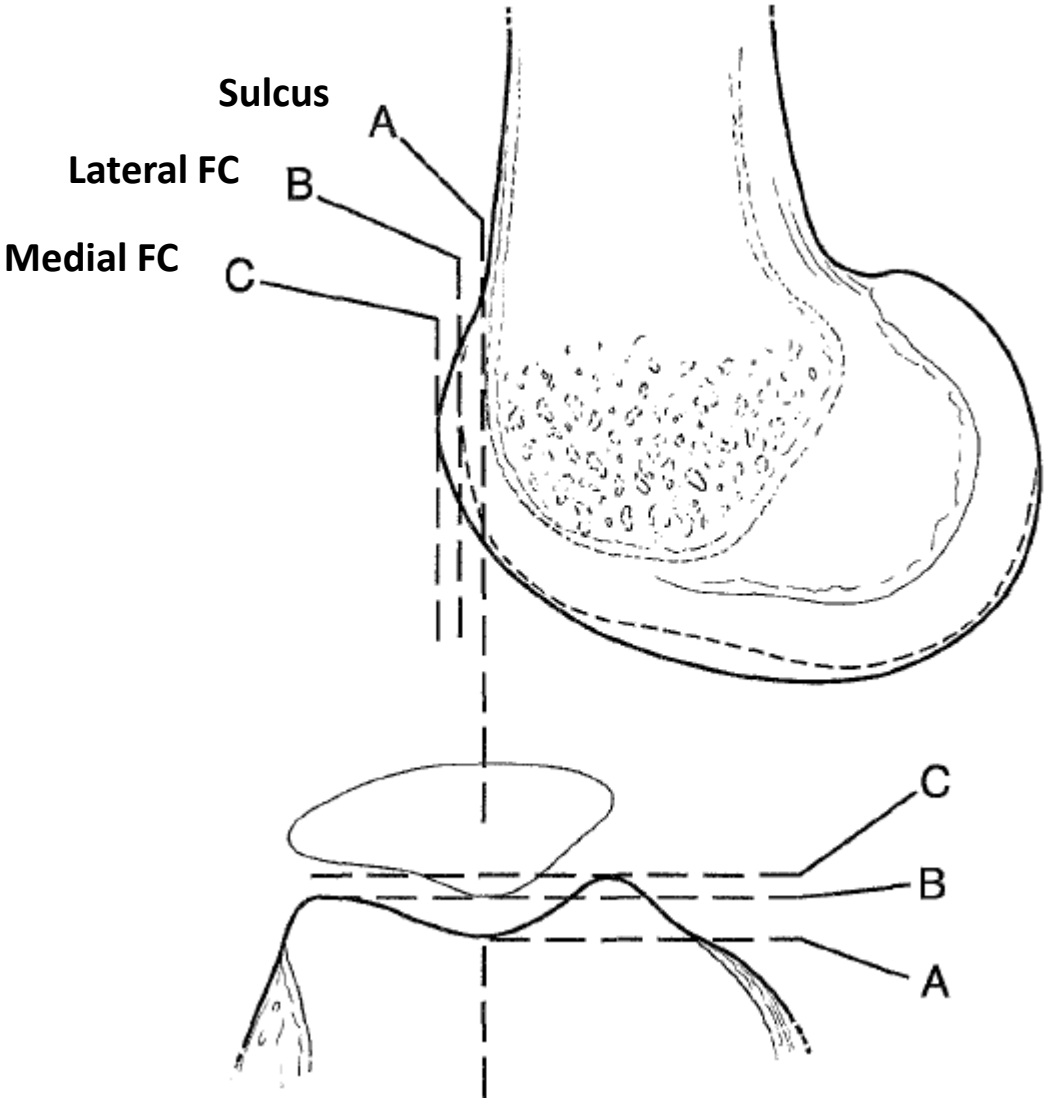


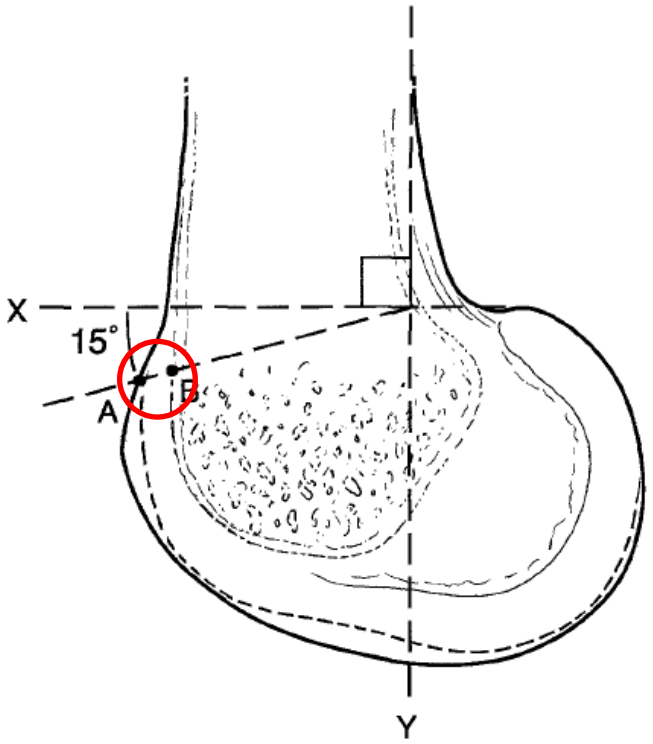
Kushino and Sugimoto ratio of PT/FT for (A) infants and (B) adolescents with normal range 0,9 to 1,3



Leung's patella alta index of $\frac{A_1 + A_2}{B}$ had a mean of 2,98 with the 95% cutoff being 3.37.

