Common Orthopedic Conditions of the Knee (Part 2) Extensor Mechanism Injuries

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Disclosures

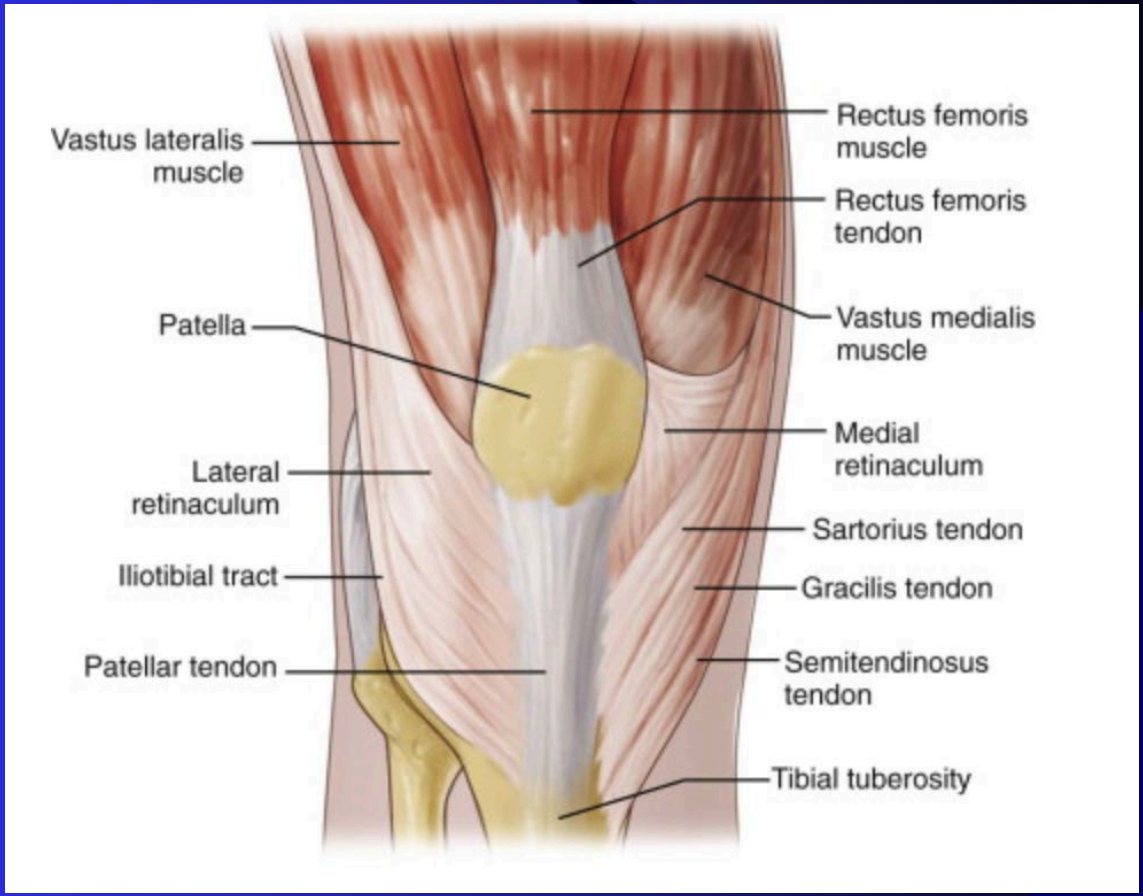
- I have no relevant commercial relationships to disclose

Learning Objectives

- Understand the diagnosis and treatment of common extensor mechanism injuries of the knee

The Extensor Mechanism

- Quadriceps Tendon
- Patella
- Patellar Tendon
- Tibial Tubercle



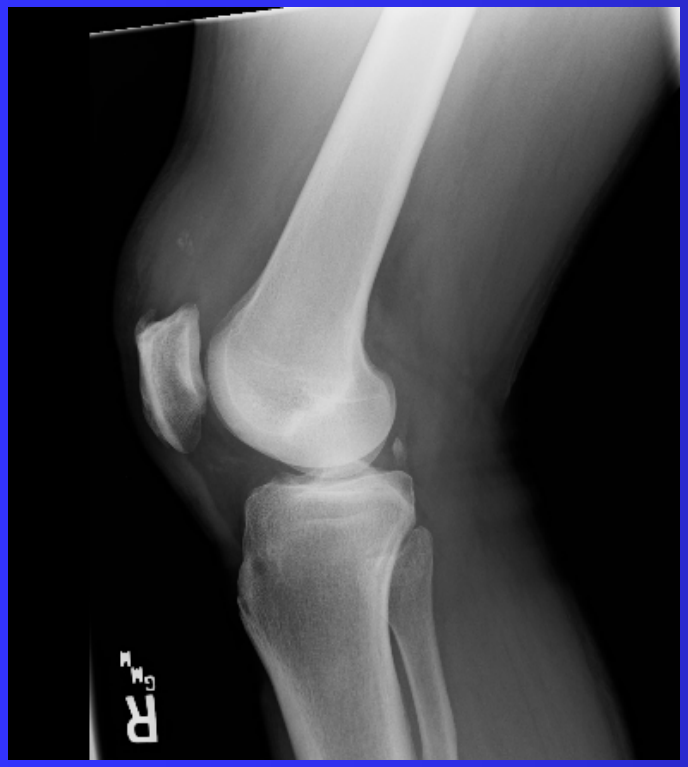
Case 1

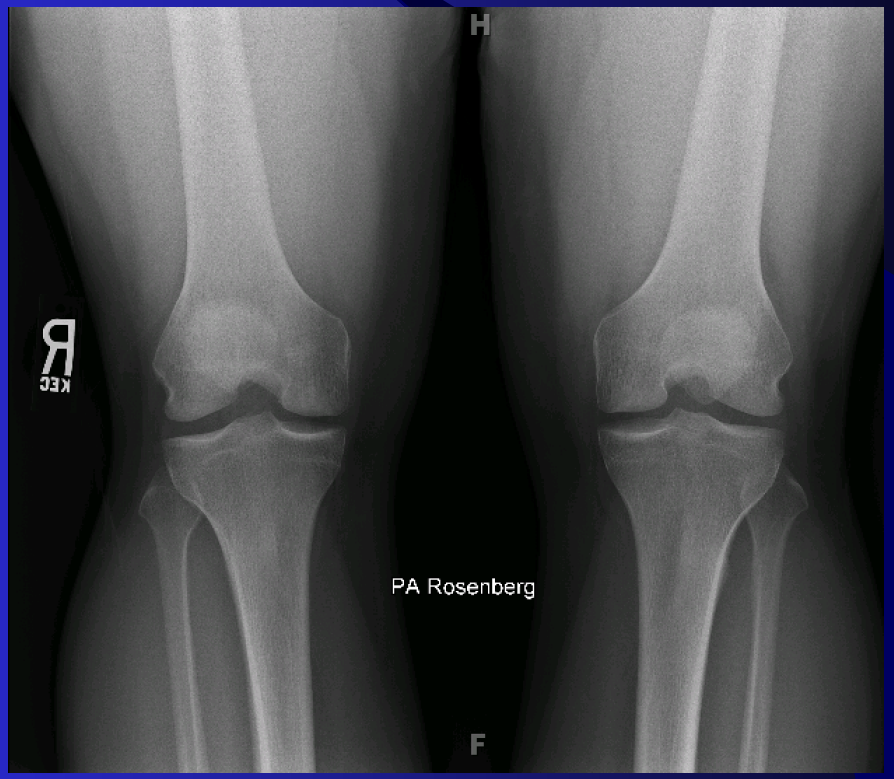
- 54 year old male with a knee injury after falling down stairs
- Pain and swelling
- Remembers feeling a pop
- Difficulty bearing weight

Physical Examination

- Effusion left knee
- Unable to actively extend the knee
- Stable to varus/valgus stress
- Negative Lachman, posterior drawer
- No joint line pain

Radiographs





Diagnosis

- Quadriceps Tendon Rupture

Patellar/Quad Tendon Tear

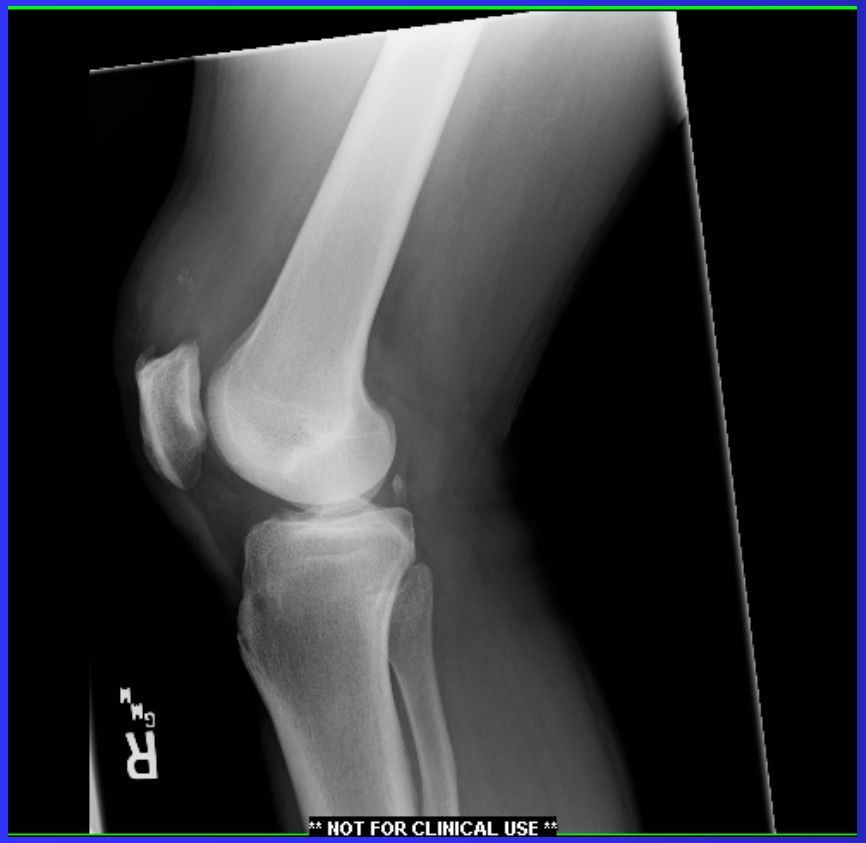
- Most common after an eccentric quad load
  - Landing from jumping
  - Fall down stairs
- Patellar tendon tears more common with sports (20-40 year olds)
  - Also associated with chronic diseases
- Quad tendon tears more common in older patients (> 40 years)

