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

https://www.youtube.com/watch?v=-hpP3JSOCq0&list=PLuBRb5B7fa_eLlhgRt2DFNKetmQ5nDLZJ&index=10

Patellar Instability

- Ala Al-Qudah, MD
- MBBS, MRCS, Jordan Board, FRCS(T&O),FRCSEd
- Trauma and Orthopaedic Specialist
- Orthopaedic Sports Surgery and Arthroscopy Specialist

CASES

- 16 years old female , Professional Karate player, 3x left knee patellar dislocation while playing sports. Otherwise fit and well. On examination Beighton score 7, Bilateral Genu Valgum, Knee effusion and lateral patellar shift
- 22 years old , Medical student, Direct blow to the knee . Severe pain , Very limited ROM, + effusion , X-ray – No fractures, MRI- MPFL ? Osteochondral fracture
- 34 years old female, recurrent patellar dislocation with flexion , otherwise fit and well , TT-TG 25
- 12 years old boy , miserable malalignment with lateral knee pain and clicking
- 25 years male ,Professional football player , direct blow to the knee , effusion +3 , X-ray and MRI – MPFL signal

Outline

- Definition
- Epidemiology
- Anatomy
- Stabilizers
- Risk factors
- Clinical Assessment
- Investigations
- Management

Definition and Epidemiology

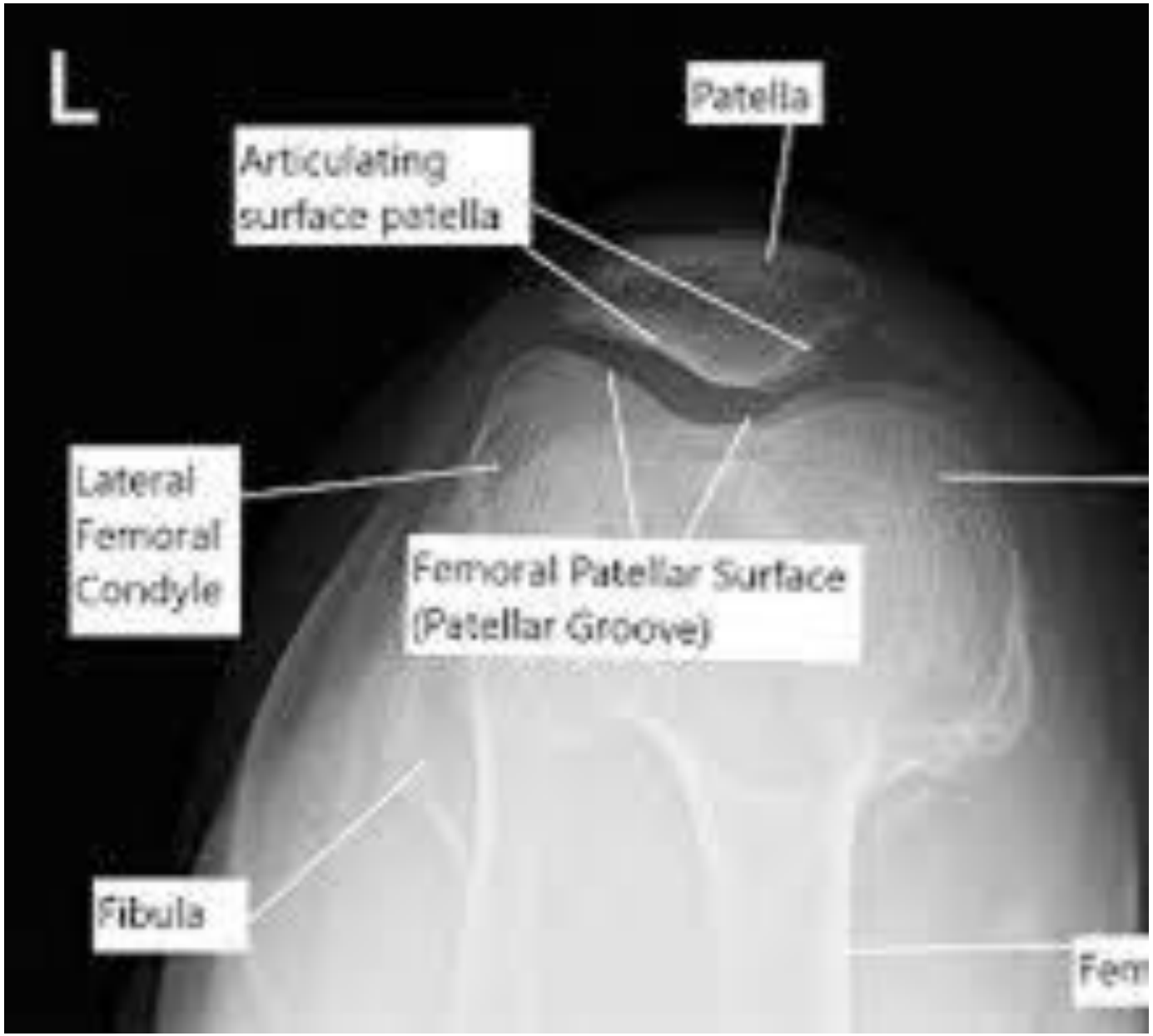
- Spectrum : subluxation or dislocation of the patella
- 3% of all knee injuries
- 5.8 per 100,000 in general population
- 29 per 100,000 in the 10-17-year-old age group
- recurrence rate 15-44% after conservative treatment
- Risk Factors :

  General : Hyperlaxity, Neuromuscular disease

  Local : Ligament injury, Trochlear morphology, Patellar Height, Mechanical Malalignment , Muscular weakness

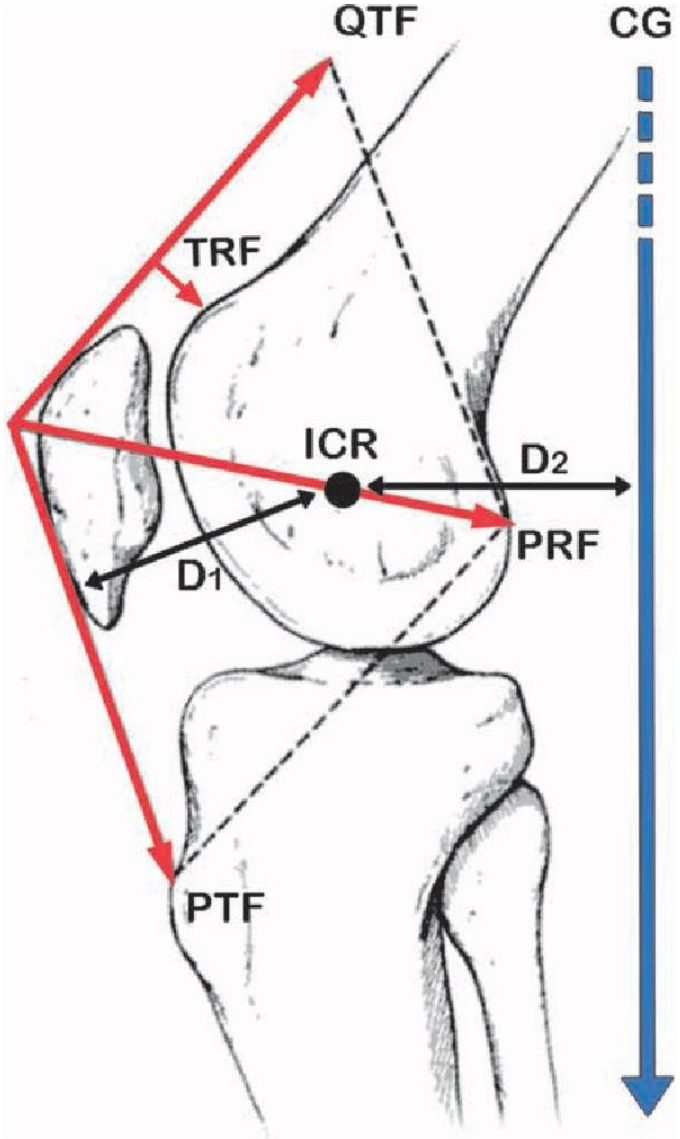
Anatomy

- PFJ : Diarthrodial Joint
- Patella :
  - Largest sesamoid bone in the body , Thickest articular cartilage
  - Two articular facets :medial and lateral- variable size , Wiberg classification
- Femur : Trochlear groove between MFC and LFC



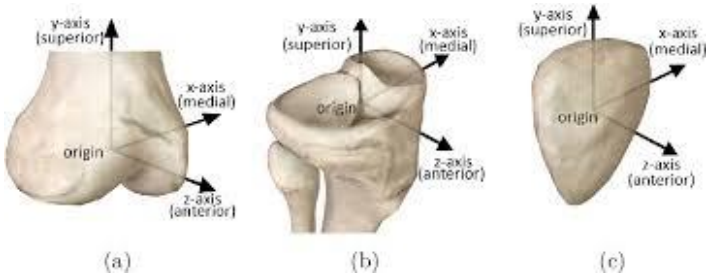
Anatomy: Function of the PFJ

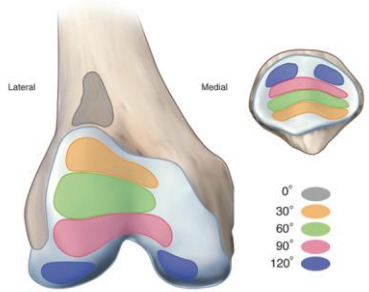
- Knee JRF
- Patella increase mechanical efficiency of the extensor mechanism by 50%
- In vitro and vivo studies : Patellar excision increase force needed by 40% and increases Tibio-femoral JRF by 250%