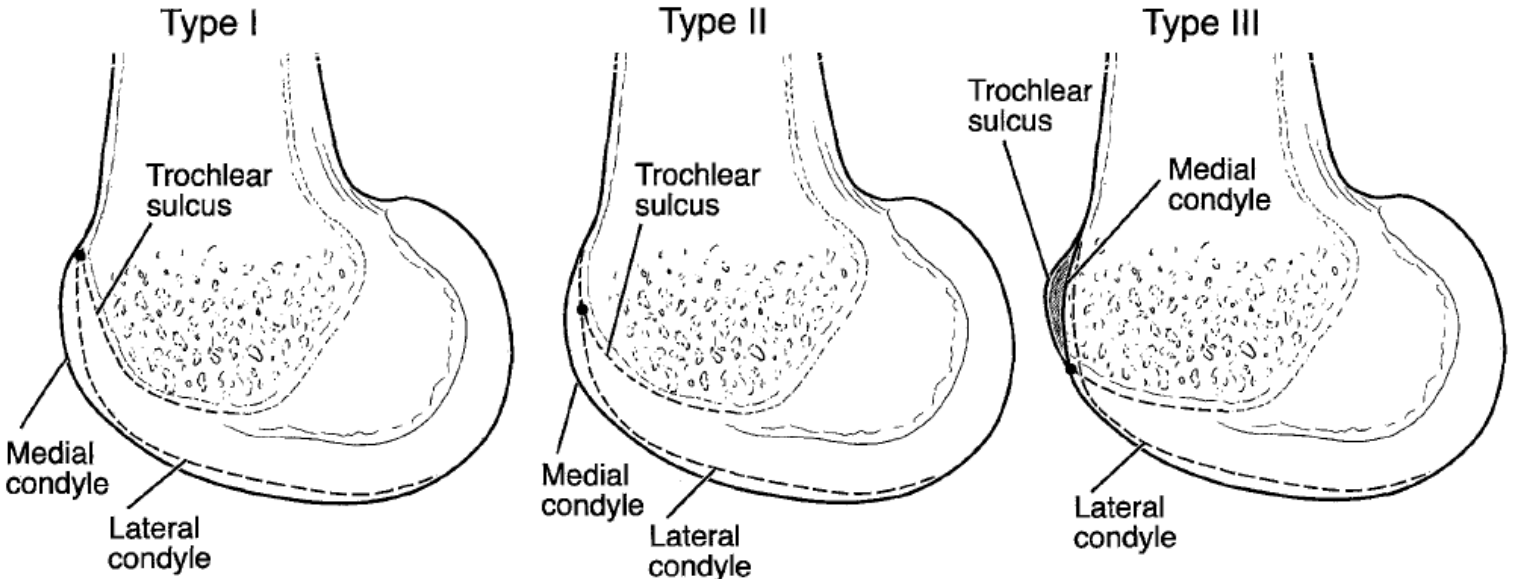
Sulcus depth



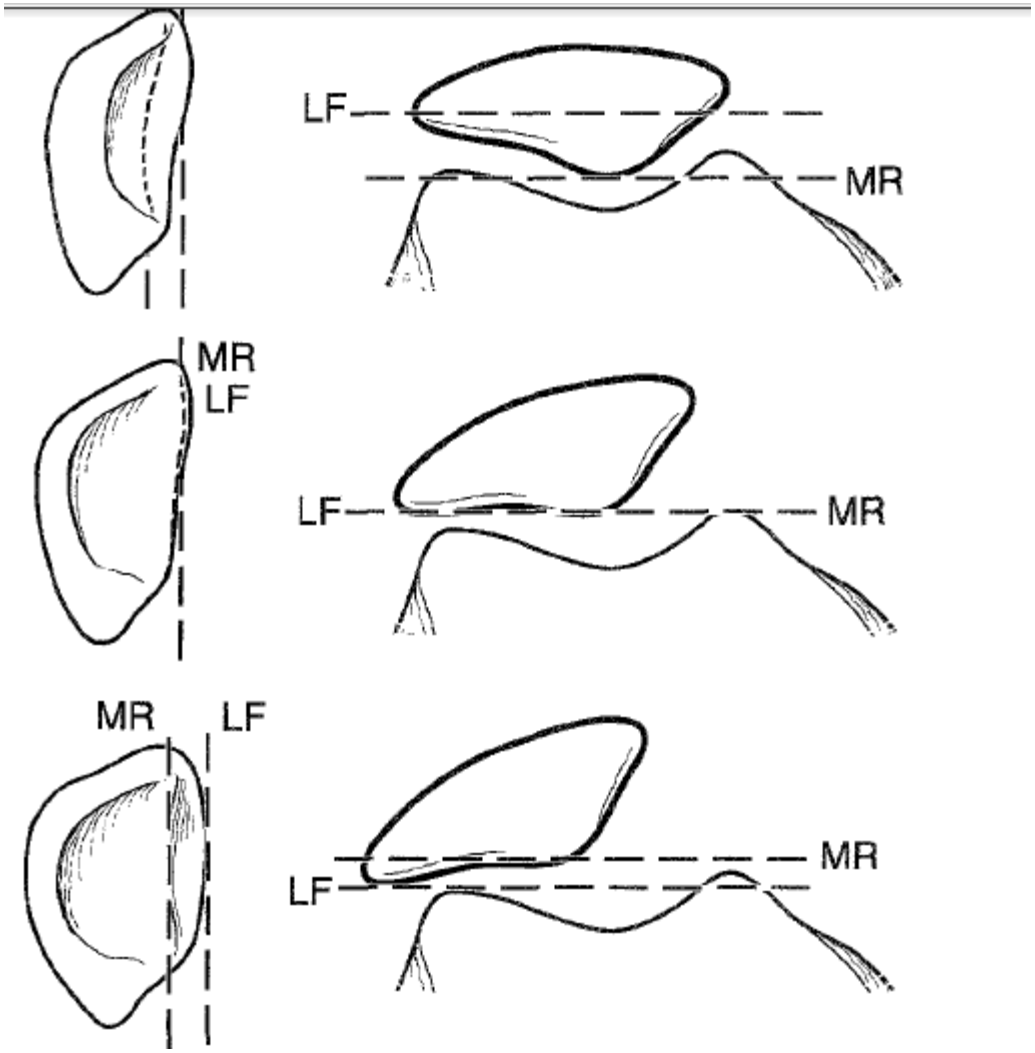


Distance is normally 7.8 mm with a threshold of dysplasia of <4 mm.