Presentation

- Acute onset of pain and soft tissue swelling after a fall or acute eccentric knee flexion
- Large effusions
- Palpable defect
- Inability to actively extend the knee
- Unable to perform a straight leg raise or has a lag with a straight leg raise
  - A lag indicates a partial tear

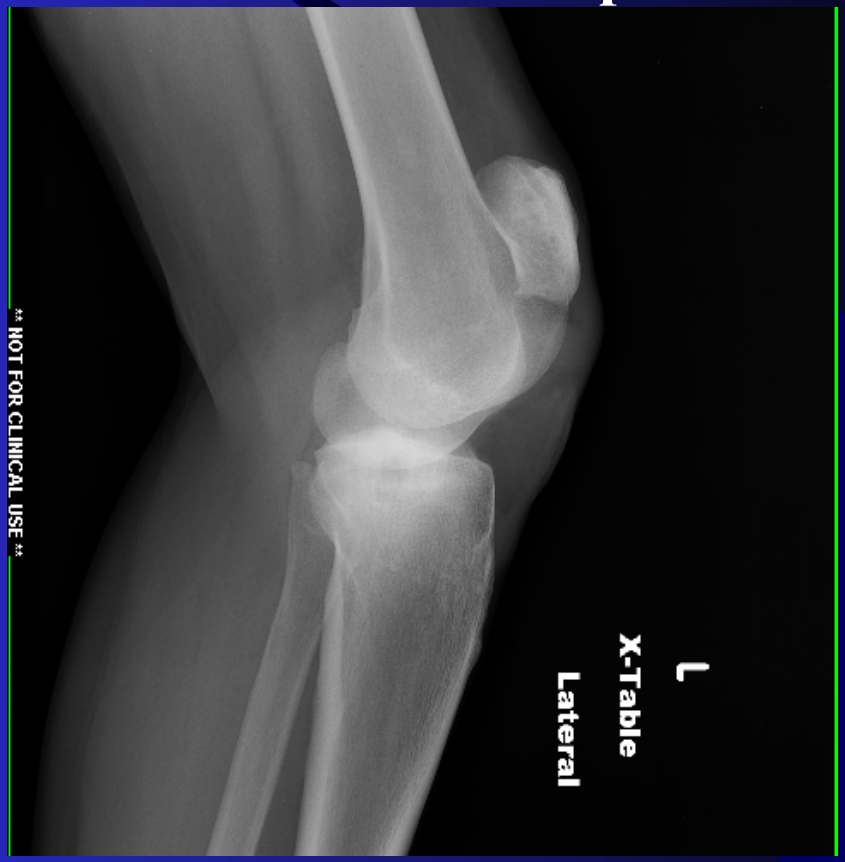
Patellar/Quad Tendon Tear

Quad tendon rupture



Patellar baja

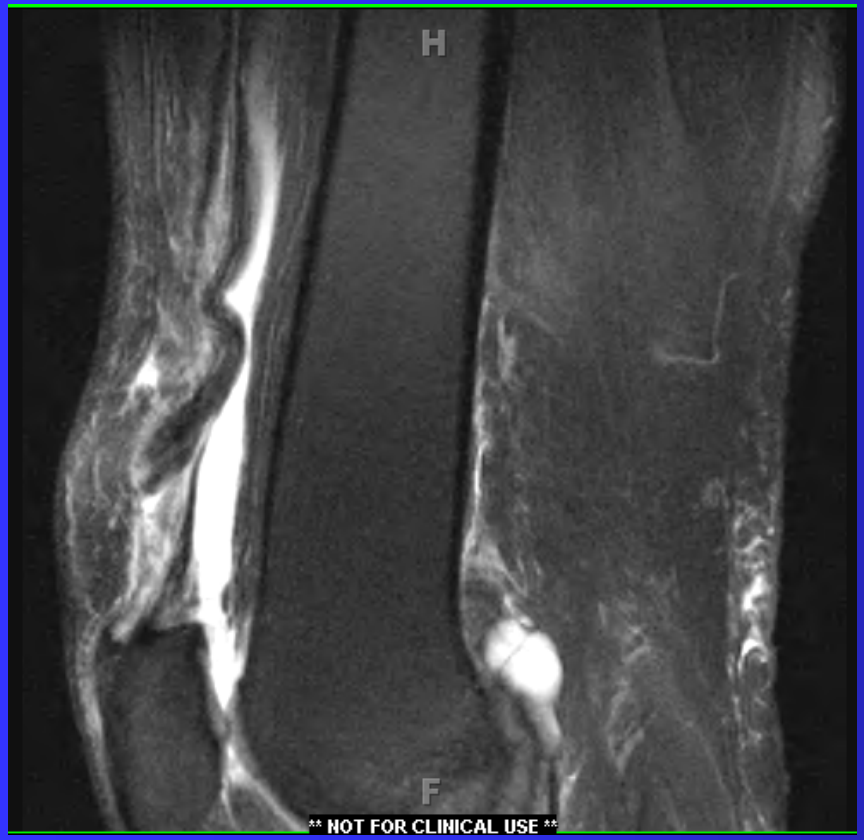
Patellar tendon rupture



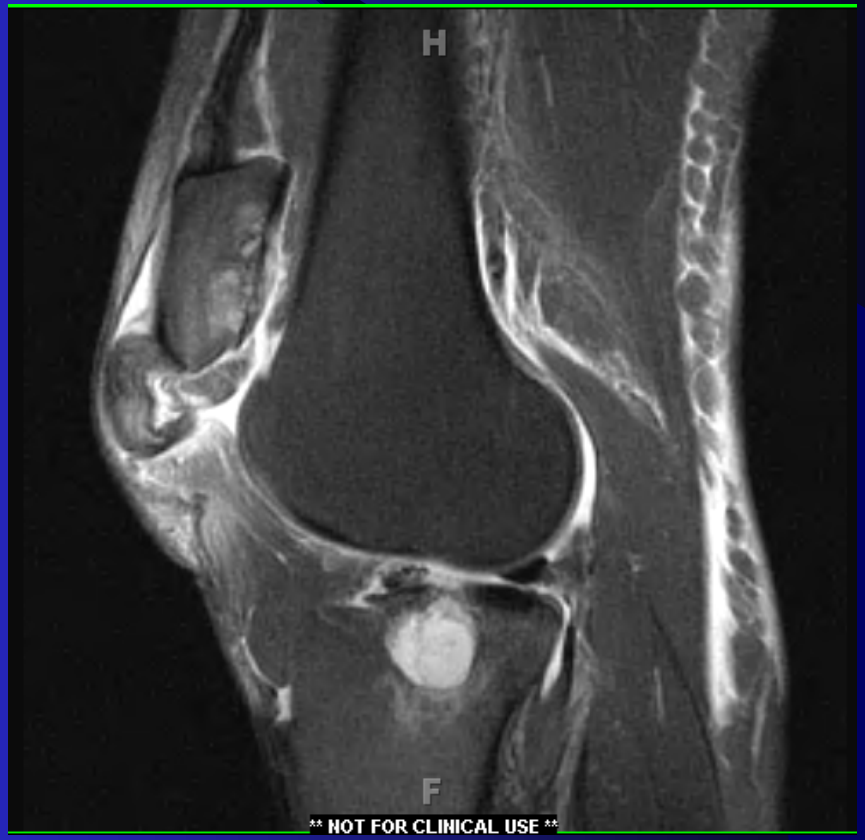
Patellar alta

Patellar/Quad Tendon Tears

Quad Tendon Rupture

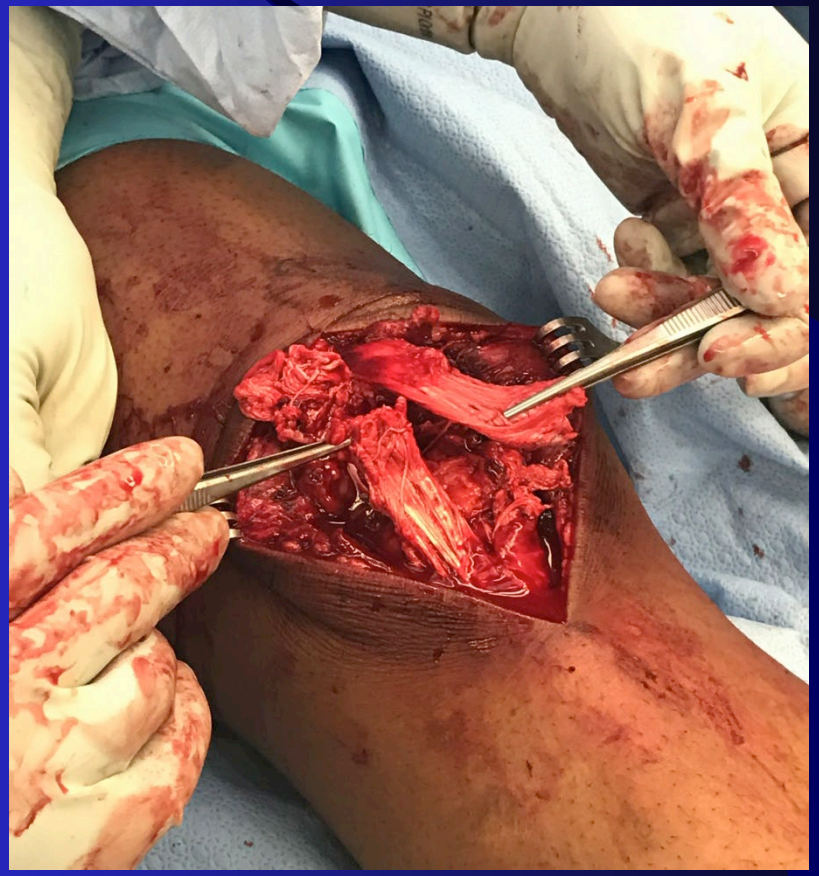


Patellar tendon rupture

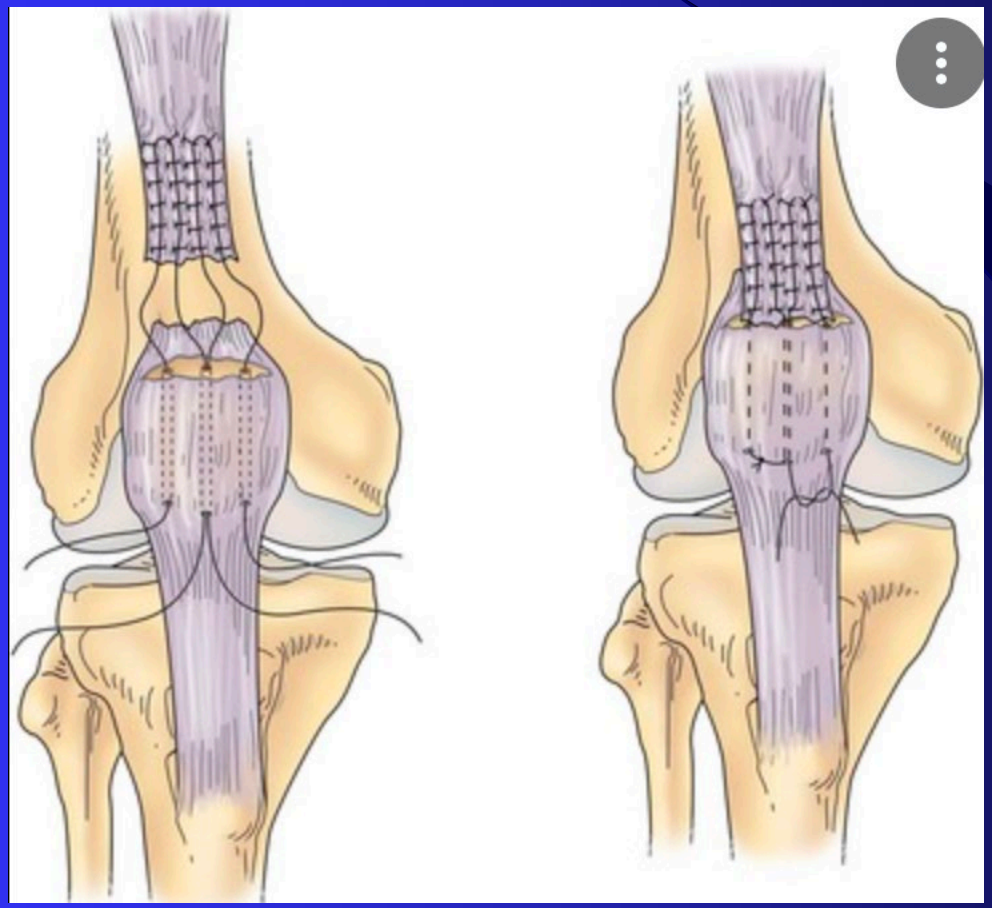


Patellar/Quad Tendon Tear

- Treatment
  - Acute repair is indicated
    - Easier within 2 weeks
  - Subacute and chronic cases may require allograft augmentation and tendon advancement