Stability of PFJ

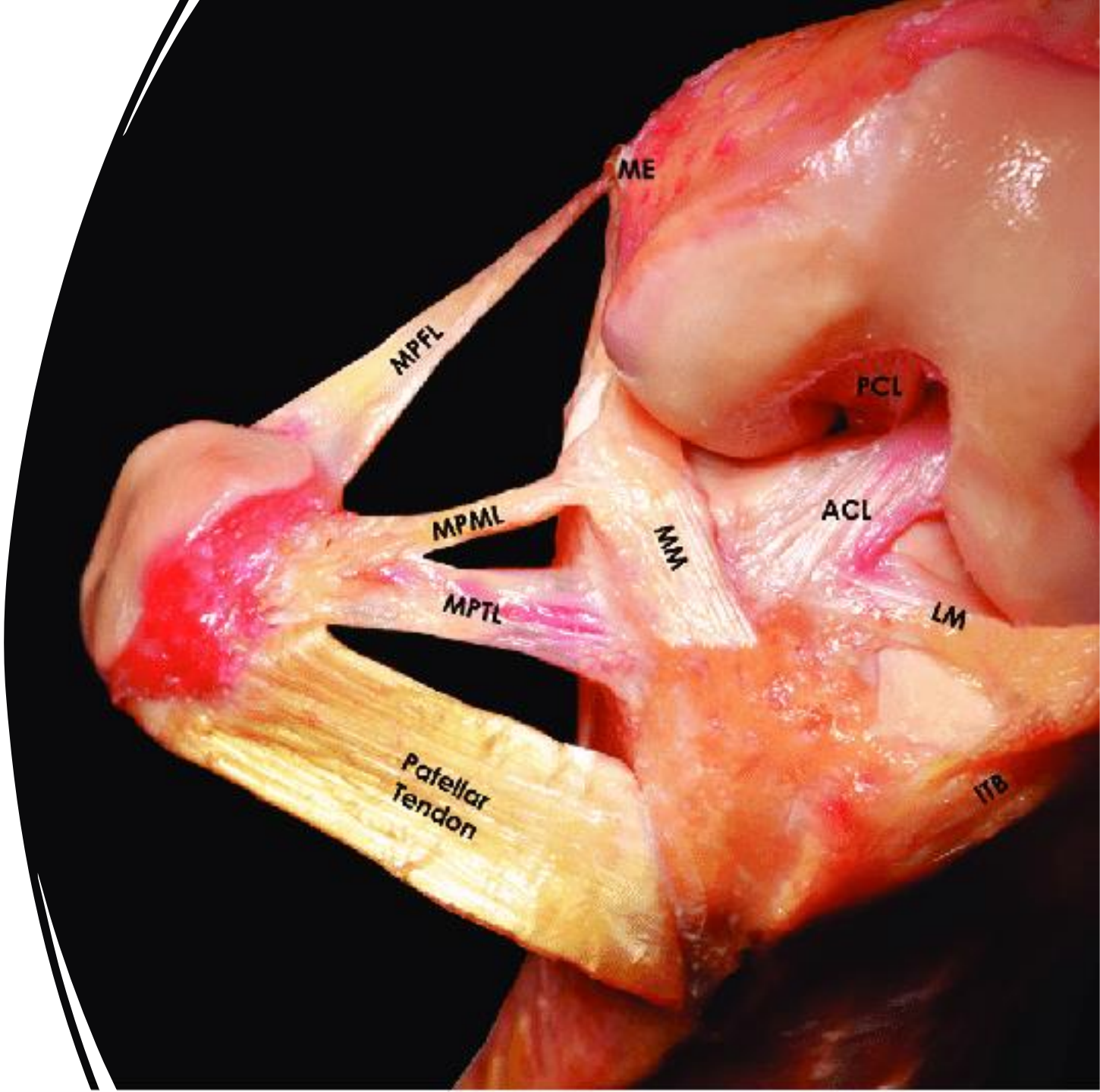
- Complex joint motion
- Essential to understand the 4D anatomy of the joint
- Stability and stabilizers changes with time based on the position of the patella within the groove at a point of time
- Patellar contact point and Patellar entry point





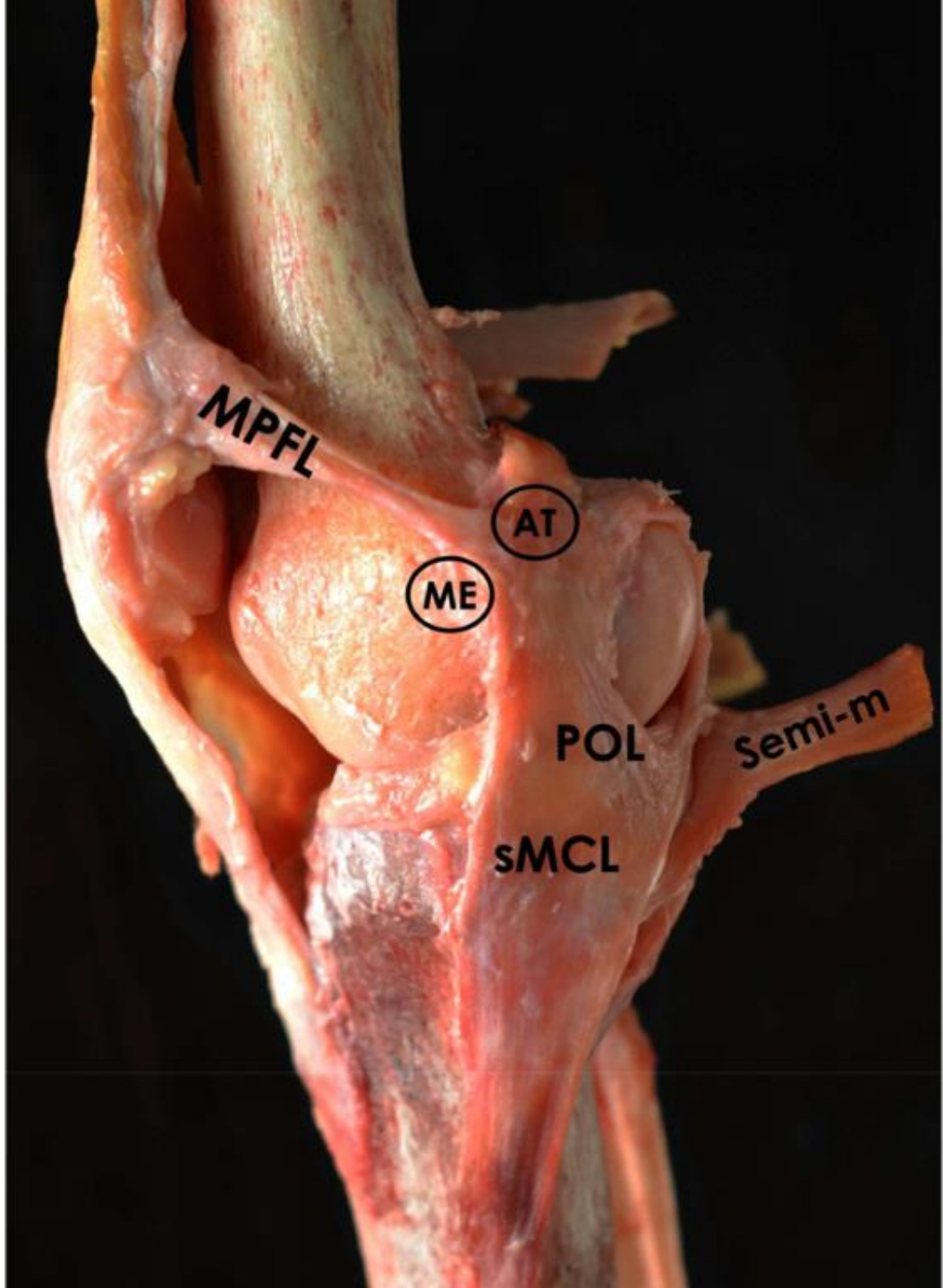
Stability of PFJ

- Bone anatomy
- ✔ Patellar shape(Wiberg et al.)
- ✔ Trochlear groove morphology and depth(Dejour el al.)
- ✔ Mechanical and anatomical axis
- ✔ Q-angle: normal change with flexion and gender: less than 18 in males and 22 in females
- Soft tissue stabilizers
- Static **: MPFL ,** MPML,MPTL
- Dynamic : Quadriceps muscle(**VMO**)



MPFL

- Lies in second layers of the knee medially
- Fan shape and has two bundles
- Femoral attachment : MFC distal to the adductor tubercle and proximal to the superficial MCL fibers posterior to the medial epicondyle
- Patellar attachment : Junction of proximal and middle thirds of superomedial patella
- Schottle point on true lateral radiograph
- Provide restraint to lateral translation from 0-30 flexion
- Can with-stand up to 200 N of tension. However, normally works in low tension environment



Clinical Assessment- History

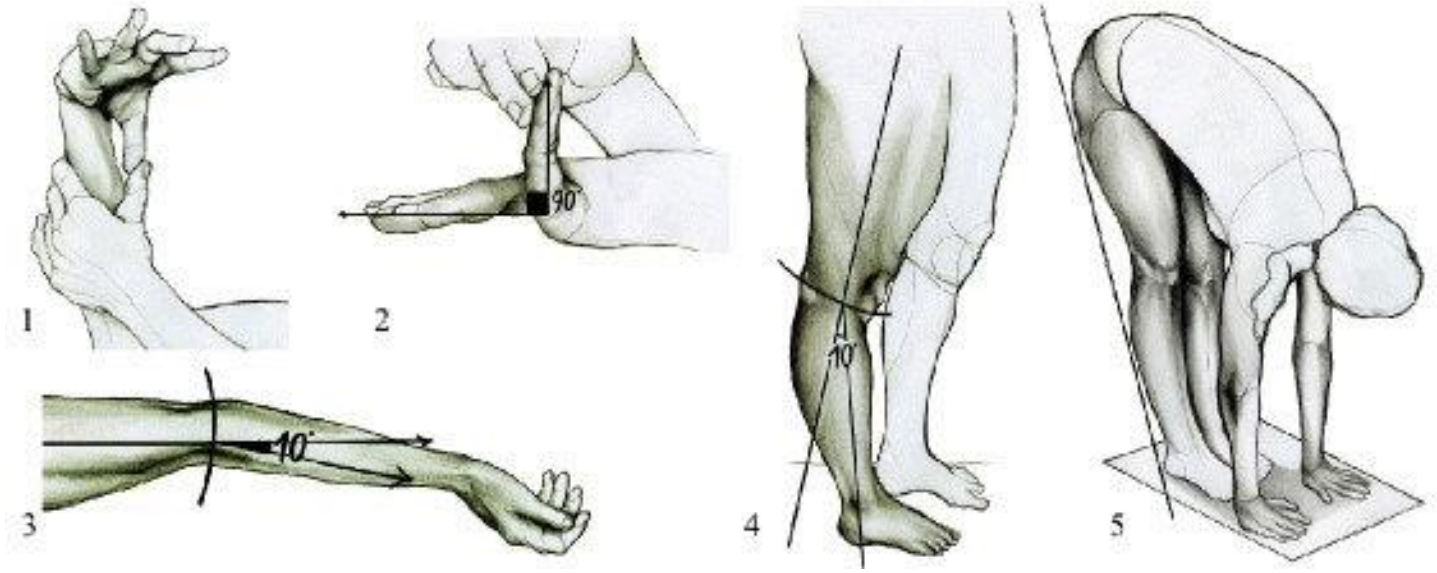
- Age of first dislocation
- Mechanism
- Frequency
- Pain, tenderness
- Gait
- Hypermobility and other joints
- PMHx, Surgical Hx
- Treatment
- Family Hx
- Risk Factors

Clinical Assessment - Examination

- Look , Feel , Move
- Standing
- ➢ Gait
- ➢ Signs of hypermobility – Marfan, ED syndrome, Beighton score
- ➢ Lower limb axis- Genu valgum
- ➢ Rotational profile : Foot progression angle and patellar position
- ➢ Always examine the hands and proper neurological assessment

Specific joint laxity	YES		NO
1. Passive apposition of thumb to forearm	☐ Left	☐ Right	☐
2. Passive hyperextension of V-MCP > 90°	☐ Left	☐ Right	☐
3. Active hyperextension of elbow >10°	☐ Left	☐ Right	☐
4. Active hyperextension of knee >10°	☐ Left	☐ Right	☐
5. Ability to flex spine placing palms to floor without bending knees	☐		☐

*Each "YES" is 1 point. A score ≥ 4 out 9 is generally considered an indication of JH. (MCP: metacarpophalangeal).