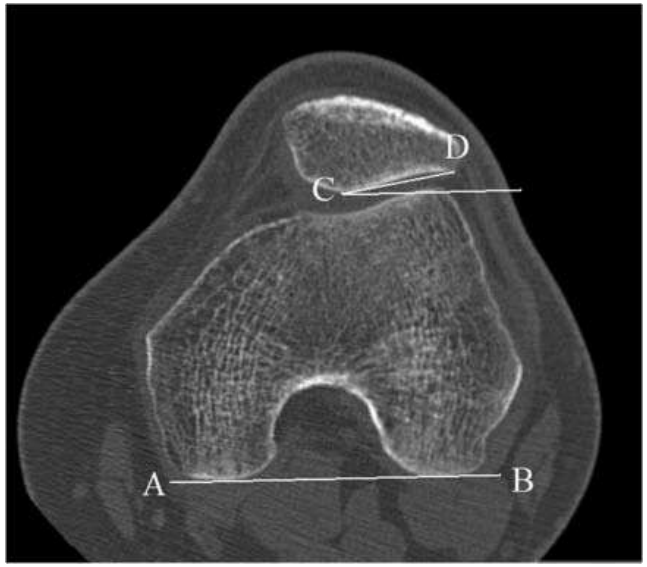
Dysplasia

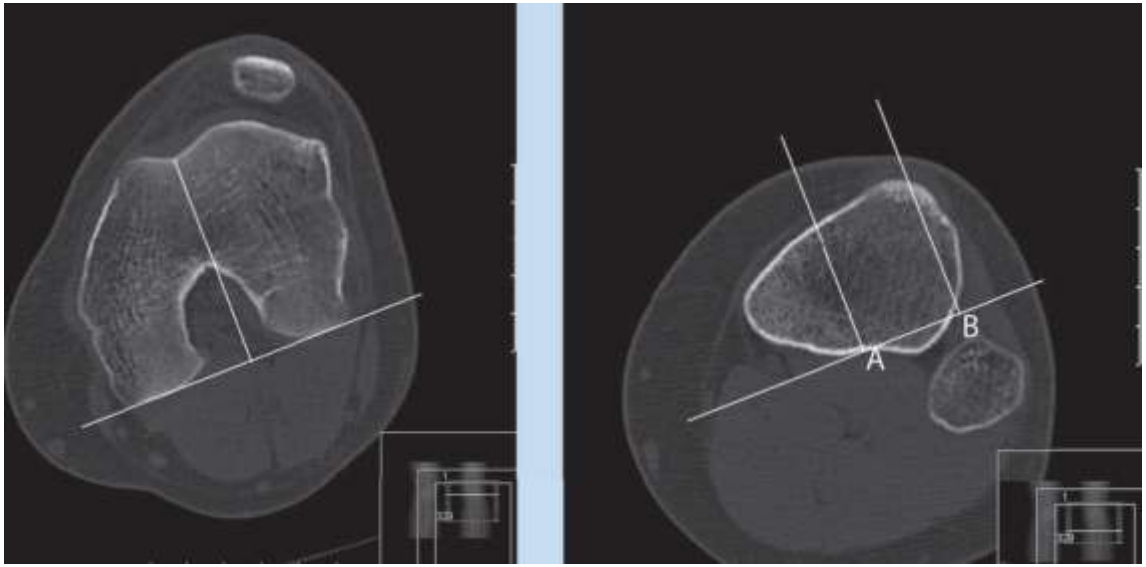

Type I
Trochlear sulcus
Medial condyle
Lateral condyle
Type II
Trochlear sulcus
Medial condyle
Lateral condyle
Type III
Trochlear sulcus
Medial condyle
Lateral condyle