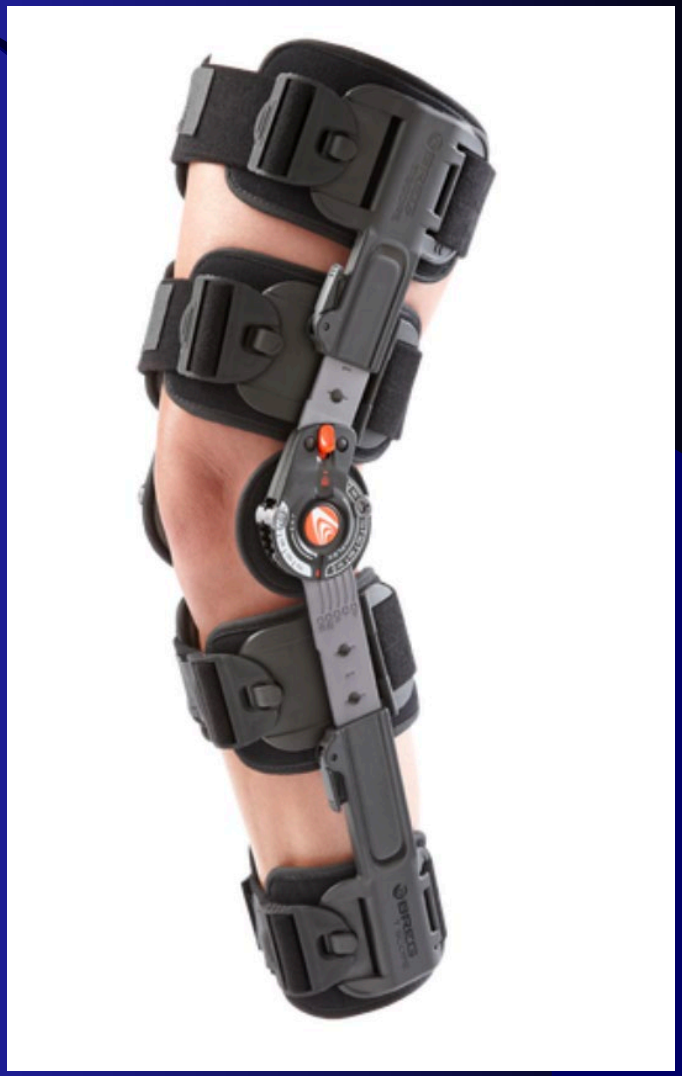


Repair



Patellar/Quad Tendon Tear

- Rehabilitation
  - WBAT with brace locked in extension
  - Early but controlled progressive ROM
  - DC brace approx. 10 weeks
  - Full recovery may take 9-12 months



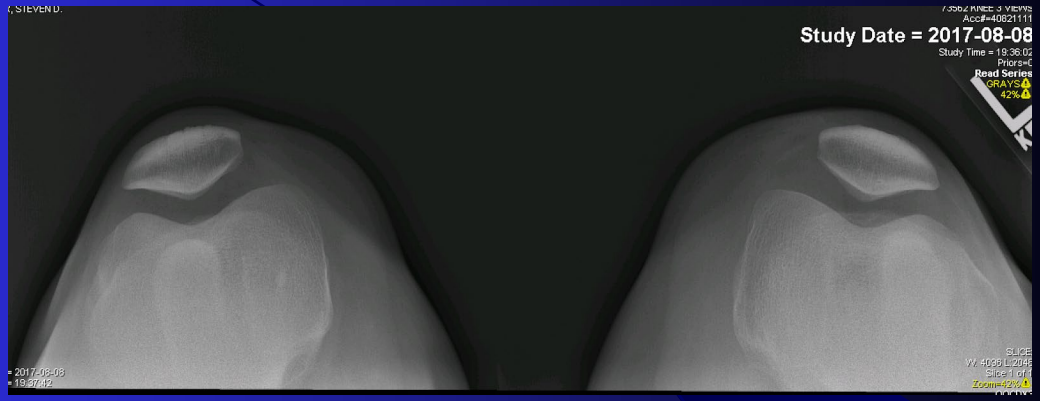
Case 2

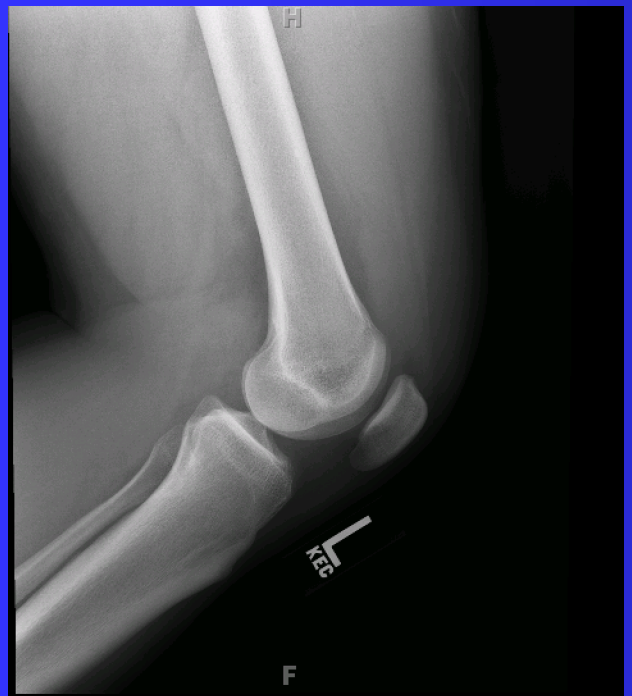
- 16 year old female with bilateral knee pain
- No injury
- Recently started running in track
- Worse with stairs, running and jumping
- Denies swelling, instability or mechanical symptoms

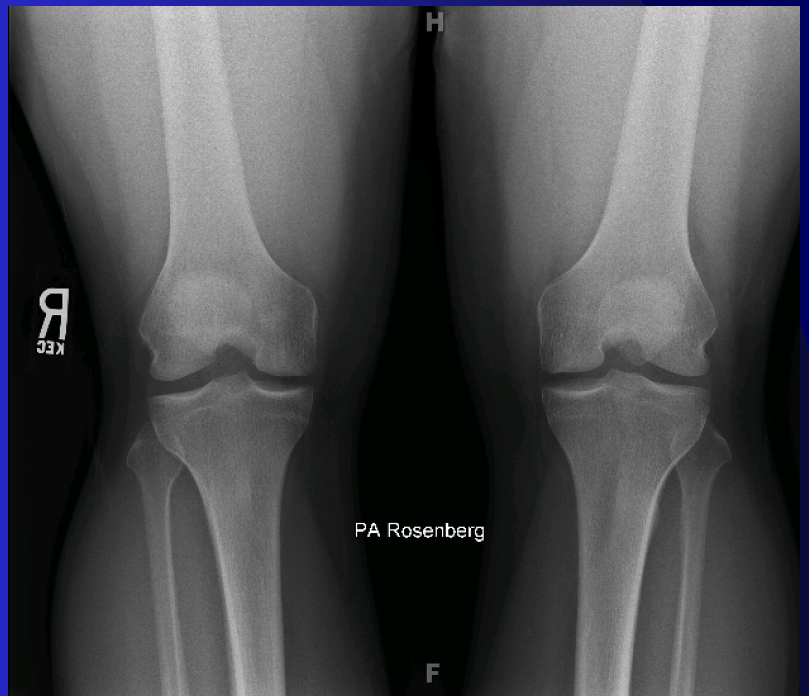
Physical Examination

- No swelling
- Full motion 0-140 degrees bilaterally
- Stable to varus and valgus stress
- Negative Lachman and posterior drawer
- No joint line tenderness
- Negative patellar apprehension
- 4/5 strength with resisted hip abduction
- Tight hamstrings