Clinical Assessment - Examination

- Sitting
  - ➢ J-signs
  - ➢ ROM

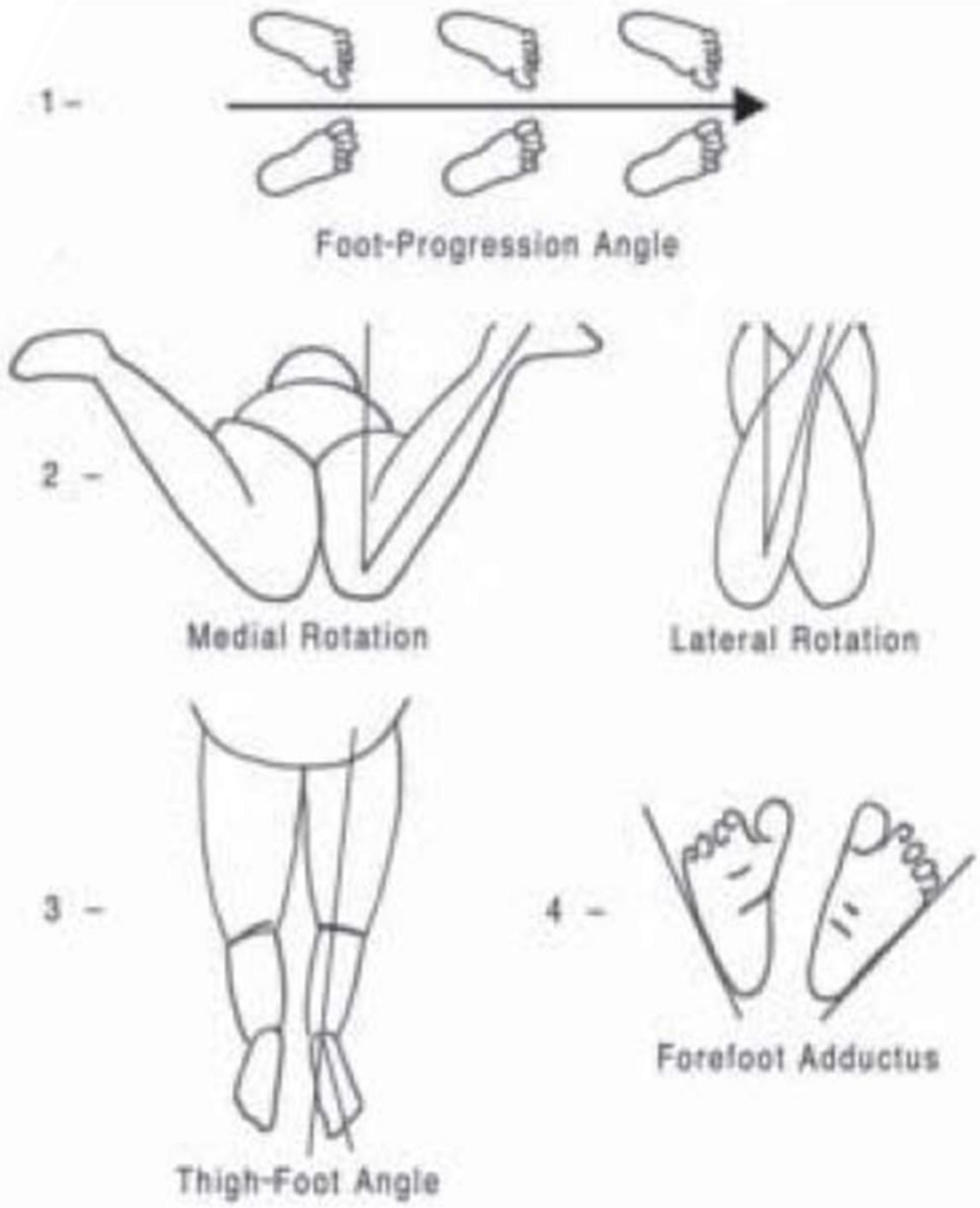
Clinical Assessment - Examination

- Supine

➢ Effusion – Grading , Patellar Tap, Ballottement, Fluid thrill
➢ Palpation –Tenderness, Crepitus
➢ Active and Passive ROM
➢ Patellar Translation , Quadrant test,End- point , Pain
➢ Patellar tilt
➢ Patellar height
➢ Quadriceps , VMO , Patellar and Quadriceps Tendons
➢ Apprehension test
➢ Knee joint
➢ Neurovascular exam
➢ Always compare

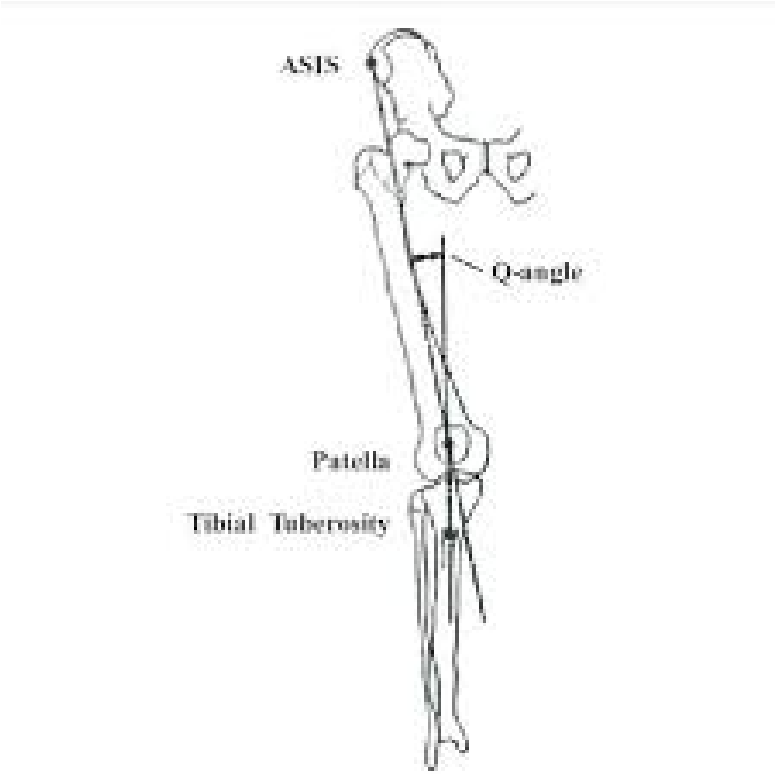
Clinical Assessment - Examination

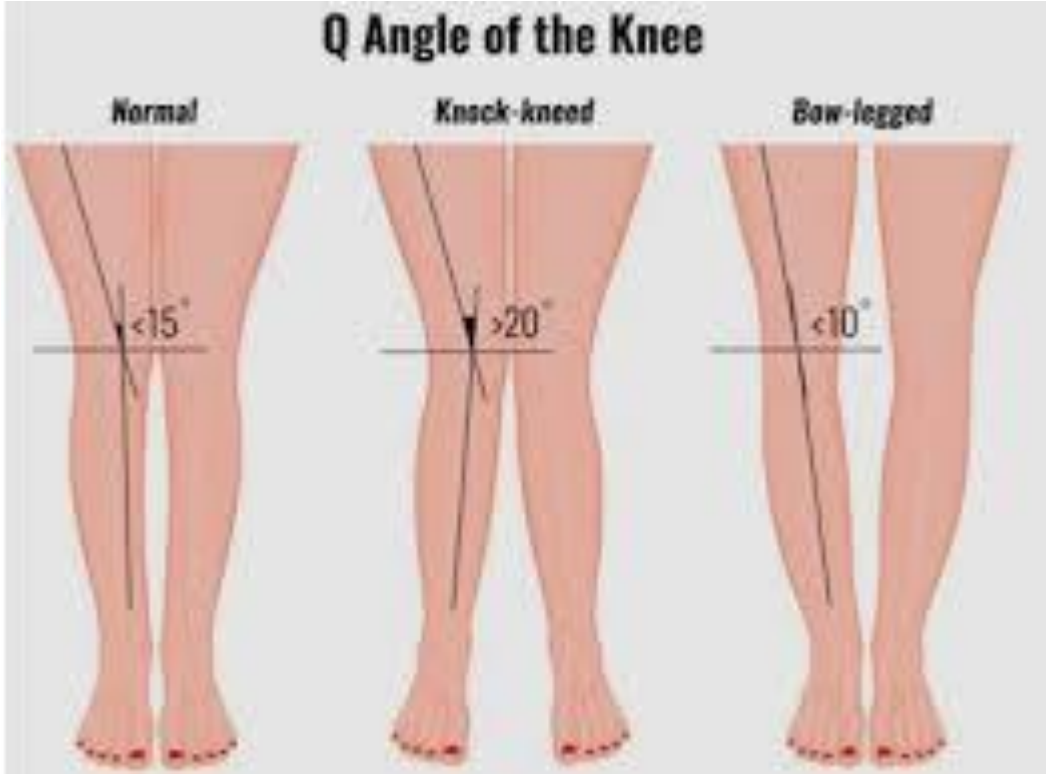
- Prone :
- Rotational profile mainly femoral version