Patella tilt



CT scan

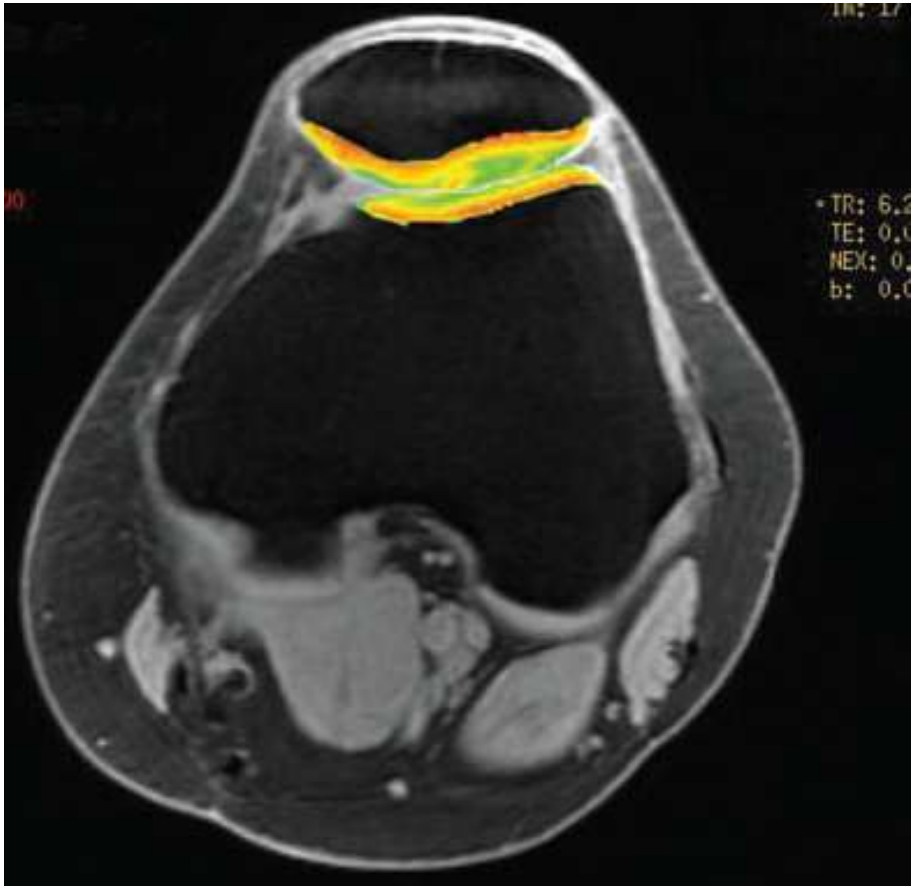




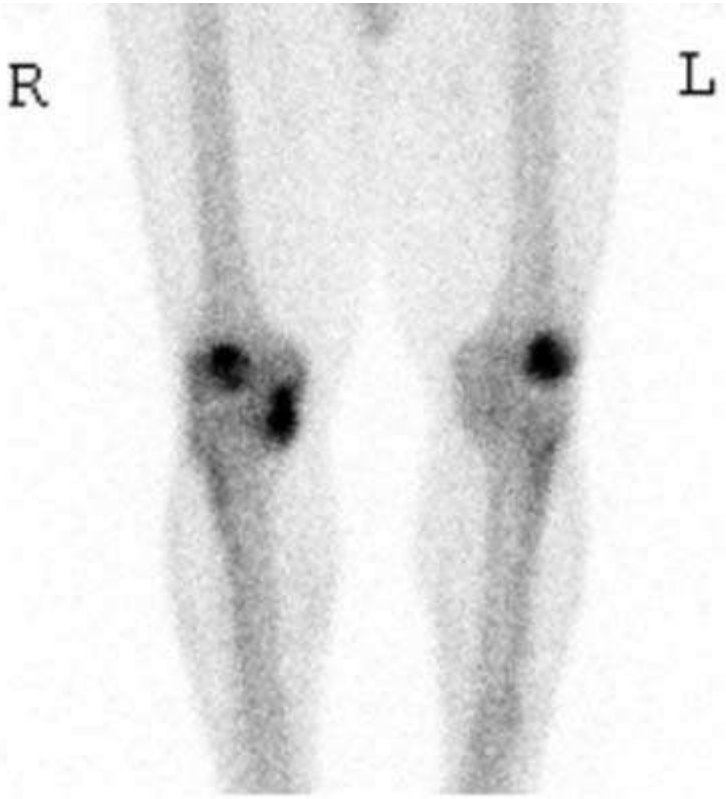
Tibial tubercle – trochlear groove (TT-TG) distance (abnormal > 15)