Radiographs







Diagnosis

- Anterior Knee pain/Patellofemoral syndrome

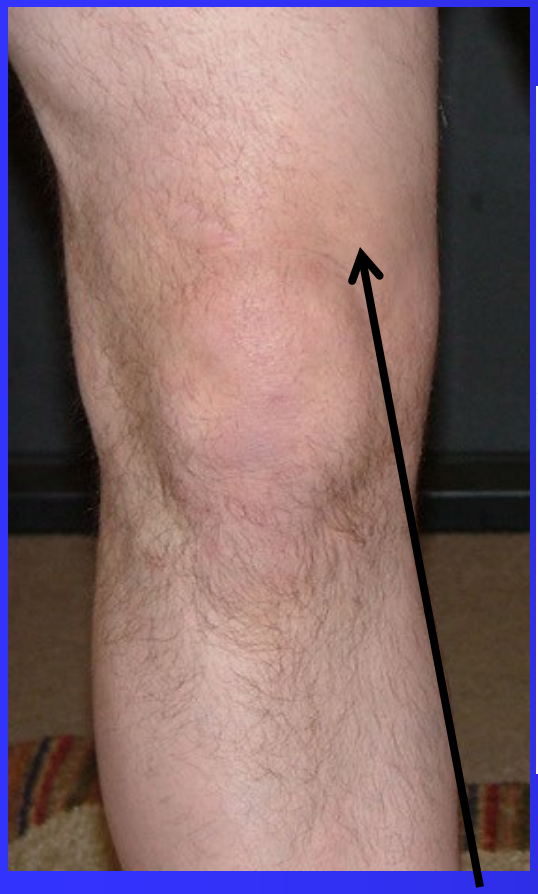
Patellofemoral Pain

- Most common condition seen in Sports Medicine Centers
  - 11% of all musculoskeletal complaints
  - 16 – 25% of running injuries
- Over twice as common in females compared to males

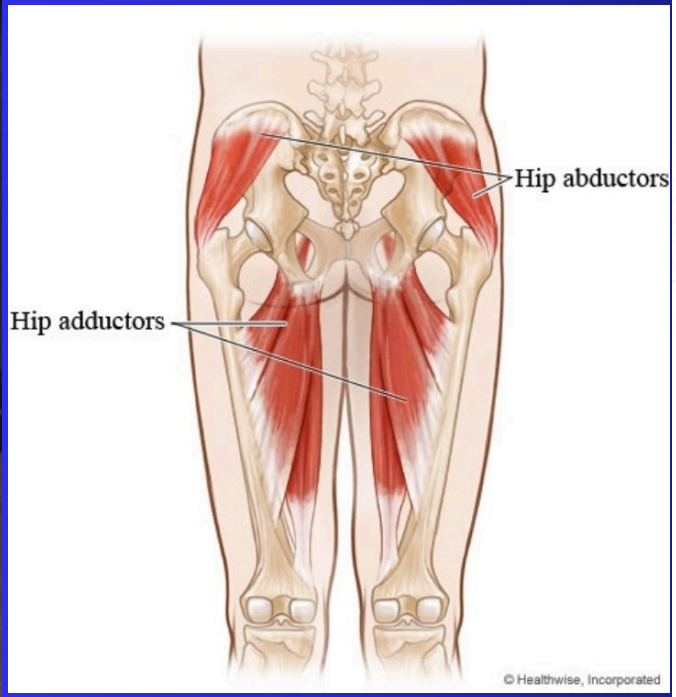
Presentation

- Significant anterior knee pain with:
  - Stairs
  - Prolonged bent knee activities
  - Jogging
  - Getting out of a car
- Often no discrete injury
- Pain often diffuse and around or underneath the patella
- Often related to overload on the lateral patellar facet

Physical Findings

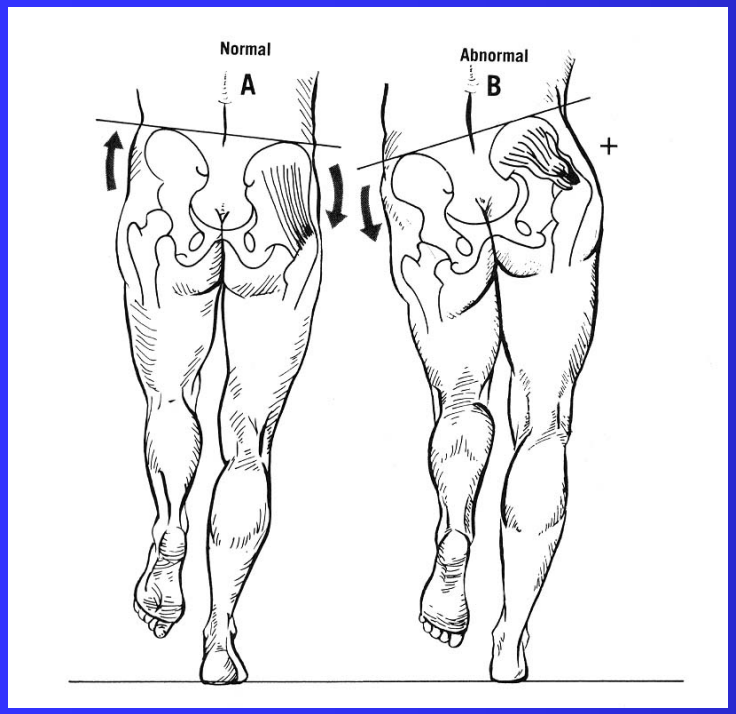


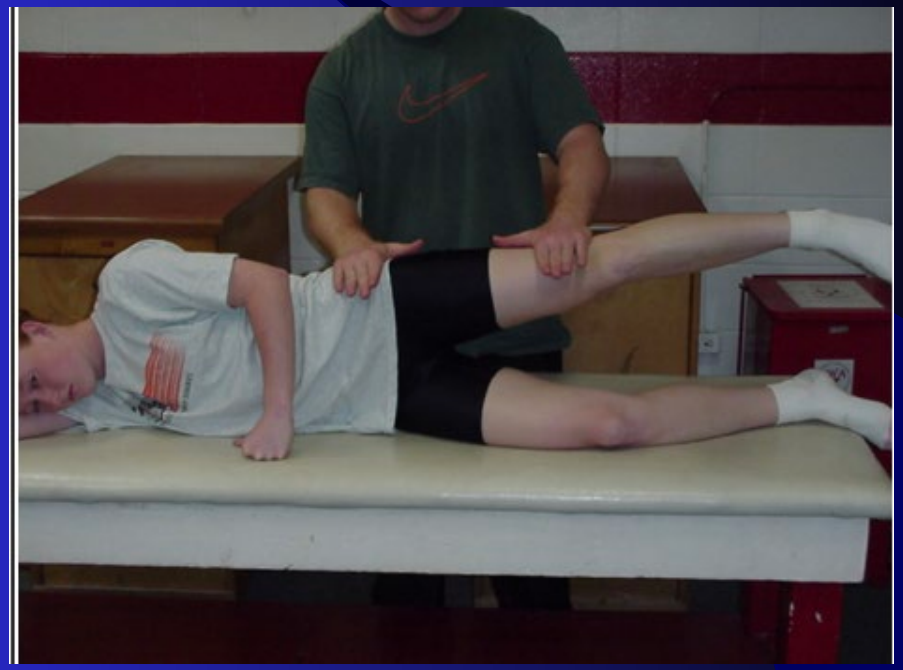
Weak/Small VMO



Tight hamstrings

Physical Findings

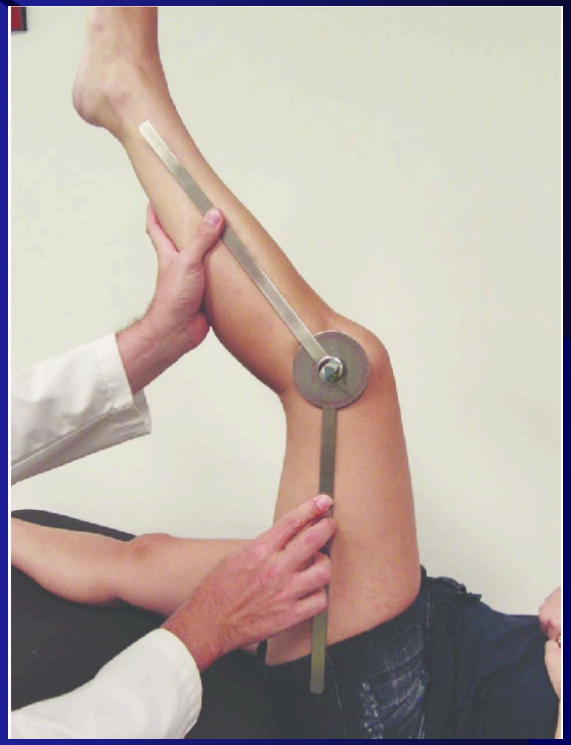




WEAK Hip Abductors

Physical Exam Findings

Side lying hip abduction



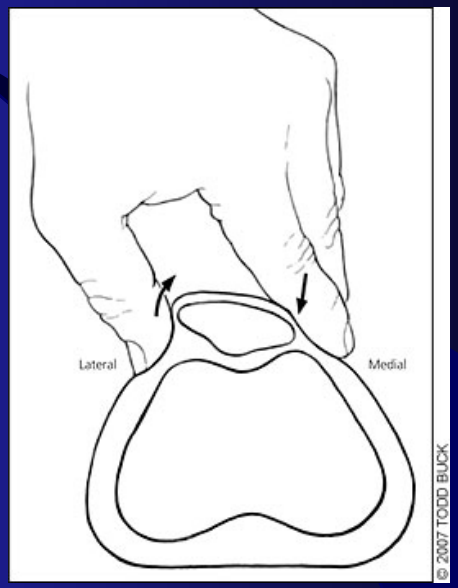
Popliteal angle measurement

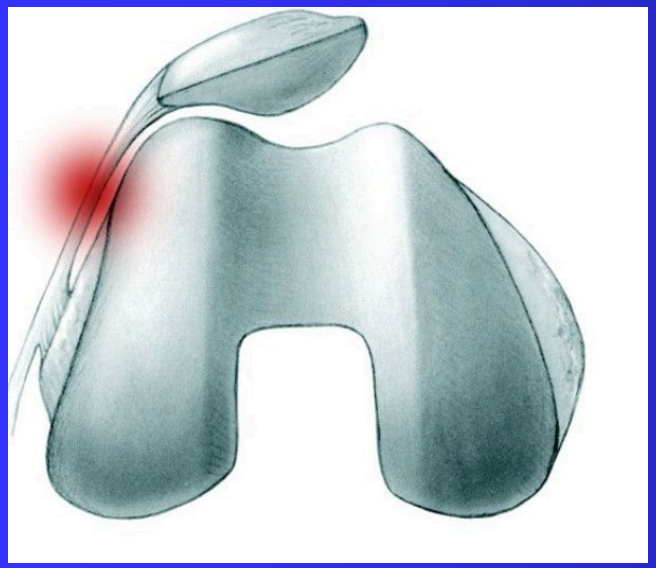
Treatment

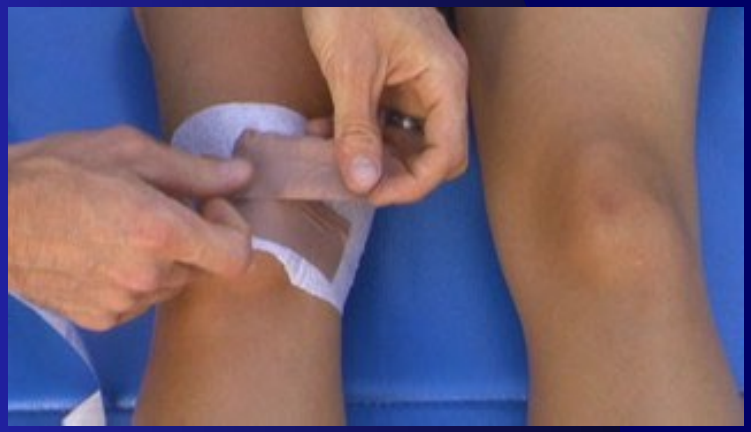
- ***Activity modification!***
  - ***Keep knee from 0-30º of flexion***
- Quadriceps strengthening (focus on VMO), hip abductor and core strengthening
- Avoid open chain quad!!!
- Hamstring stretching

Patellofemoral Treatment

- Stretching of the tight lateral retinaculum
- Patellofemoral taping







Treatment

- Weight control/loss critical!