Radiology- AP Radiographs

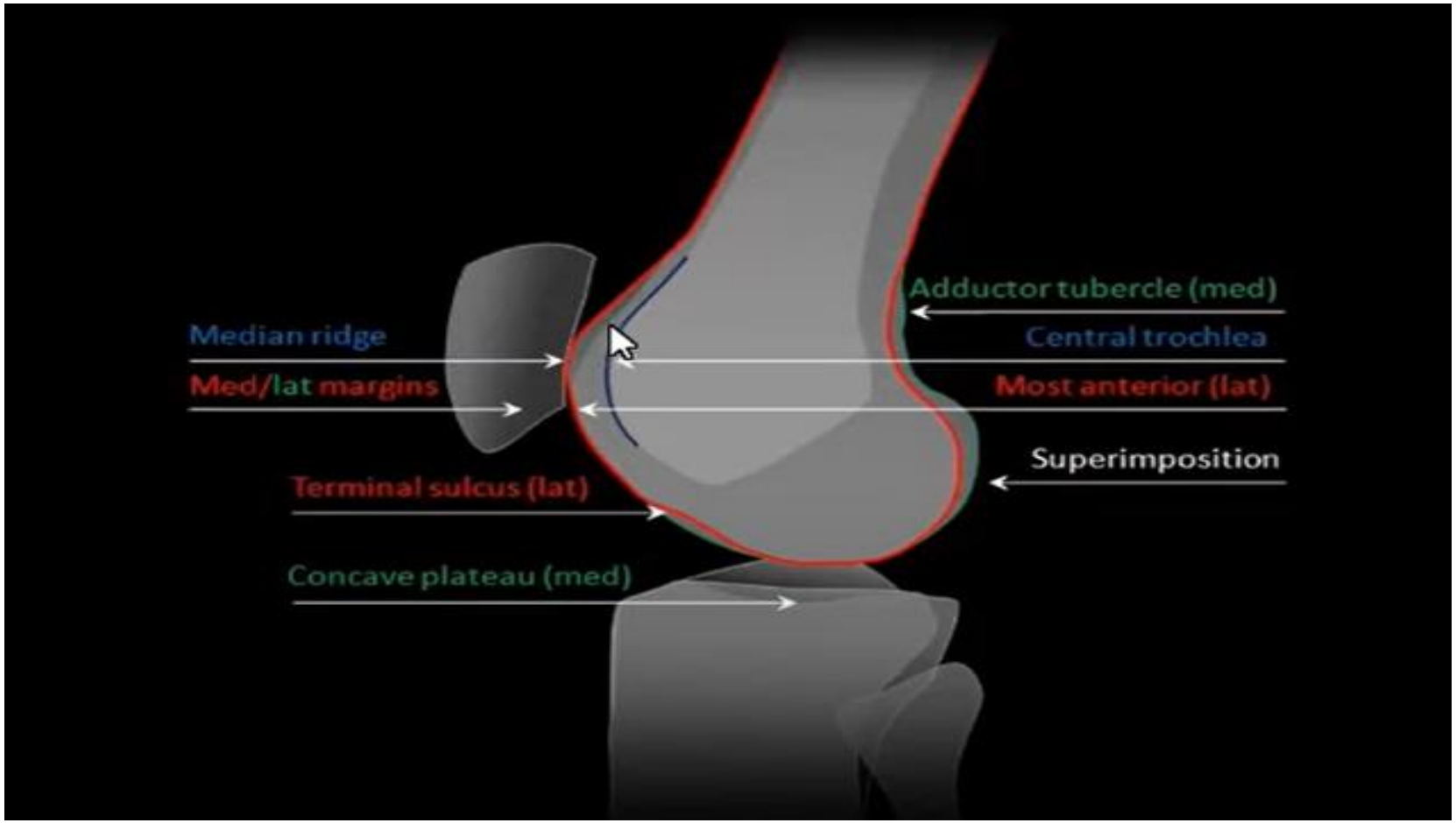
- Standing Long lower limb measurement radiographs
- Q-angle
- Lower Limb axis





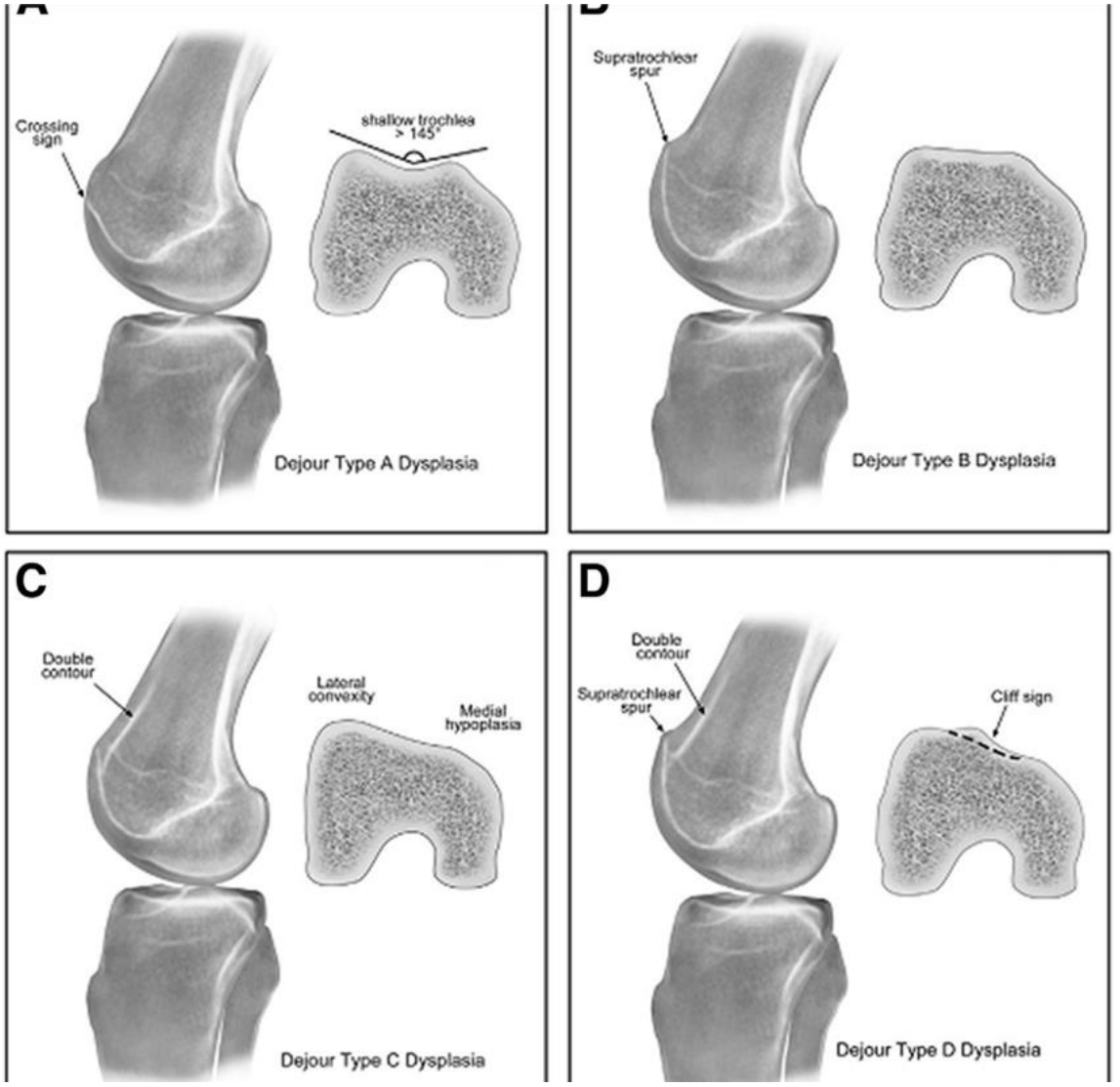
Radiology – Lateral radiographs

Dejour classification is based on true lateral radiographs



Radiology – Lateral radiographs

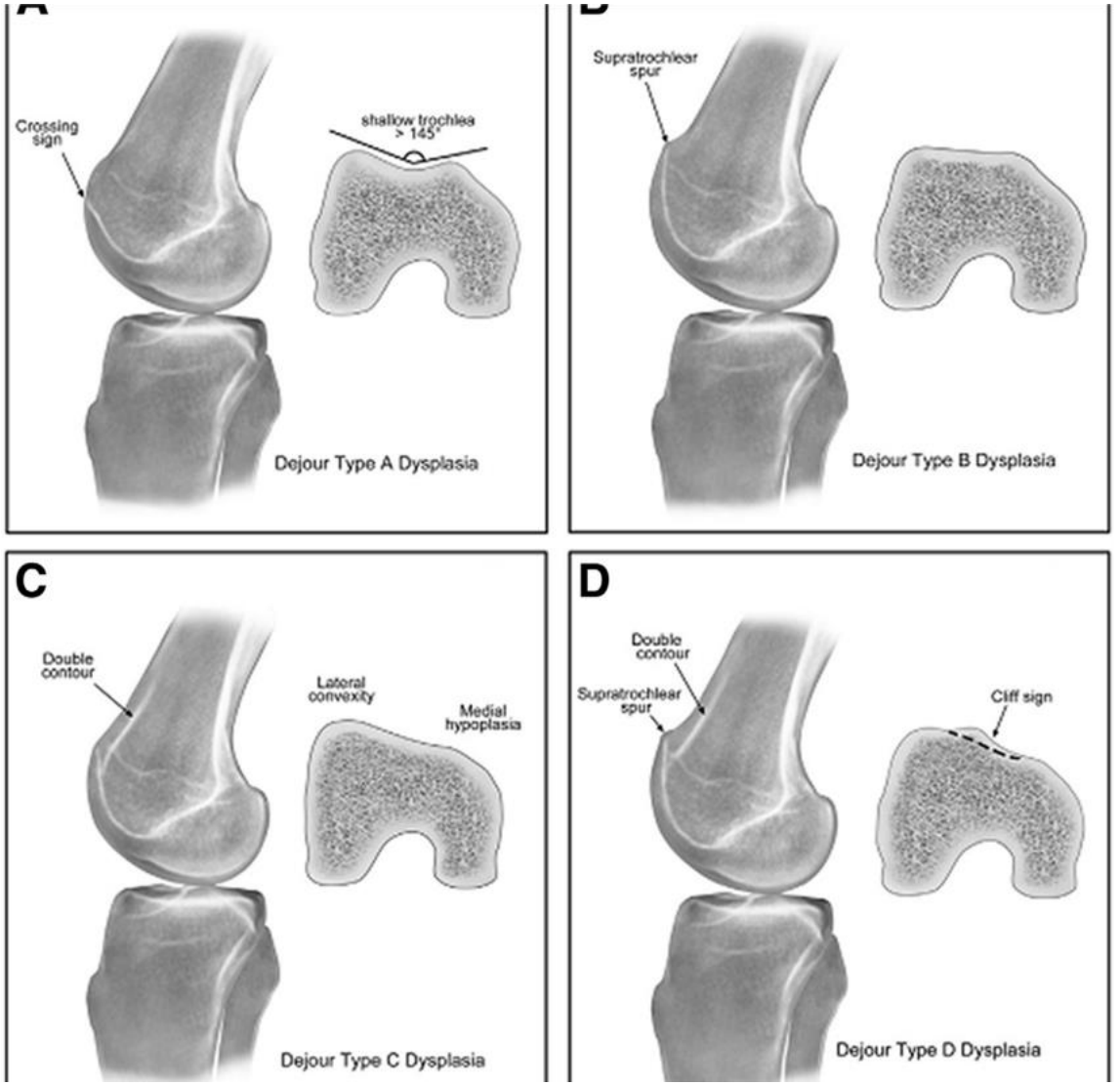
- Dejour classification:
  - ➢ Crossing Sign
  - ➢ Double contour
  - ➢ Trochlear Spur



Radiology – Lateral radiographs

➢ Dejour classification:

- Type A: crossing sign, normal facet geometry but shallow trochlea
- Type B: crossing sign, trochlear spur on lateral radiograph and flat trochlear groove on cross-sectional imaging
- Type C: crossing sign and double contour on lateral radiograph with medial facet hypoplasia and lateral facet convexity
- Type D: crossing sign, trochlear spur and double contour on the lateral radiograph and a cliff-like pattern between the medial and lateral facets

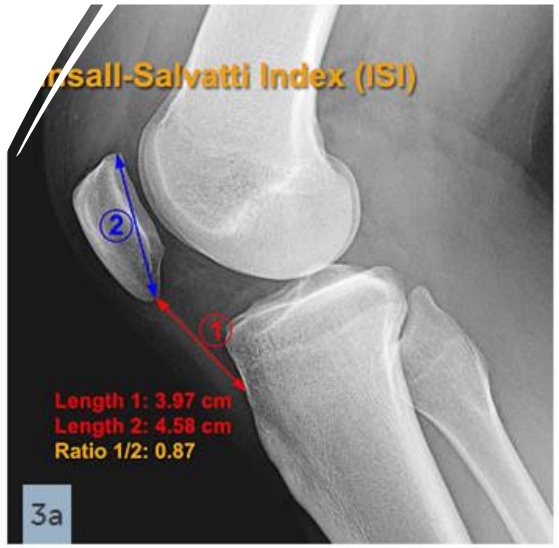


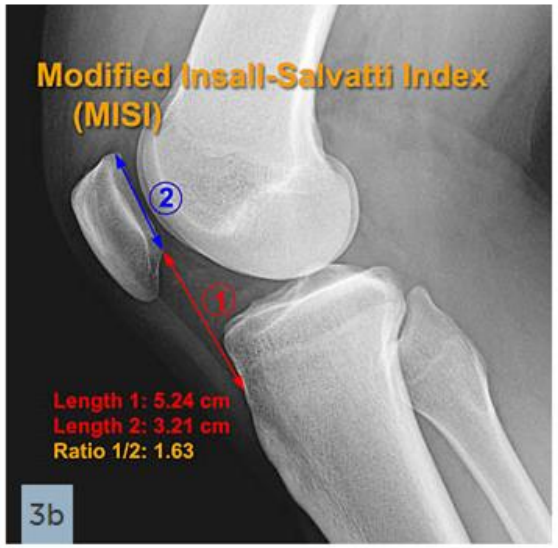
Radiology – Lateral radiographs

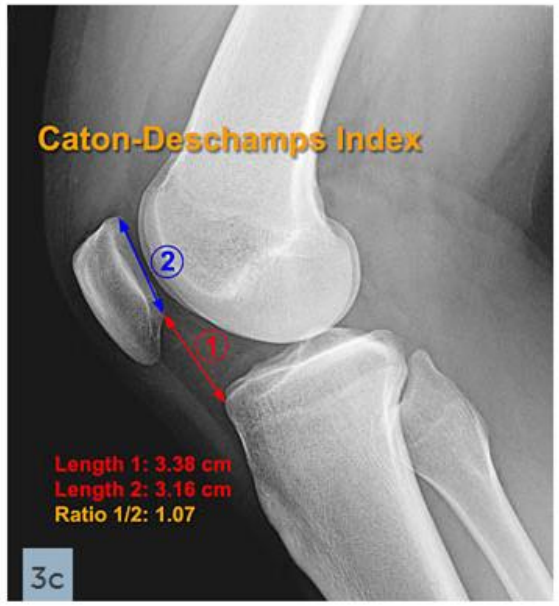
- Patellar Height

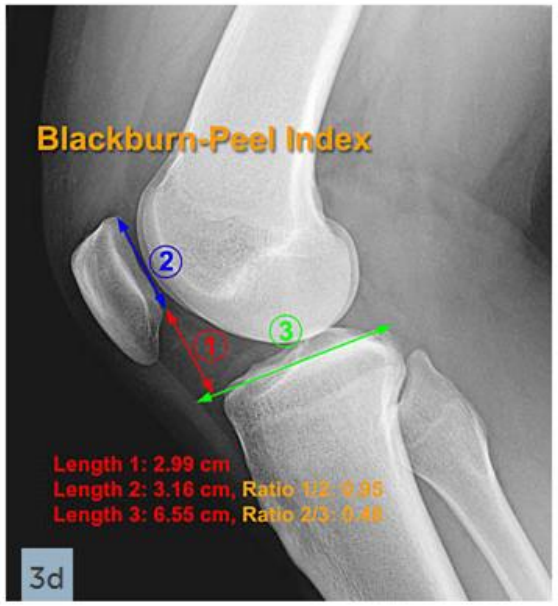
❖ Can be measured on MRI scan too

- We use Insall-Salvati and Caton-Deschamps index
- Less variation with the Caton-Deschamps index









Radiology – Lateral radiographs

- Schottle point

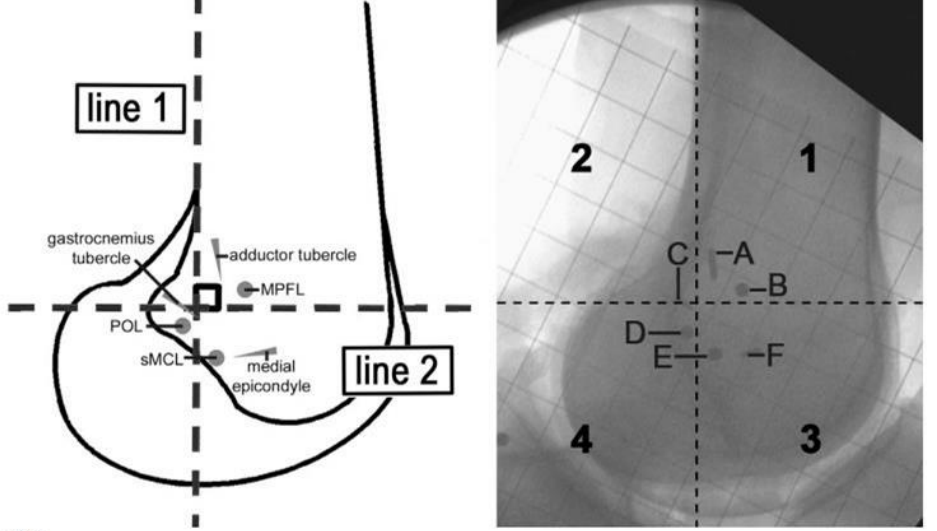
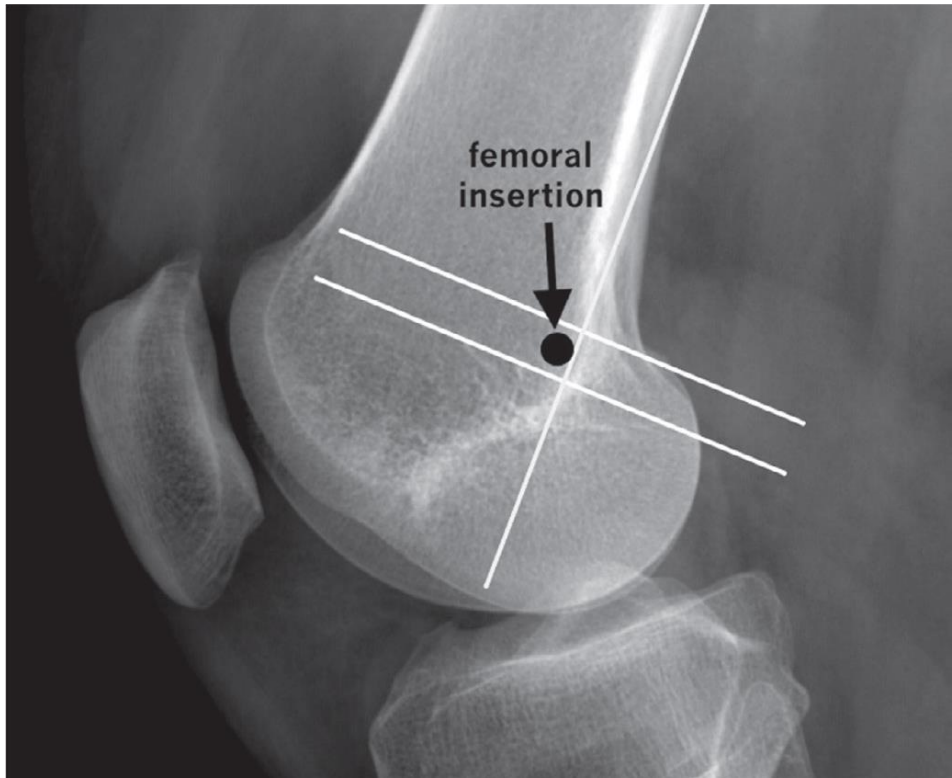


Fig. 4
Illustration (left) and lateral knee radiograph (right) demonstrating the placement of the femoral reference lines. Line 1 was drawn as an extension of the posterior femoral cortex, and line 2 was drawn perpendicular to line 1 and passed through the posterior portion of the Blumensaat line. The numbers 1 through 4 in the radiograph indicate quadrants of the lateral aspect of the distal part



Radiology – Merchant view

- Position of the patella during flexion may affect interpretation – Usually instability begins at the onset of flexion

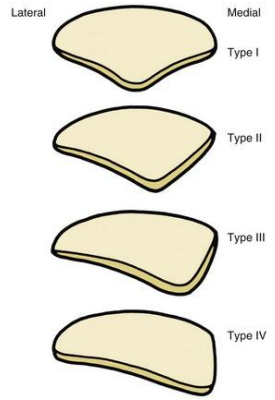
➢ Lateral Patellar tilt- Variable between different studies – up to 8 is accepted

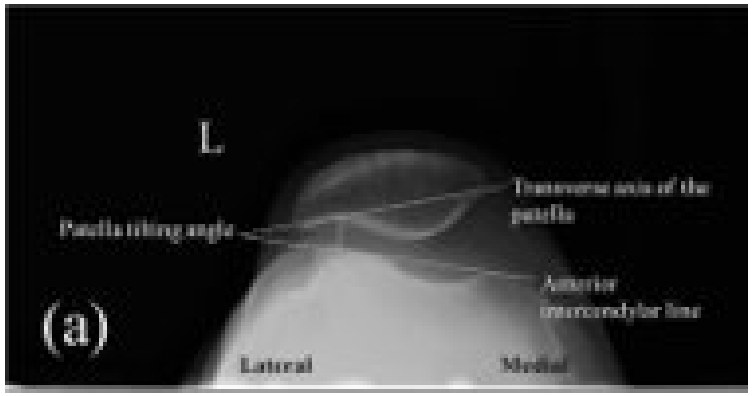
➢ Sulcus angle- Normal 135±10º

➢ Congruence angle (-6 degrees)

➢ Lateral Patellofemoral angle –Normal >11

➢ Patellar shape and morphology- Weiberg classification





Radiology – CT and MRI

- CT- Osteochondral fractures ,Loose bodies, TT-TG distance, Trochlear groove, Patellar morphology , 3D reconstruction
- MRI

➢ Cartilage
➢ Osteochondral fractures
➢ TT-TG distance
➢ TT- PCL distance (Seitlinger et al.)
➢ MPFL
➢ Bedierat classification and cartilage overlap(Biedert et al.)