MRI scan

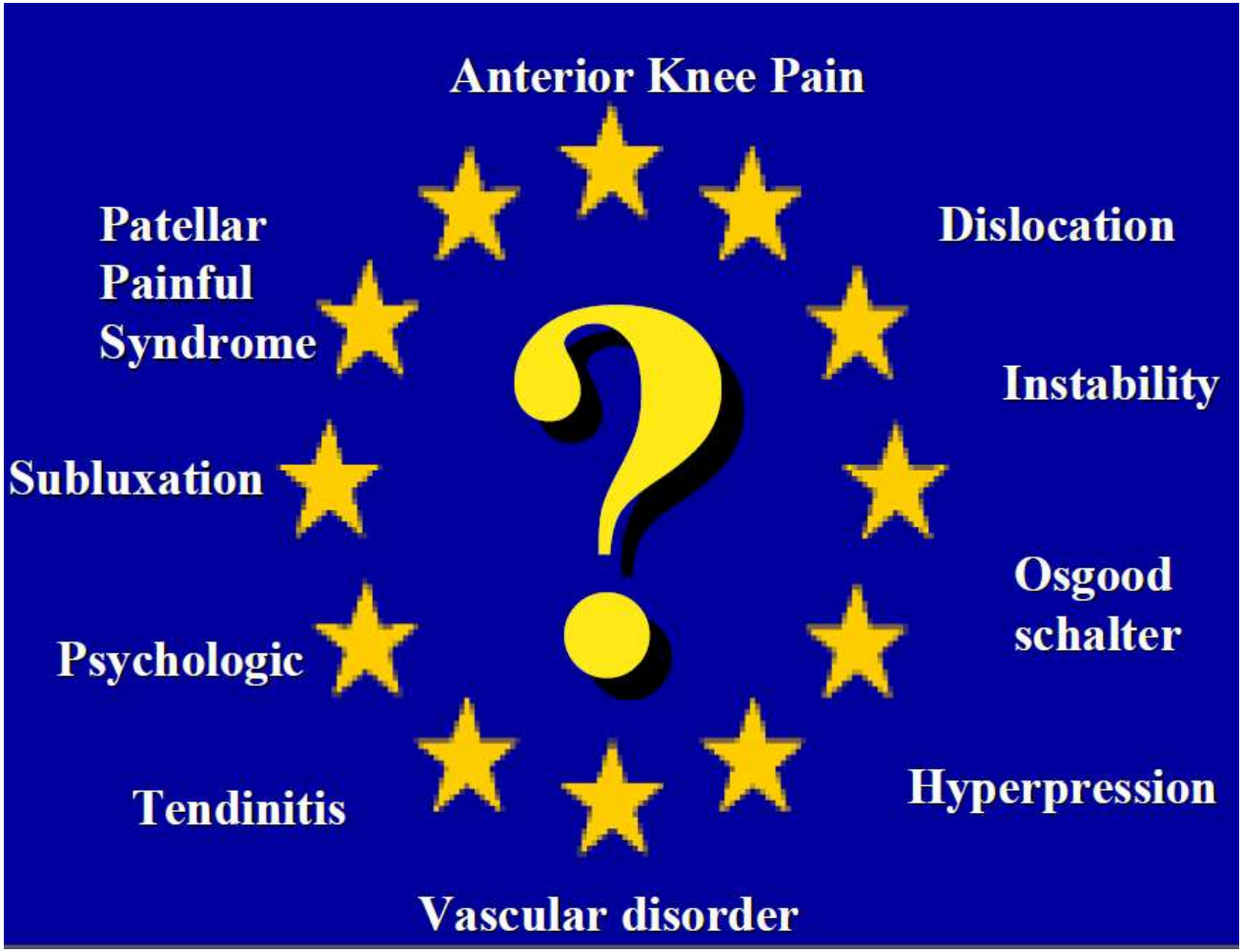
T-2 chondral mapping



Bone scan



Common syndromes



Common syndromes

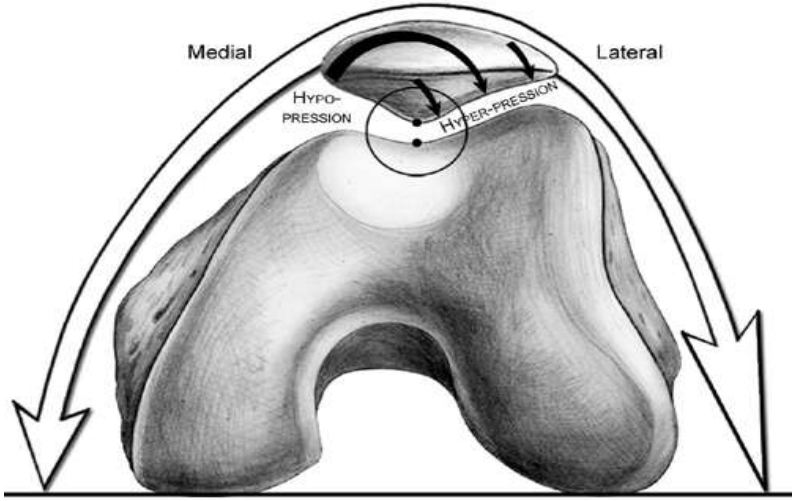
Lateral patella compression syndrome (LPCS)

MPFL rupture – patella instability

Chondromalacia patellae

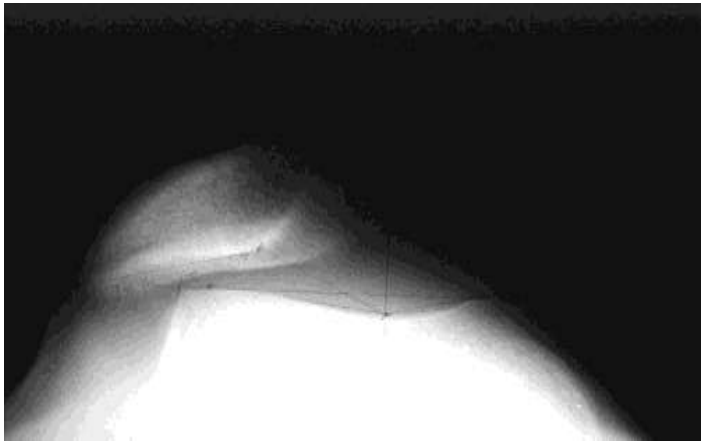
Lateral patella compression syndrome (LPCS)

- originally described by Ficat in 1975



- excess pressure along the lateral facet of the patella, usually associated with a tight lateral retinaculum and radiographic evidence of patella tilt

Patients will present with complaints of pain rather than instability.



Manual compression of the patella into the trochlea will often exacerbate the pain

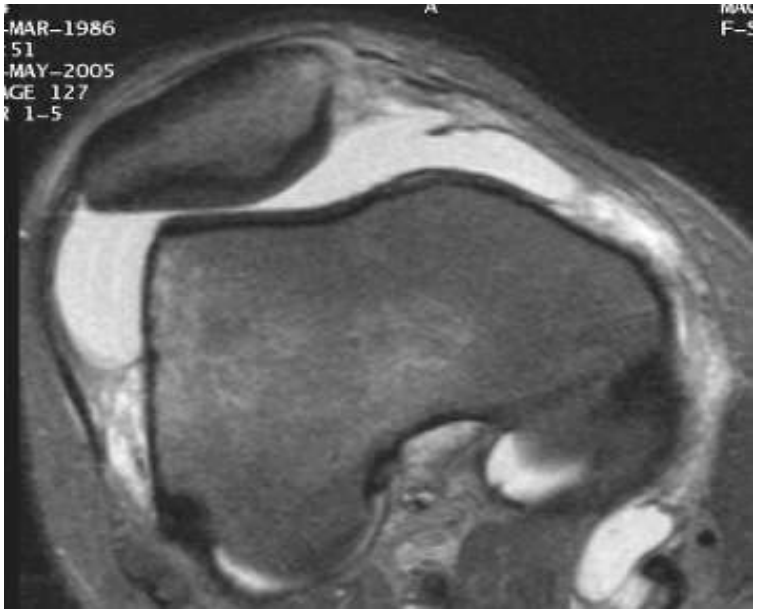
Lateral patella compression syndrome (LPCS)

Conservative

The mainstay of treatment for LPCS is non-operative

- rest, ice, and AIA
- improving patella alignment
- stretching of the tight lateral retinaculum and IT Band.
- VMO strengthening will help dynamically medialize the patella and unload the lateral facet.