- Forces between the patella and femur
  - 3x body weight with stairs
    - Lose 5 pounds = 15 pounds off the patella/femur
  - 7x body weight with deep knee bends
    - Loss 5 pounds = 35 pounds off the patella/femur

Case 3

- 17 year old basketball player with left knee pain
- No injury
- Pain in the front of the knee
- Worse with jumping and running
- Denies swelling, instability or mechanical symptoms

Physical Examination

- No effusion
- Normal range of motion 0-140 degrees
- Stable on exam (varus/valgus & ant/post drawer)
- No joint line tenderness
- Tenderness over the patellar tendon
- Hamstring tightness
- Weak Glute strength
- Normal radiographs

Diagnosis

- Patellar Tendonitis

Patellar Tendonitis

- Inflammation involving the patellar tendon
- Common in jumping and running sports
- Insertional more common than mid substance
- Similar presentation to anterior knee except these patient have tenderness over the patellar tendon

Treatment: Phase 1

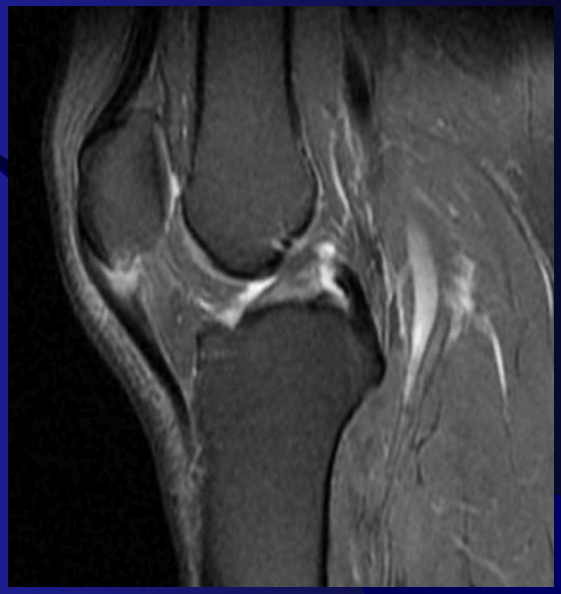
- Majority improvement with nonoperative treatment
- Ice, NSAIDs (oral/topical)
- Physical therapy
  - Quad and glute strengthing, hamstring stretching
  - Modalities (ionophoresis / e stim)
- Bracing (Chopat Strap)

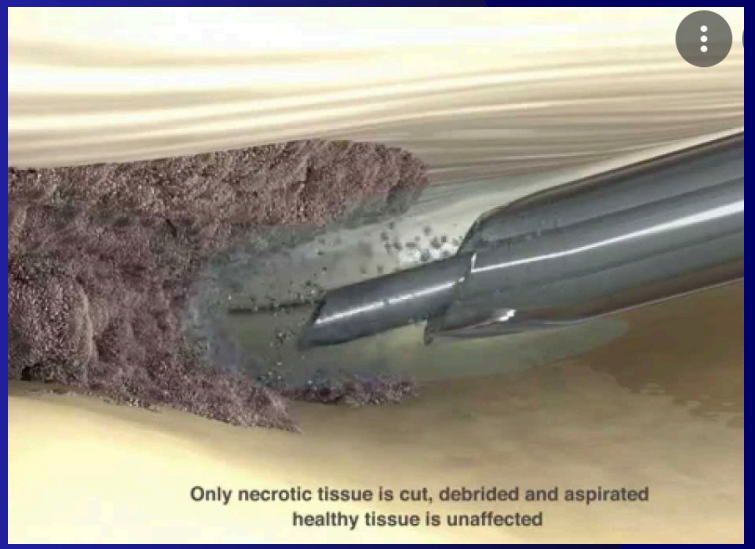
Treatment: Phase 2

- MRI to confirm location of tendinopathy
- Injection with PRP

(AVOID CORTISONE)

- High frequency ultrasound
  - Ultrasound
  - Tenex





Treatment: Phase 3

- Open surgical debridement
- Disease tendon excised (usually central and proximal at the insertion)
- Immobilization 1-2 weeks until quad control returns
- Return to sports 4-5 months

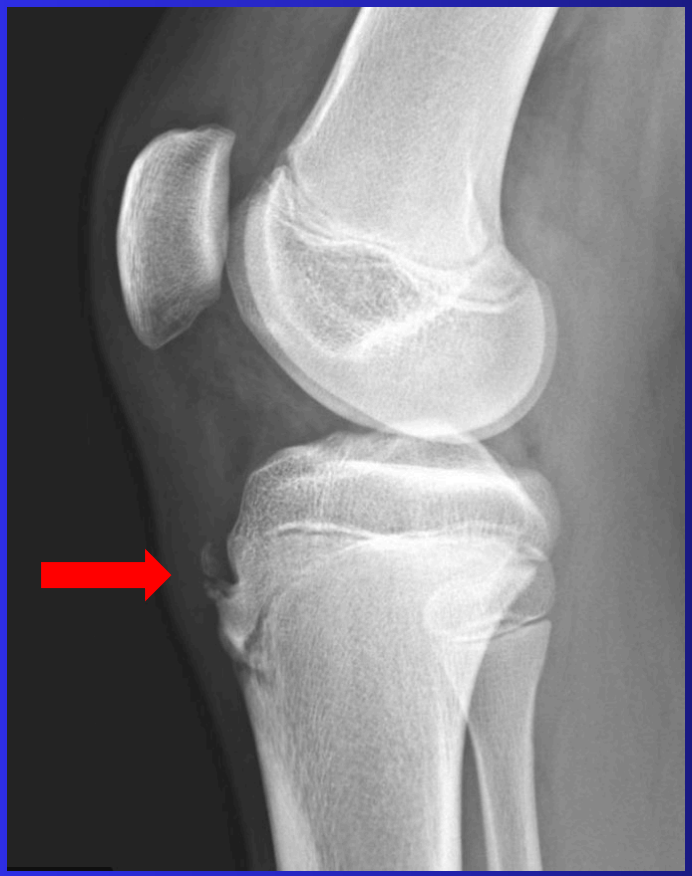
Case 4

- 11 yo male football player with swelling and pain over the front of the knee
- No specific injury
- Worse with running and jumping
- Pain with kneeling
- No instability or mechanical symptoms

Physical Examination

- No swelling
- Full motion 0-140 degrees
- Stable varus/valgus and Ant/post drawer
- No joint line pain
- Neg patellar apprehension
- Tenderness and swelling over the tibial tubercle
- Tight hamstrings

Radiographs



Diagnosis

- Osgood Schlatter Disease

Osgood Schlatter

- Inflammation at the apophysis of the tibial tubercle
- Occurs in active early teens
- Worse with bent knee activities such as running, jumping and climbing stairs
- Overuse injury in which part of the growth plate pulls away from the tibia

Treatment

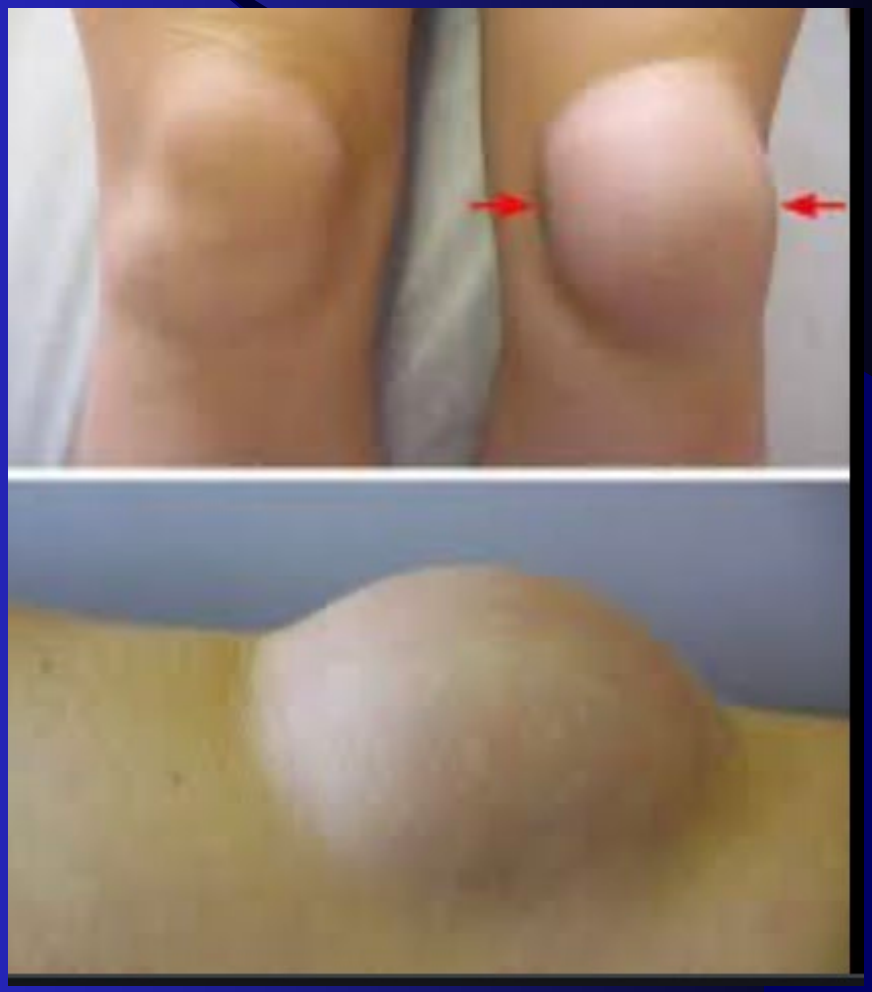
- Rest
- Ice
- NSAIDS
- Avoid kneeling
- Resolves entirely with skeletal maturity