Patellar Instability – Management aims

1

Restore stability and Tracking

2

Treat underlying osteochondral damage

3

Prevent development of OA

Patellar Instability – Management guidlines

- Complex pathology with lack of high-quality evidence
- Multifactorial pathology
- The American Society for Sports Medicine and the Patellofemoral Foundation guidelines – Expert opinion and lack of high-quality evidence.
- "menu à la carte" algorithm - Dejour et al.
- BASK and BOAST Consensus guidelines:Robust Systematic review of current literature

British Orthopaedic Association

aossm™
American Orthopaedic Society for Sports Medicine

Patellar Instability – Algorithm

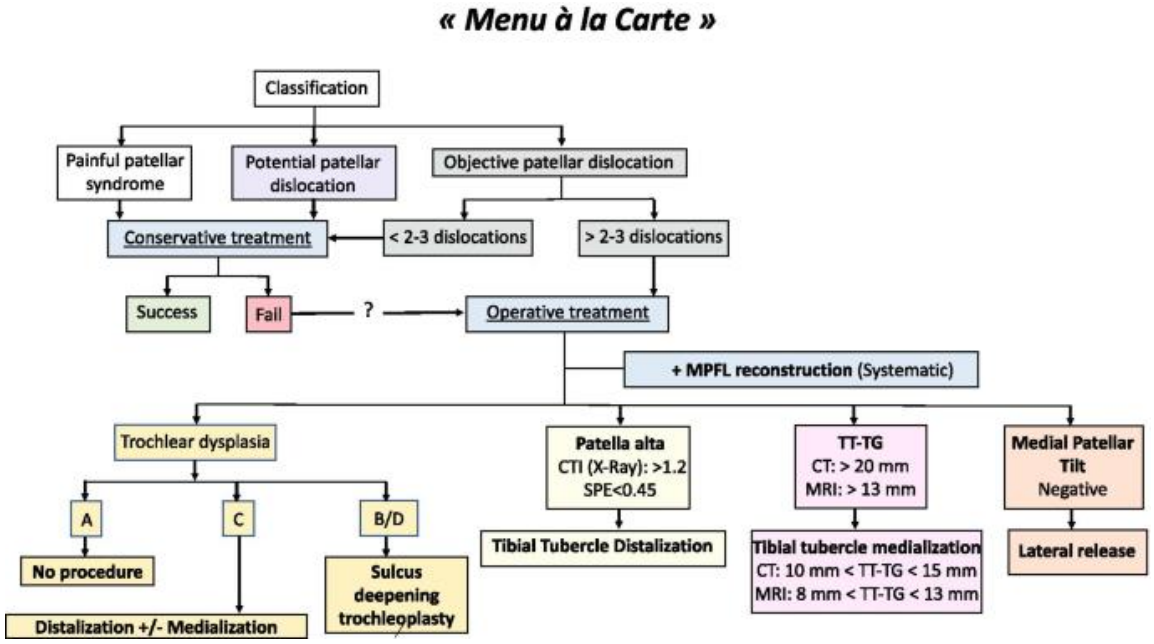
Dejour *et al.*
Journal of Experimental Orthopaedics (2021) 8:109
https://doi.org/10.1186/s40634-021-00430-2

Journal of
Experimental Orthopaedics

ORIGINAL PAPER Open Access

Updated treatment guidelines for patellar instability: "un menu à la carte"

David H. Dejour[1], Guillaume Mesnard[1] and Edoardo Giovannetti de Sanctis[1,2*]



Patellar instability – Conservative treatment

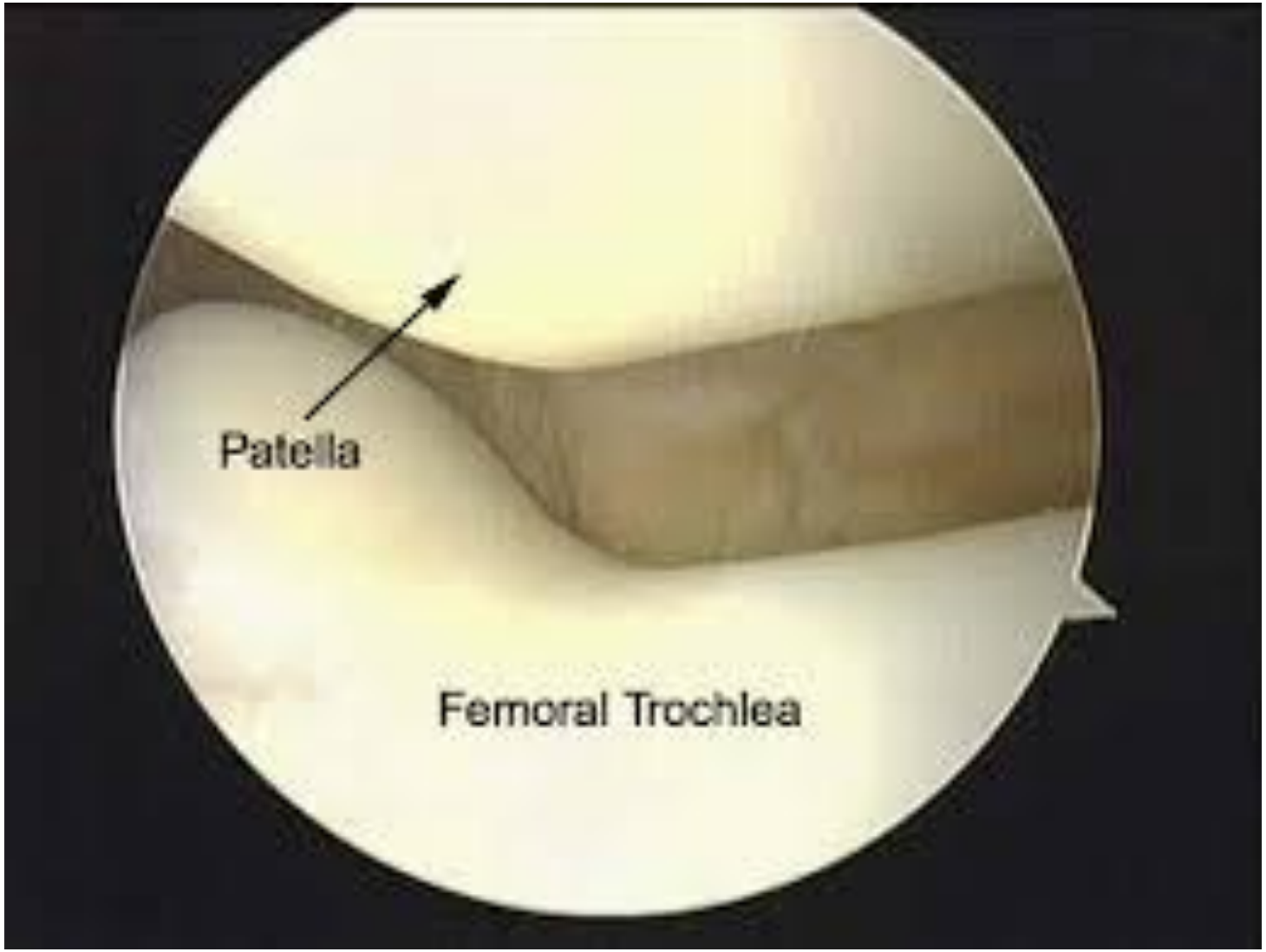
- First time dislocation
- Reducible with no Osteochondral fractures
- Avoid prolonged immobilization due to high risk of stiffness
- Patellar Brace- controlled motion
- Arthrocentesis for pain
- Dynamic stabilizers strengthening – Close chain , VMO, Quadriceps strengthening, Core body strengthening, ITB stretching
- High Re-dislocation rate especially with chronic MPFL injury

Patellar instability- Surgical Treatment

- MDT approach- Specialist Knee surgeon , Physiotherapy, Occupational therapist
- Arthroscopy
- Soft tissue reconstruction – MPFL
- Bony procedures – TT transfer, Trochleoplasty and Trochlear groove deepening
- Osteotomies around the knee to restore Q-angle and rotation
- Tailored according to underlying pathology
- Lateral release- May increase lateral and medial instability

Surgical treatment - Arthroscopy

- Removal of loose bodies or osteochondral fragments
- Real-time visualization of patellar tracking- Fluid inflation may alter normal tracking
- Assess for OA
- Debridement of the trochlear spur



Surgical treatment - MPFL reconstruction

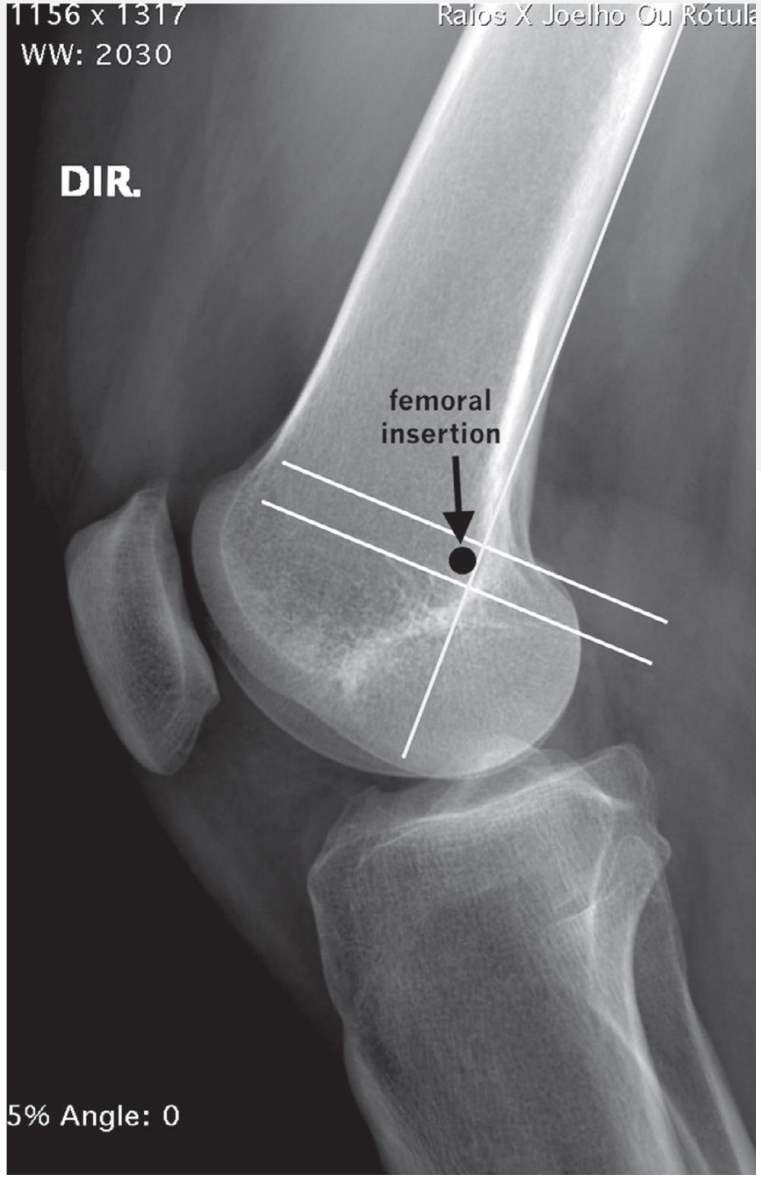
- Autograft – Gracilis , Semi-tendonitis – No enough evidence which one is better.
- Allograft
- Double limb Autograft has better outcome -Weinberger et al
- Anatomical reconstruction under Image guidance –Shottle point
- Onlay or inlay fixation
- Different fixation methods , screws , endobuttons
- Severe trochlear dysplasia is the most predictable factor for failure- Kita, Keisuke et al