MPFL rupture – patella instability



© Med Sci Monit, 2007; 13(9): BR181-187
PMID: 17767112

www.MedSciMonit.com
Basic Research

Received: 2007.02.27
Accepted: 2007.07.20
Published: 2007.09.03

Isometric behavior of the reconstructed medial patellofemoral ligament using two different femoral pulleys: A cadaveric study

Authors' Contribution:
A Study Design
B Data Collection
C Statistical Analysis
D Data Interpretation
E Manuscript Preparation
F Literature Search
G Funds Collection

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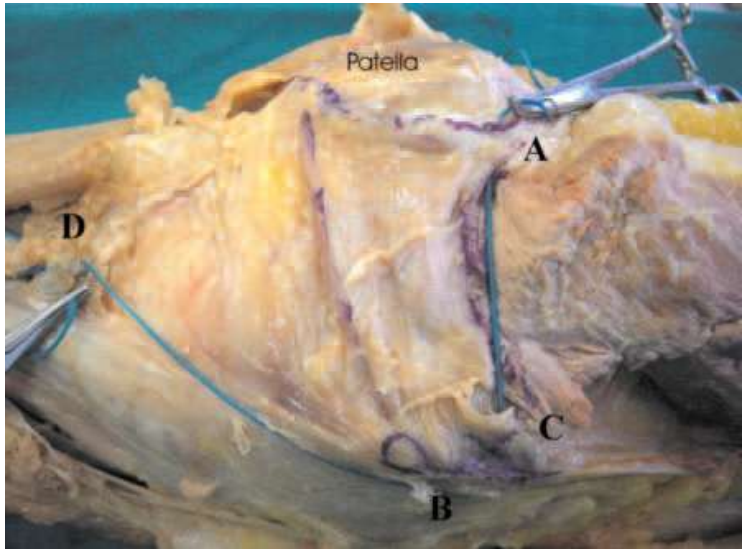
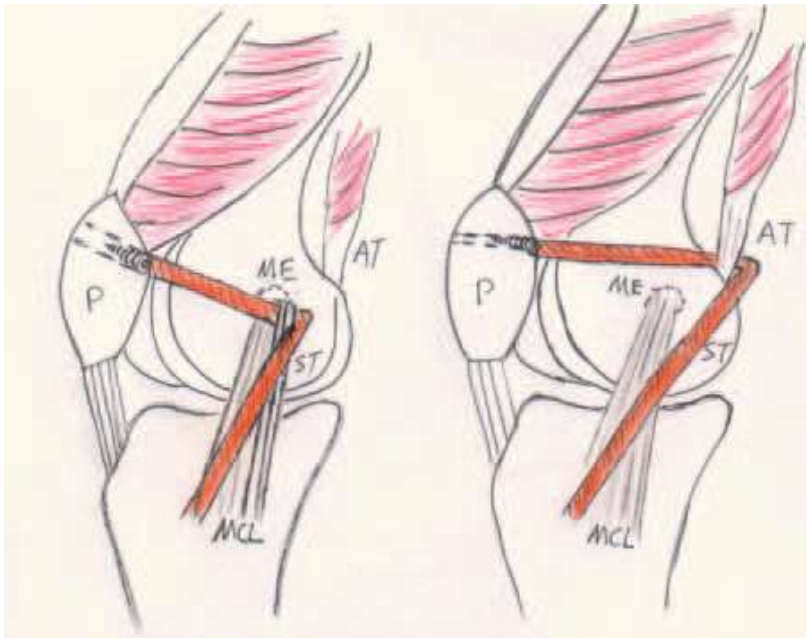
Source of support: Departmental sources