Case 5

- 54 year old carpenter with left knee swelling
- No specific injury
- Does report recent kneeling on a hard surface
- Tightness with bending
- Minimal pain

Physical Examination

- Swelling in the prepatellar bursa but no joint effusion
- Motion –135 degrees
- Ligamentously stable
- No redness, warmth and/or induration
- Normal radiographs

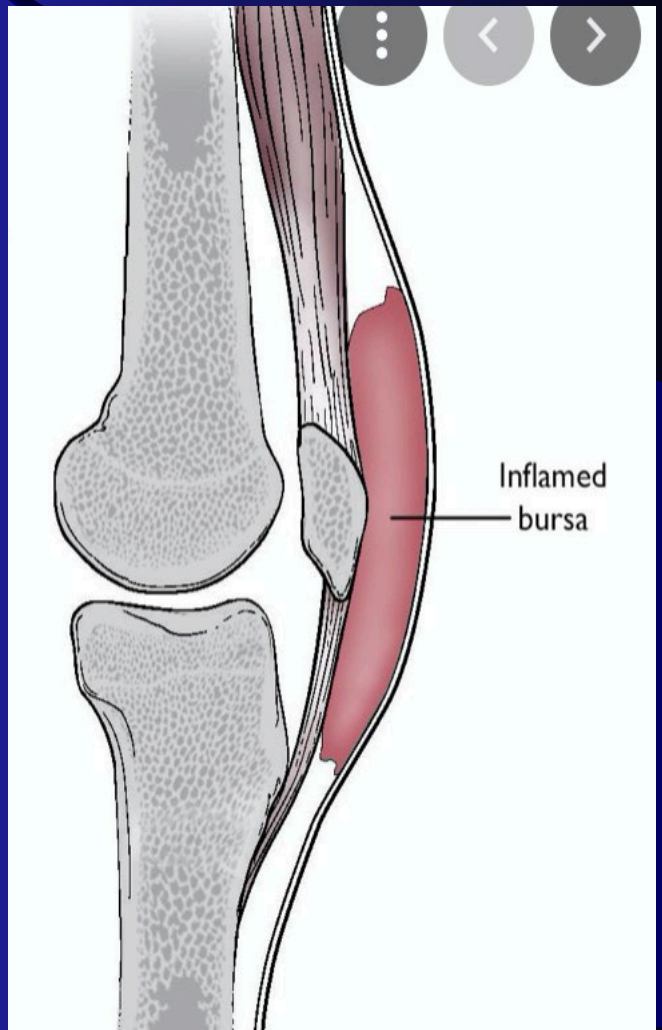


Diagnosis

- Prepatellar Bursitis

Prepatellar Bursitis

- Inflammation in the prepatellar bursa
- Soft tissue plane between the anterior knee patella and capsule and the overlying skin
- Can occur with prolonged kneeling and pressure over the anterior knee



Treatment

- Need to rule out infection
  - Warmth, redness, pain, systemic signs
  - Infected bursitis requires surgical wash out
- In the absence of infection
  - COMPRESSION (continuous)
  - Ice
  - Avoid kneeling
  - Can consider aspiration +/- cortisone injection if compression fails. Does increase risk of infection

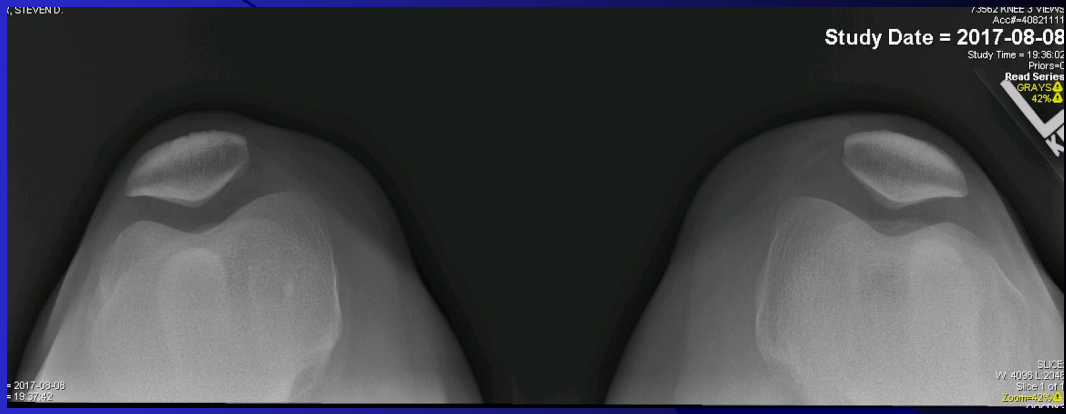
Case 6

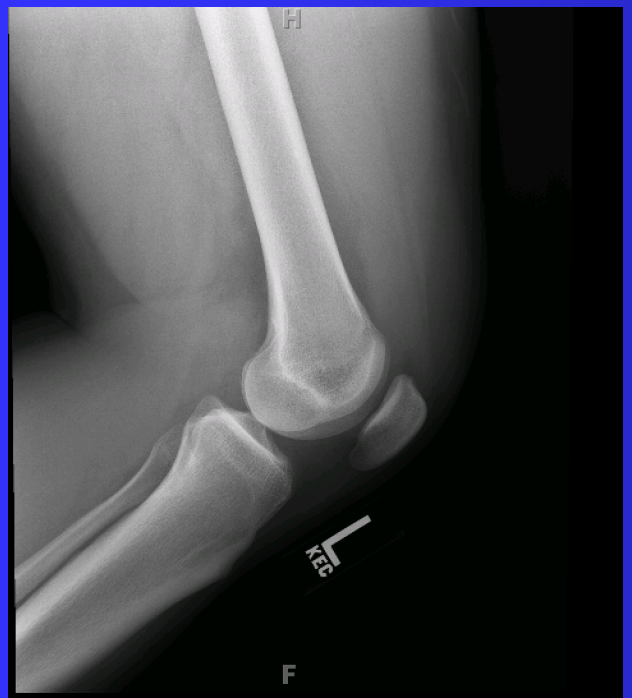
- 16 yo female soft ball player who injured her right knee while batting
  - Felt a pop
  - Immediate pain and swelling
  - Difficulty ambulating
  - No previous history of knee pain

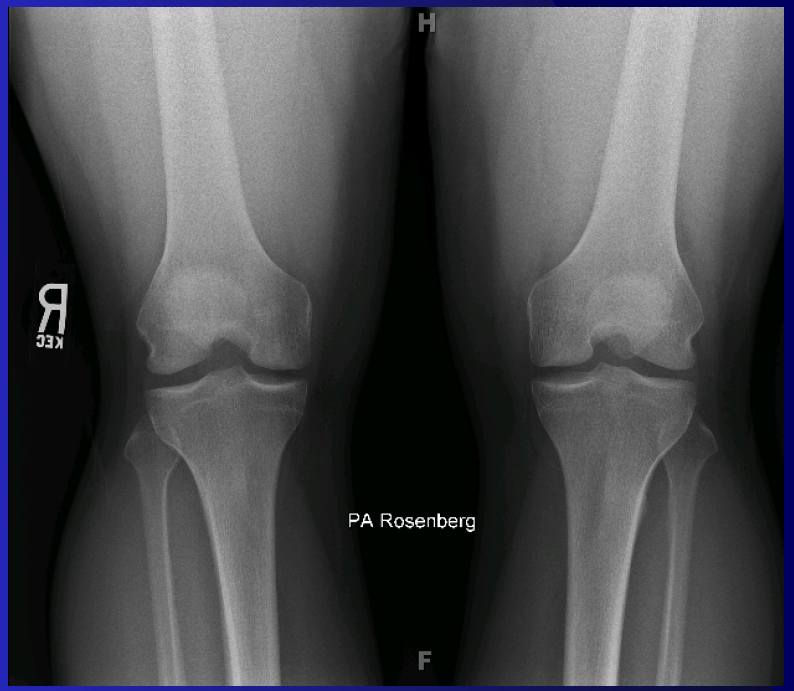
Physical Examination

- Moderate effusion
- ROM 0-90 degrees
- Stable to varus and valgus stress
- 1A Lachman, neg posterior drawer and dial
- No joint line tenderness
- Pain over the medial patellar facet
- NVI