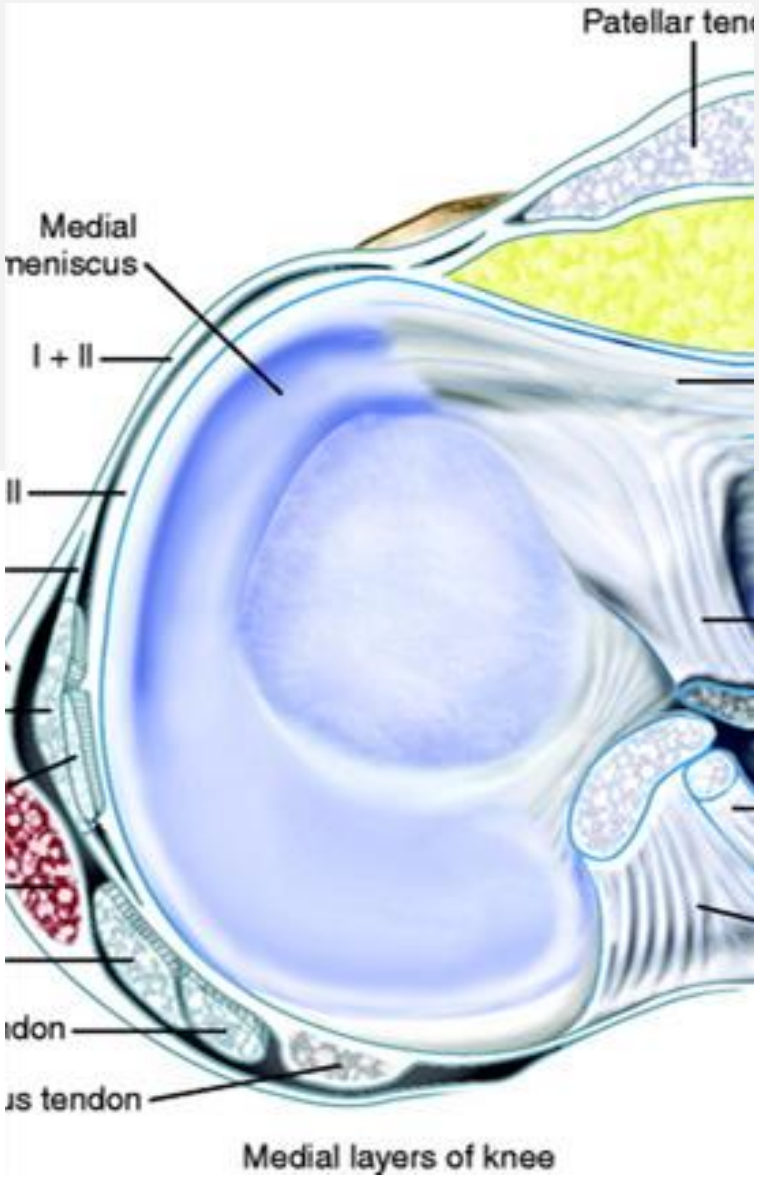
Surgical Technique - MPFL reconstruction

- Anatomic Double bundle autograft – Semitendinosus
- General ,Spinal or regional anesthesia
- Important landmarks – Borders of the patella , Medial Epicondyle, TT, Schottle point on II, Joint line
- Harvest and prepare the Semi-T through standard approach
- Two Incisions for MPFL reconstruction
- Preparation of the Patellar and femoral tunnels

Surgical Technique - MPFL reconstruction

- Essential to understand the medial layers of the knee
- Graft passed in the second layer between the capsule and retinaculum
- Identify the shottle point : Proximal and posterior to the medial epicondyle in the sulcus between the Medial Epicondyle and adductor tubercle
- Always use Image intensifier
- Methods for fixation : Interference screws , Anchors , endobuttons
- Avoid tight graft – may cause anterior knee pain or limit ROM





Surgical Technique - MPFL reconstruction

Post operative rehabilitation :

- Gradual ROM in adjustable knee brace 0-90

Trochleoplasty

- Indication :Recurrent Patellar instability with severe Trochlear dysplasia B or D and evidence of maltracking
- Contraindication : OA, Open physis , pain but no instability
- Aims to decrease JRF and improve tracking by deepening the groove and improve the TT-TG distance
- Open or Arthroscopic

Trochleoplasty- Open Technique

- Dejour et al. Described the open technique for trochleoplasty
- Three main goals

1. Deepening of the groove
2. Reduce the Spur
3. Proximal realignment

- Subchondral approach to preserve the cartilage

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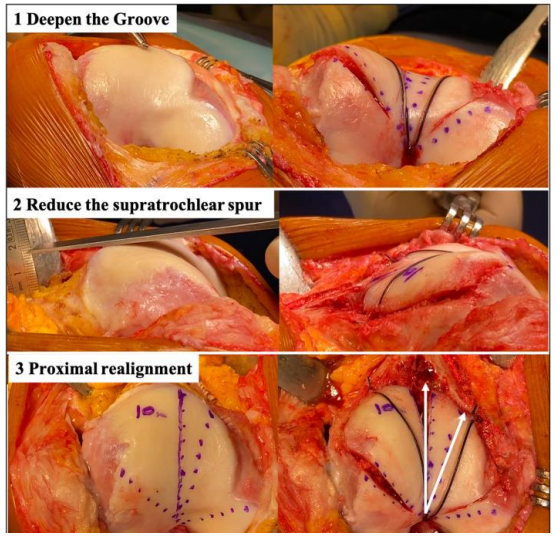
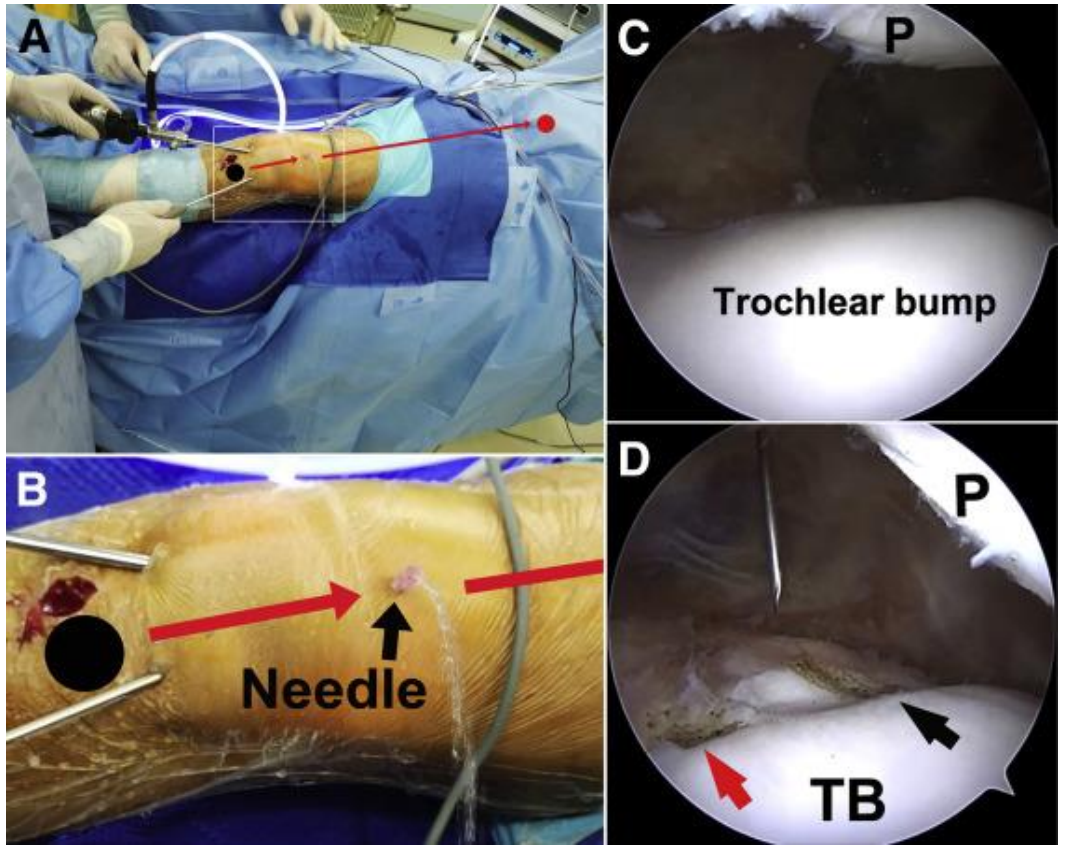


Arthroscopic Trochleoplasty

- Minimal invasive -Four portals
- Cartilage flaps
- Debride the spur and deepening the tunnel
- Fixation of the cartilage flap – Anchors