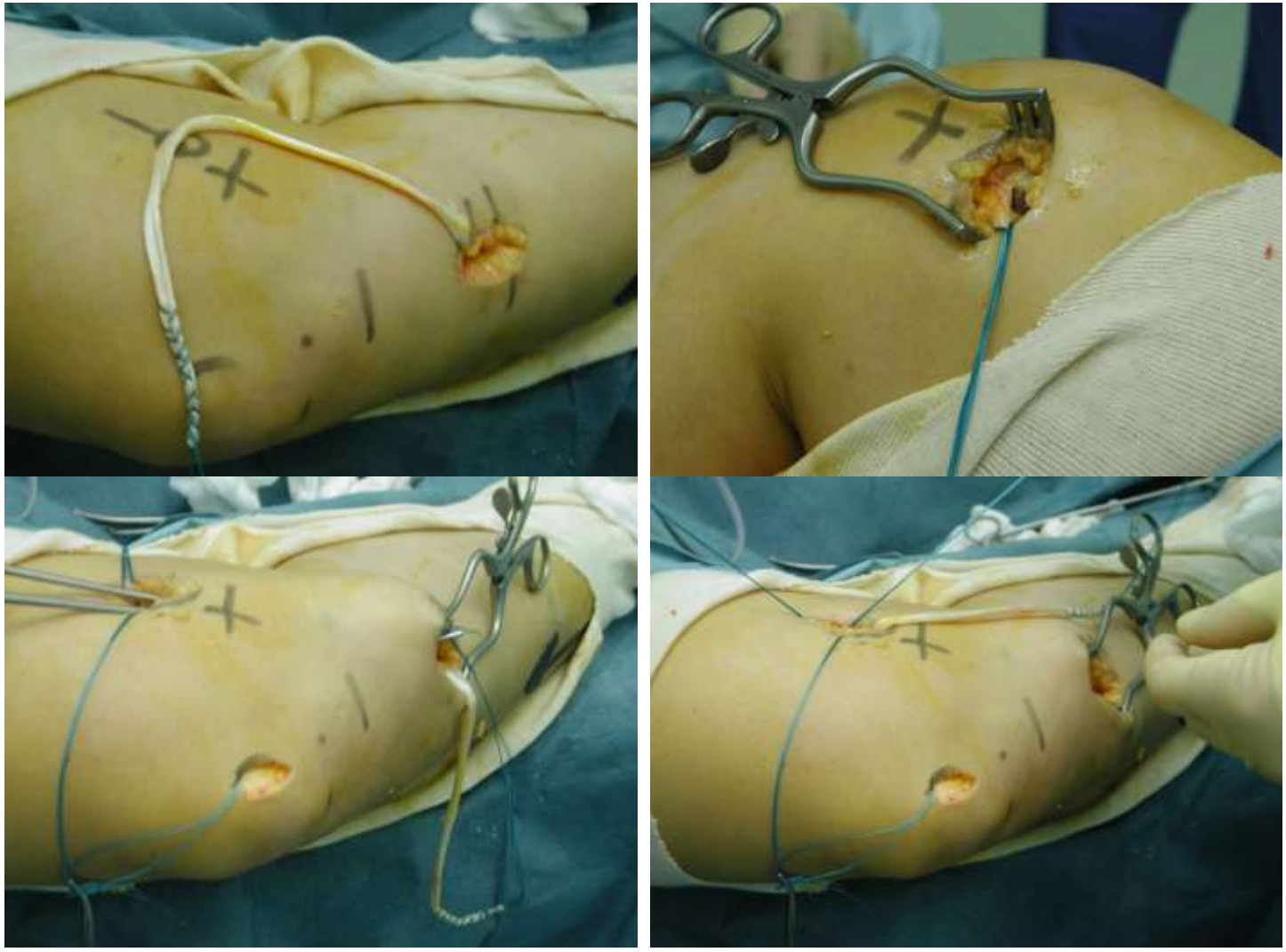


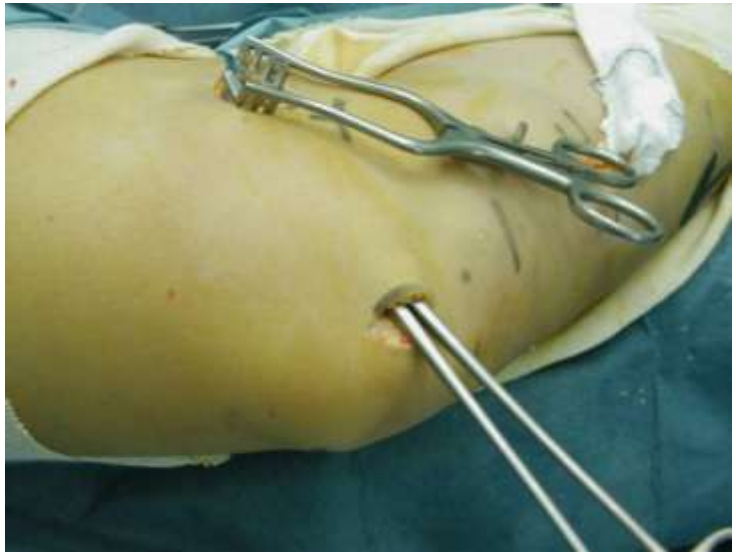
MPFL Reconstruction for Recurrent Patella Dislocation: A New Surgical Technique and Review of the Literature

Int J Sports Med 2008; 29: 359–365

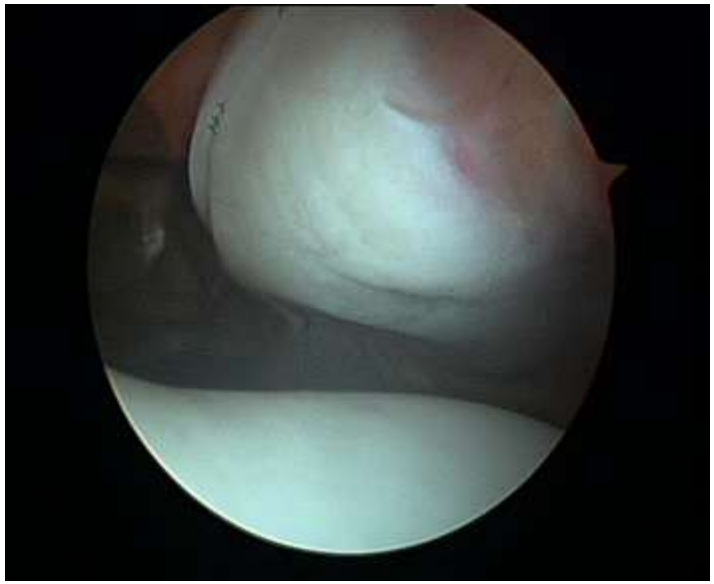
Authors: A. Panagopoulos, L. van Niekerk, I. K. Triantafillopoulos

Affiliation: Orthopaedics and Trauma, Centre for Sports Injury Surgery, Friarage and Duchess of Kent Military Hospitals, Northallerton, United Kingdom