Radiographs







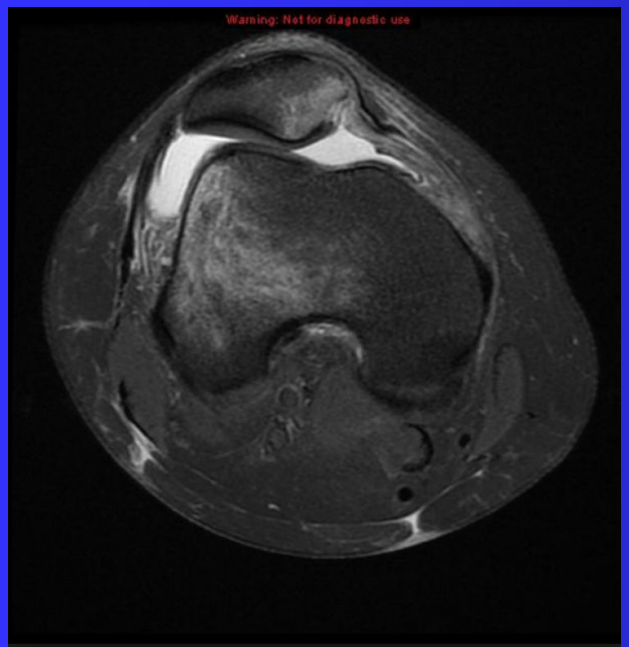
Diagnosis

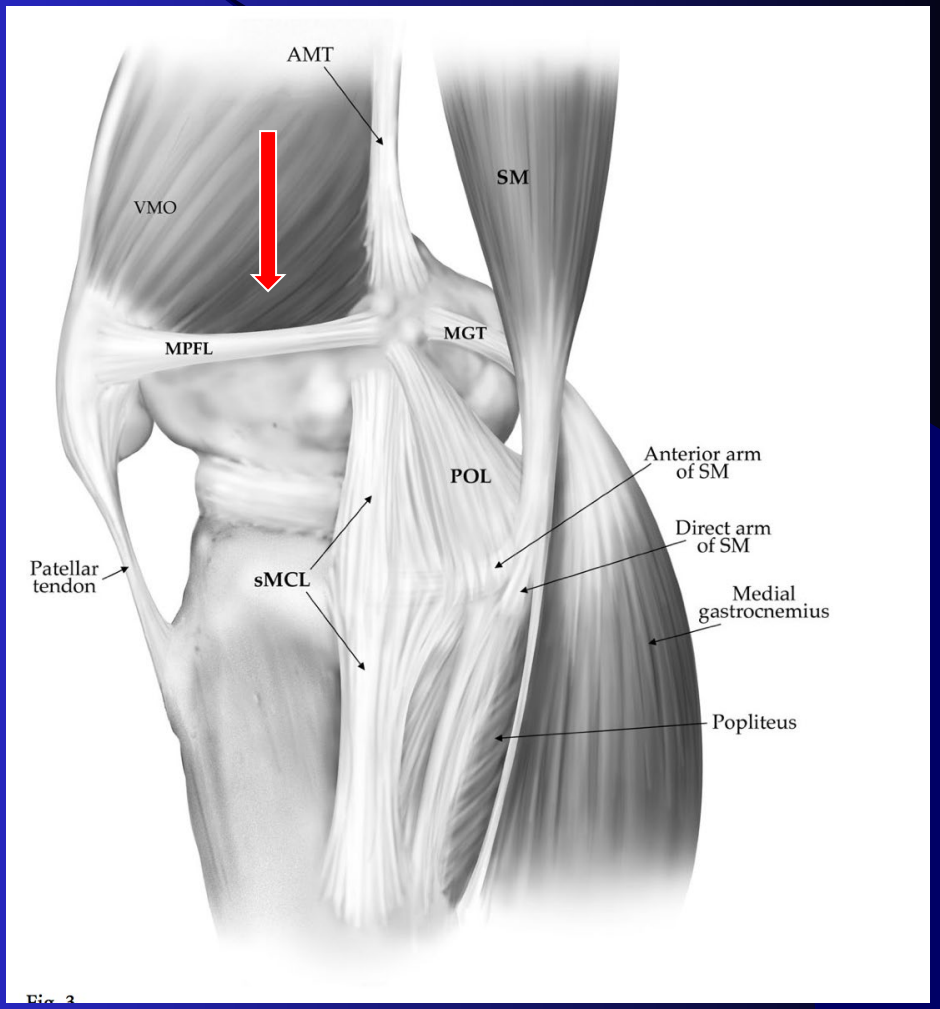
- Patellar Dislocation

Patellar Dislocation

Tearing of the MPFL

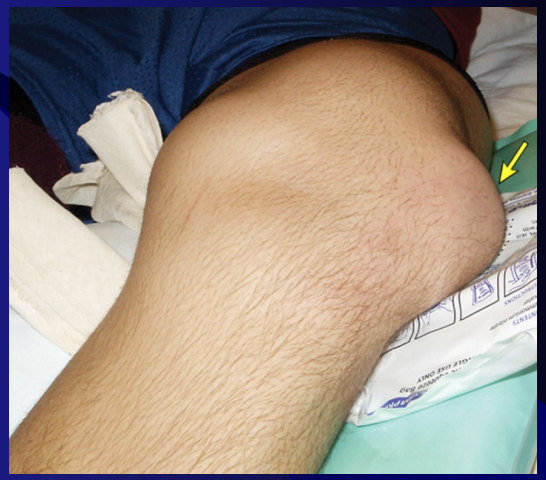
Femoral >>>Patellar

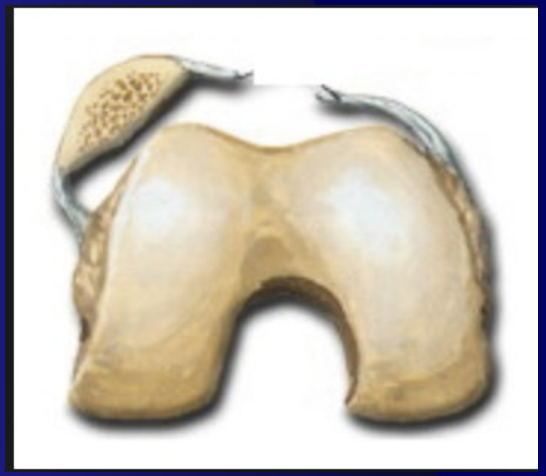




PATELLA DISLOCATION

- Most common in younger patients (<30)
- Cause is multifactorial
  - Trauma (acute)
  - Underlying anatomic variants (chronic)
- Majority of patients (acute dislocators) do well with nonoperative treatment
- Can result in cartilage injury to the medial patella facet and/or lateral trochlea



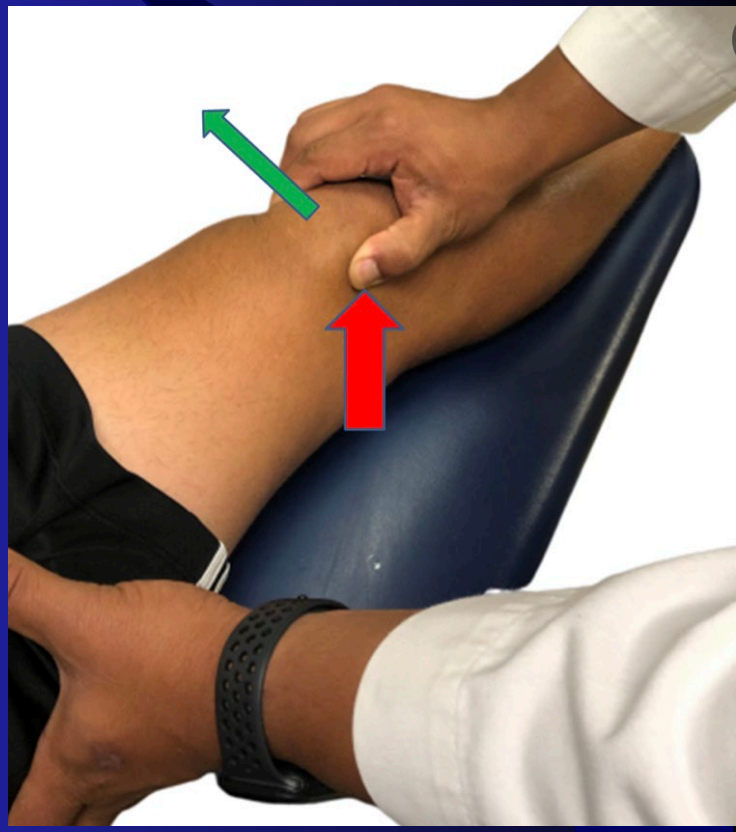


PATELLA DISLOCATION

- Presentation
  - Acute pain and swelling after a pop in the knee
  - Often the knee buckles or shifts
  - Often the patient knows that the patella popped out

Physical Examination

- Knee Effusion
- Limited range of motion
- Tenderness over the MPFL (medial epicondyle +/- medial patellar facet)
- Positive apprehension (more common in chronic setting)



Treatment

- Limited role for operative treatment in first time dislocators in the absence of osteochondral fracture and/or MPFL avulsion

Nonoperative Treatment

- Brief immobilization in extension until quad control returns
- Ice, NSAIDs, compression,+/- aspiration
- Transition to patellar stabilization brace
- Physical therapy emphasizing quad, glute and core
- RTS ~ 6-12 weeks

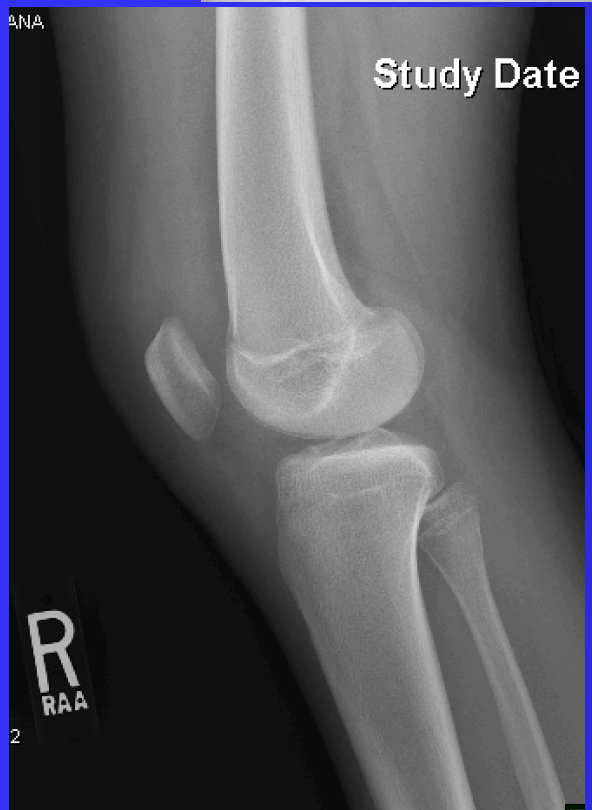
Case 7

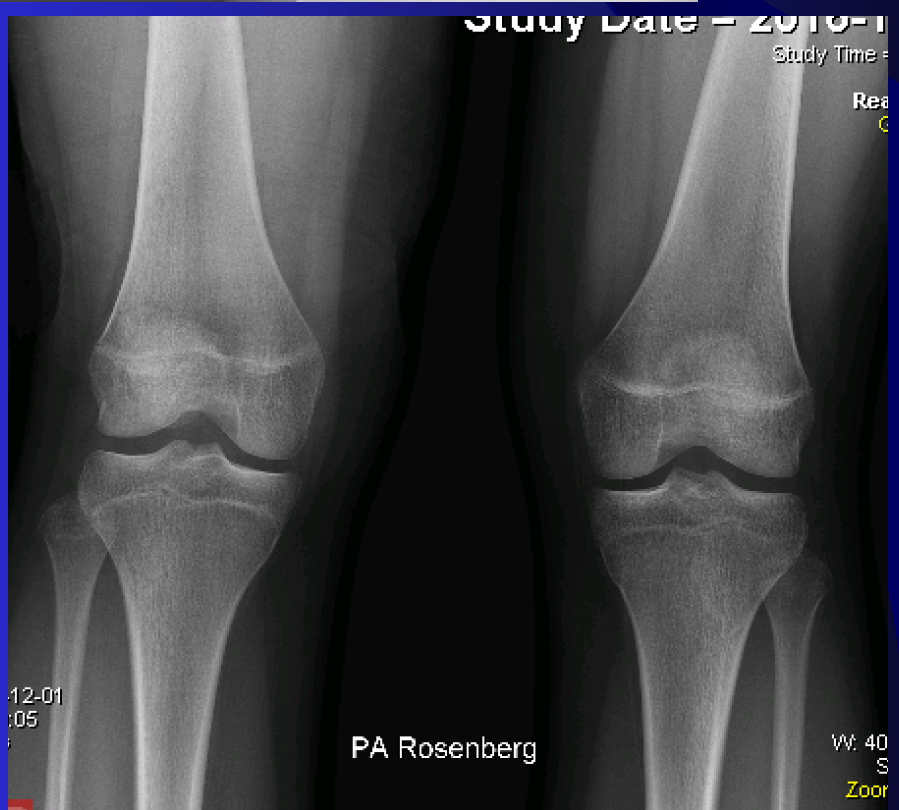
- 14 year old soccer player with knee pain after colliding with an opponent
- Felt a pop
- Difficulty bearing weight
- No previous history of knee pain