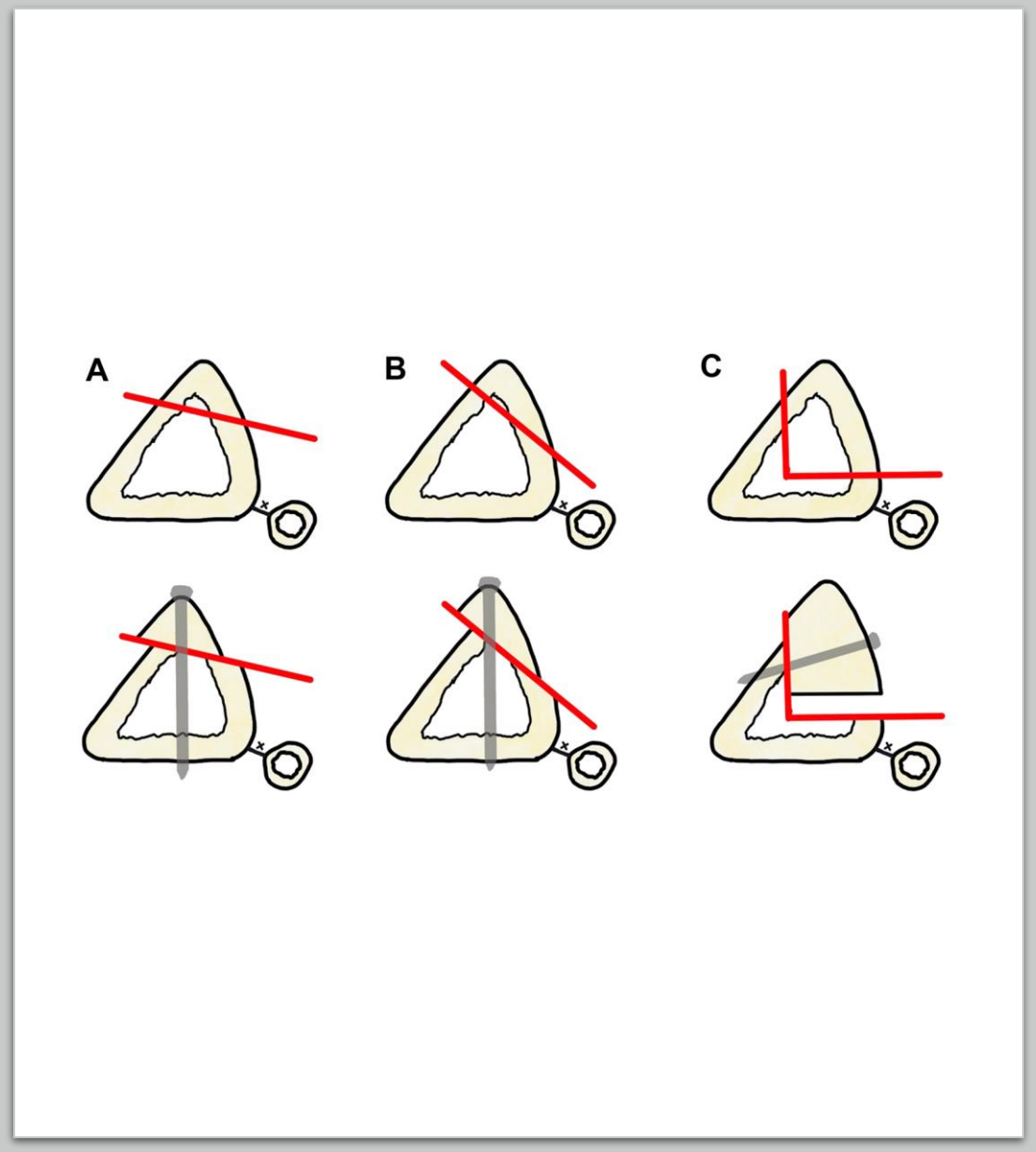
Technical Note

Precise Arthroscopic Mini-trochleoplasty and Medial Patellofemoral Ligament Reconstruction for Recurrent Patellar Instability With Severe Trochlear Dysplasia

Hu Xu, M.D., Ming Ding, M.D., Yingchun Wang, M.D., Binghui Liao, M.D., and Lei Shangguan, M.D.

Tibial Tuberosity Transfer-TTT

- Indications : Recurrent patellar instability with failed conservative treatment, Anterior Knee pain , Abnormal patellar height , TT-TG distance >20mm
- Need careful interpretation of the TT-TG distance in the context of lower limb rotational abnormalities.
- Preoperative planning : Osteotomy plane will determine the final PFJ biomechanics
- Types :
  - Anteromedialization – Fulkerson
  - Anteriorization – Maquet , Fulkerson
  - Medialization : Elmslie-Trillat procedure
  - Distalization



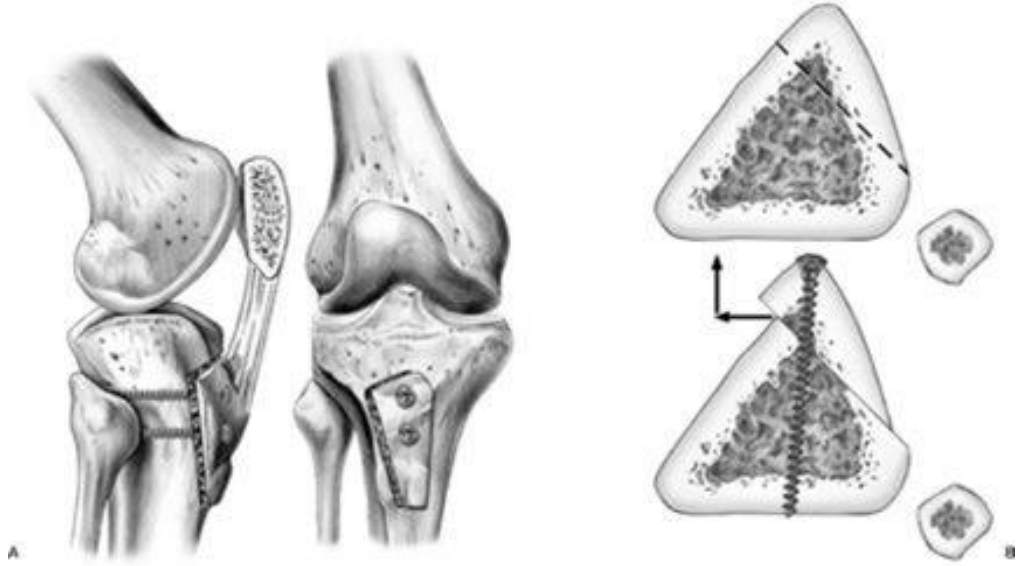
Tibial Tuberosity Transfer-AMZ osteotomy

- Approach – Anterior midline but can be modified to address other pathologies
- Exposure : Full thickness skin flaps, Tourniquet improves exposure
- Osteotomy :

❖ Plane of osteotomy will determine the amount of anteriorization and medialization

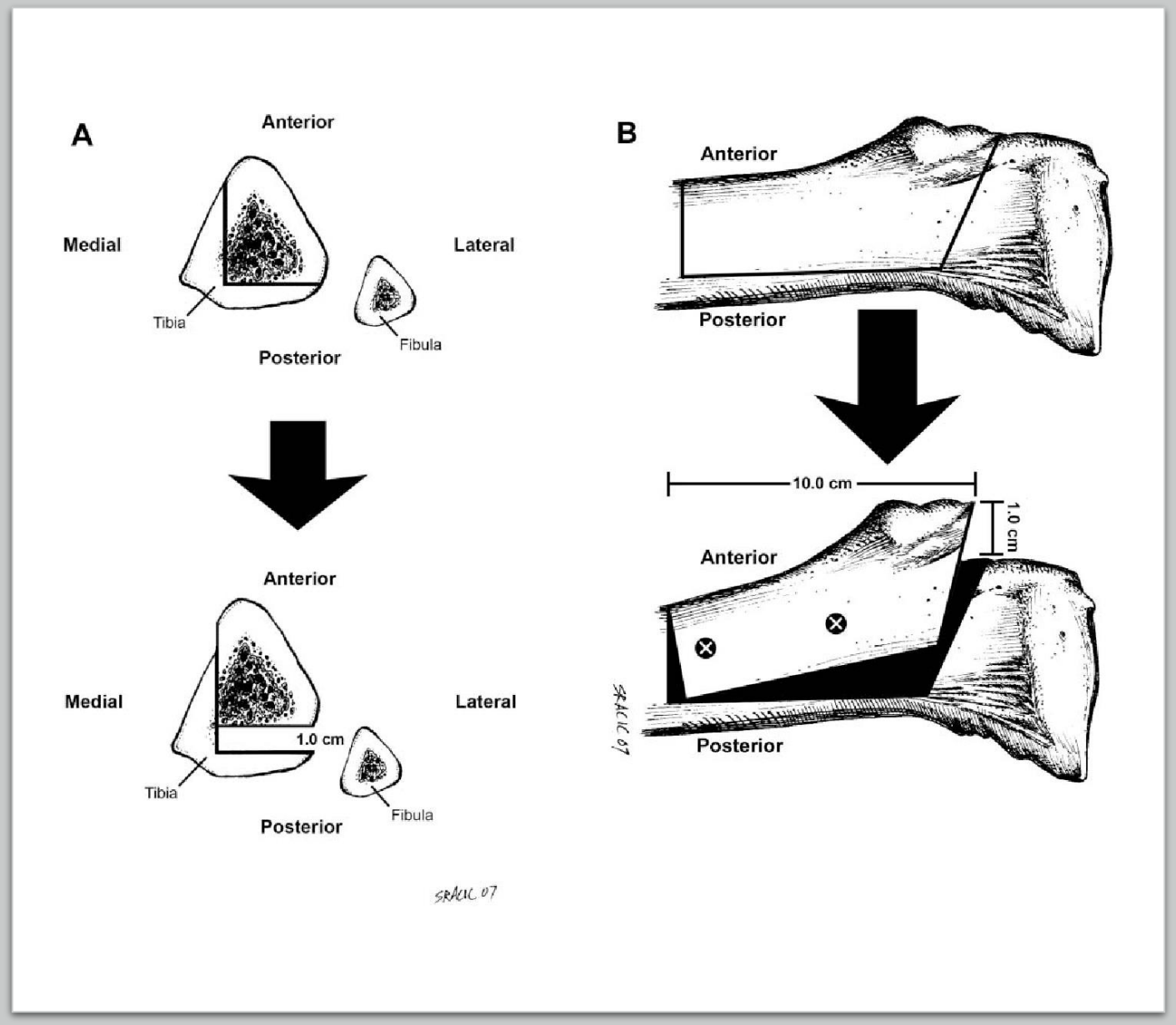
❖We aim for distally tappred 7-10 cm pedicale

- Fixation : We use lag screws with interfragmentary compression – Usually 2-3 screws



Tibial Tuberosity Anteriorization

- Maquet Technique- Requires structural bone graft to support the tuberosity- high complication rate
- Fulkerson : Based the AMZ osteotomy . More posterior and vertical cut will allow anteriorization without the need of bone graft



TTT- Post-operative rehabilitation

- Non weight bearing with hinged knee brace locked in extension
- Early Quadriceps exercise
- Gradual weight bearing at 6 weeks
- Gradual increase of ROM after swelling and pain allows

Is there a golden option?

MPFL is the main stabilizer for lateral translation, and it is injured in almost all lateral patellar dislocations-Duthon Et al.

Recurrent after conservative treatment with MPFL injury is up to 44 %

PFJ Dislocation after MPFL reconstruction alone is very low - <5%

Succes rate after MPFL and TTT - 96% -Ebied AM

There is no gold standard treatment and treatment should be tailored for each patient.

THANK YOU