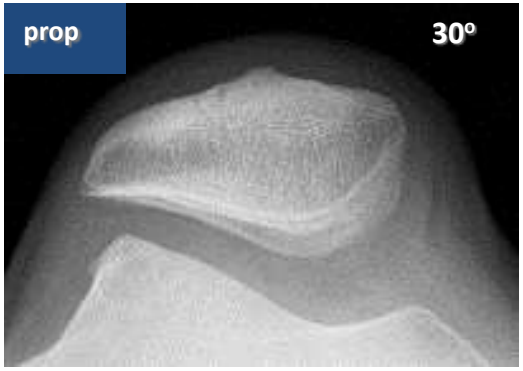


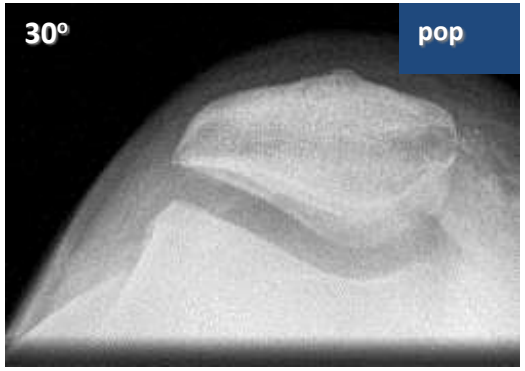



Patella dislocation



Patella centralization

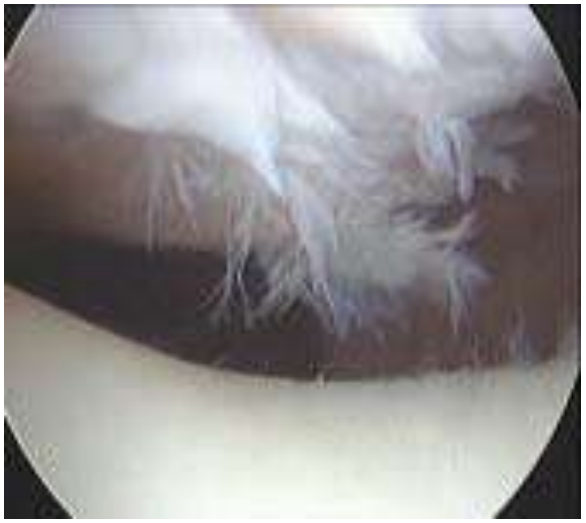




Chondromalacia

The term chondromalacia refers specifically to the pathological appearance of damaged articular cartilage

May be caused by repetitive normal biomechanical loading, a single traumatic episode, asymmetric overload caused by malalignment, or by arthritic conditions



Chondromalacia

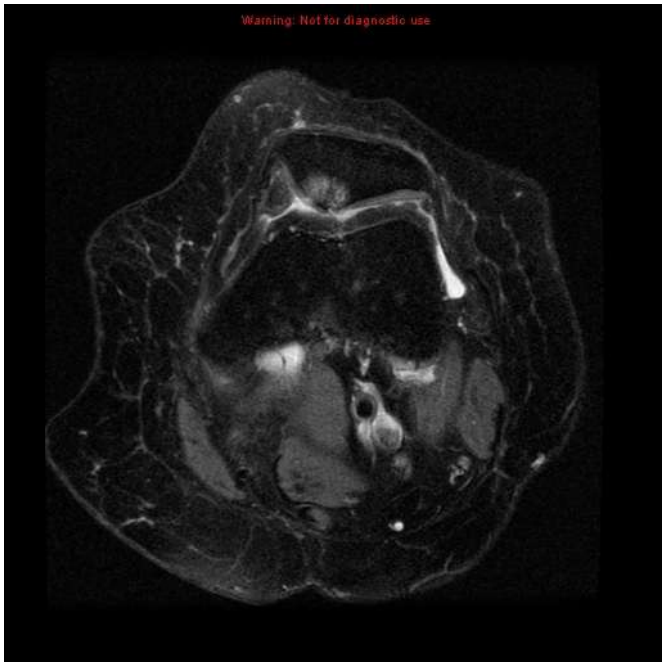
Pain, etiology unclear (adjacent synovium, subchondral bone)

crepitus, and possibly a joint effusion

Patella compression test (+)

Outerbridge classification

Combination with tight retinaculum or insufficient medial restrains



Treatment

associated malalignment

VMO strengthening

lateral retinaculum stretcing

Taping or bracing techniques

Orthotics (hyperpronation)

NSAID, Donarot

Decision Making (try to understand the etiology)

If a patient presents with Grade 3 chondromalacia of the central ridge of the patella with a history of a direct blow to this area → simple debridement

If a patient presents with a long history of progressive symptoms with lateral facet CM, a tight lateral retinaculum, and evidence of lateral patellar compression syndrome, → debridement plus lateral retinacular release

If a patient has a history of recurring patella dislocation or subluxation → stabilization procedure along with arthroscopic debridement


Anterior Knee Pain
Bursitis
Pathophysiology and Etiology
Diagnositic Tools
Signs and Symptoms
Prognosis
Treatment/Education/Prevention
Inflammatory Degenerative Arthritis
Pathophysiology and Etiology
Diagnostic Tools
Signs and Symptoms
Prognosis
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Ligamentous Injury
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Meniscal Tear
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Osteochondritis Dessicans
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Patellar Tendinopathy
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Neoplastic Growth
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Bone Contusion
Pathophysiology and Etiology
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Chondromalacia Patella
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Infrapatellar Fat Pad Irritation
Pathophysiology and Etiology
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Medial Synovial Plica Irritation
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Osgood-Schlatter Disease
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Patellar Maltracking and Subluxation
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Patellofemoral Pain Syndrome
Pathophysiology and Etiology
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