Physical Examination

- Moderate effusion
- ROM 0-90 degrees
- Stable to varus and valgus stress
- 1A Lachman, neg posterior drawer and dial
- No joint line tenderness
- Pain over the medial patellar facet
- NVI

Radiographs

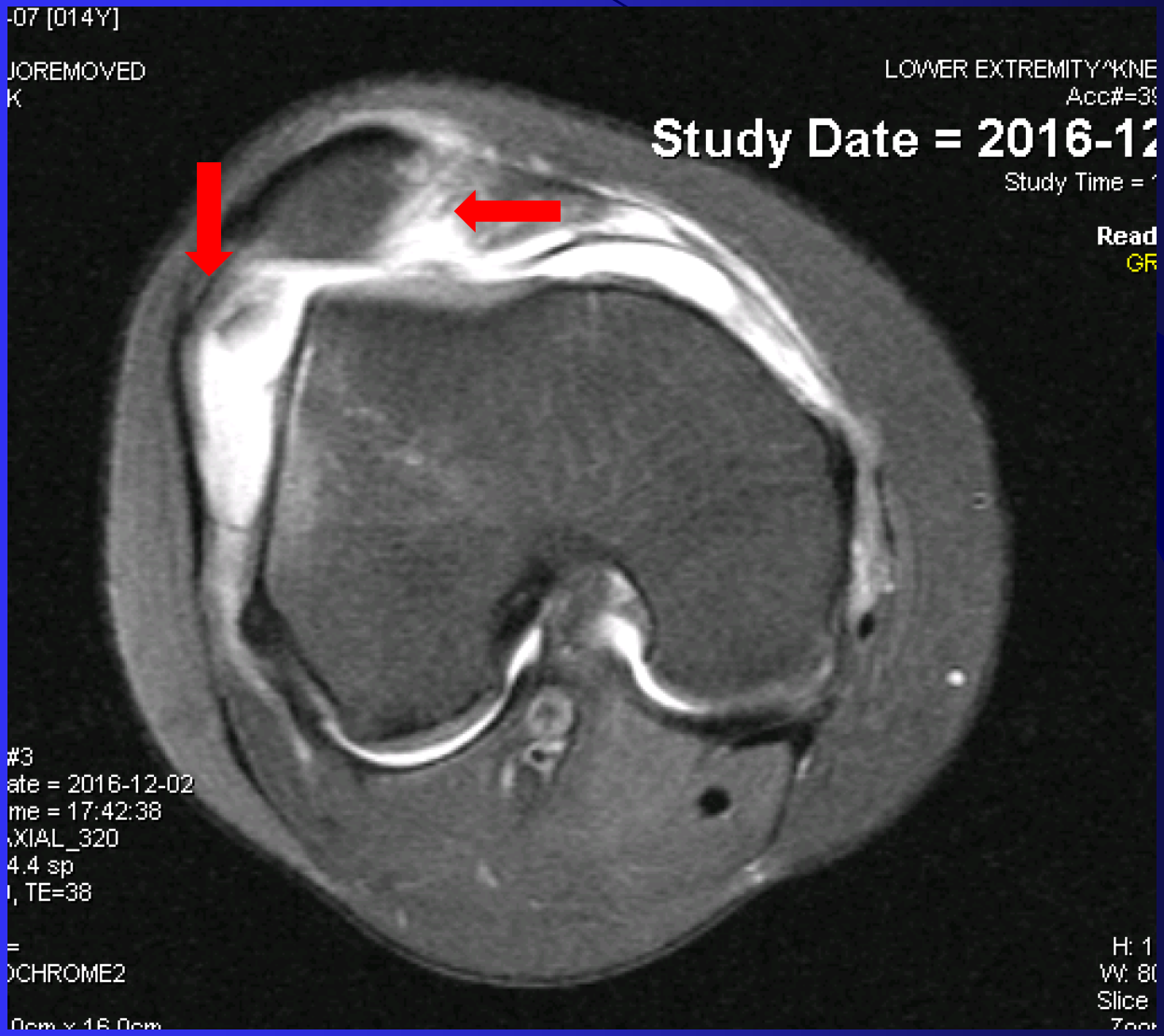




Diagnosis

- Patellar dislocation with loose osteochondral fracture

MRI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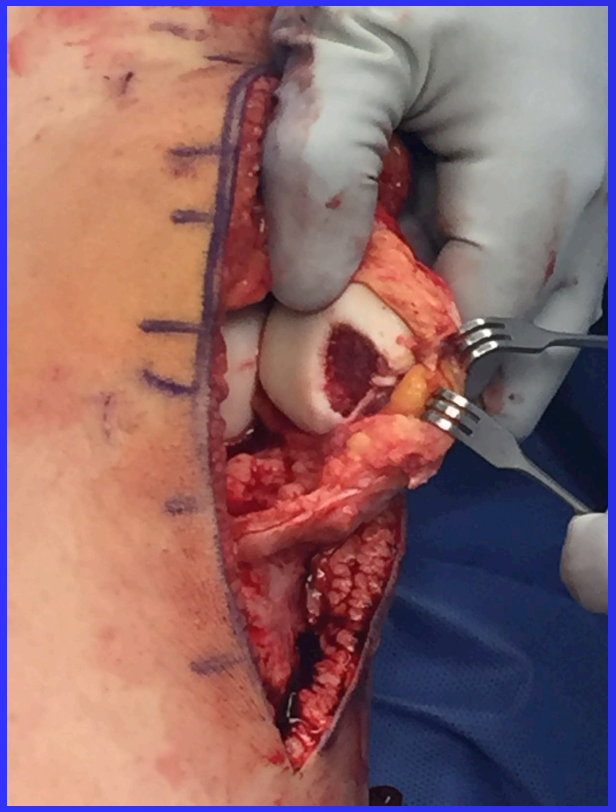
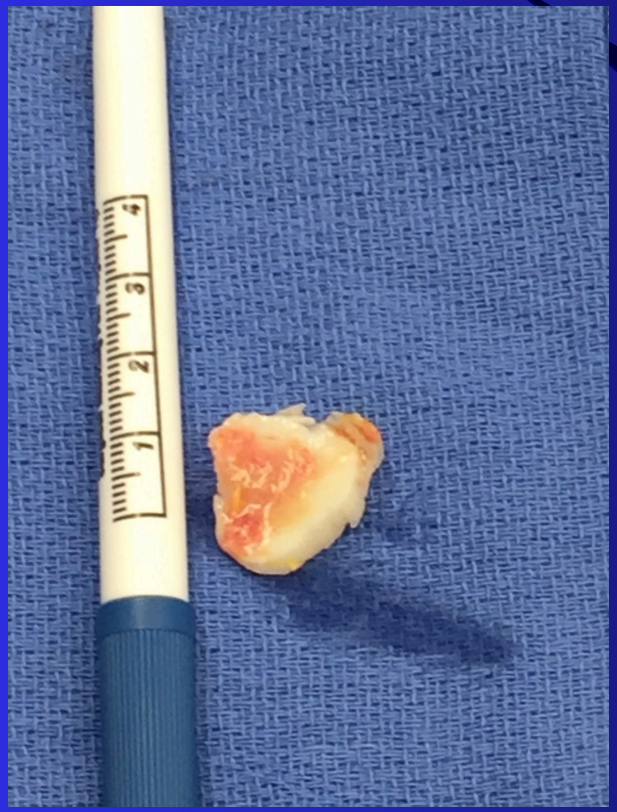
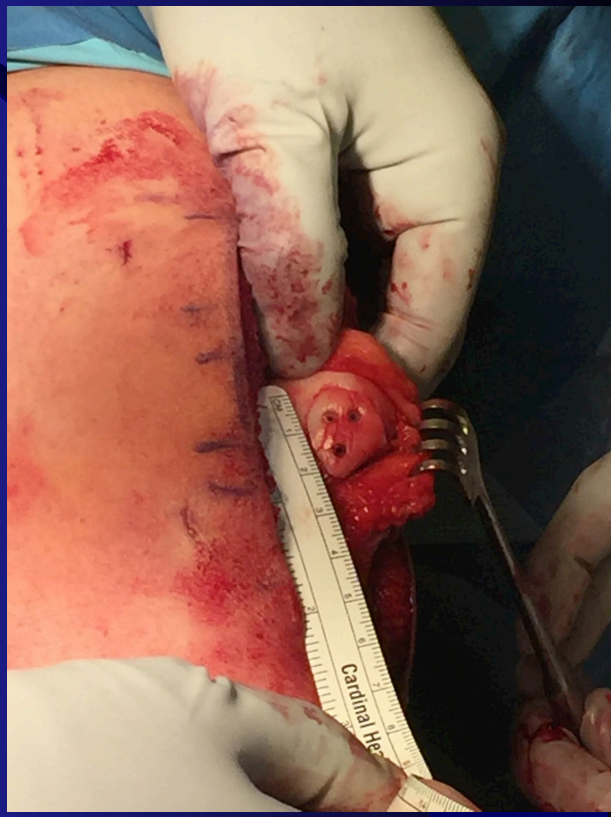
Treatment







Case 8

- 16 year old female cheerleader with recurrent patellar dislocations
  - First dislocation event 10 mo prior while doing a handspring
  - Completed a course of PT and was bracing
  - Two additional events since
  - Most recent event 3 weeks ago climbing out of a ball pit

Physical Examination

- Normal standing alignment
- Minimal swelling
- ROM -5 – 140
- Stable to varus and valgus stress
- 1A lachman, neg ant drawer/ post drawer, neg dial
- Positive patellar apprehension
- 3 quadrants of lateral glide with soft endpoint on the injured side compared to 1 quadrant on the uninjured side
- 45 degrees of internal rotation of the hip at 90 degrees of flexion

Diagnosis

- Recurrent Patellar Instability

Recurrent Patellar Instability

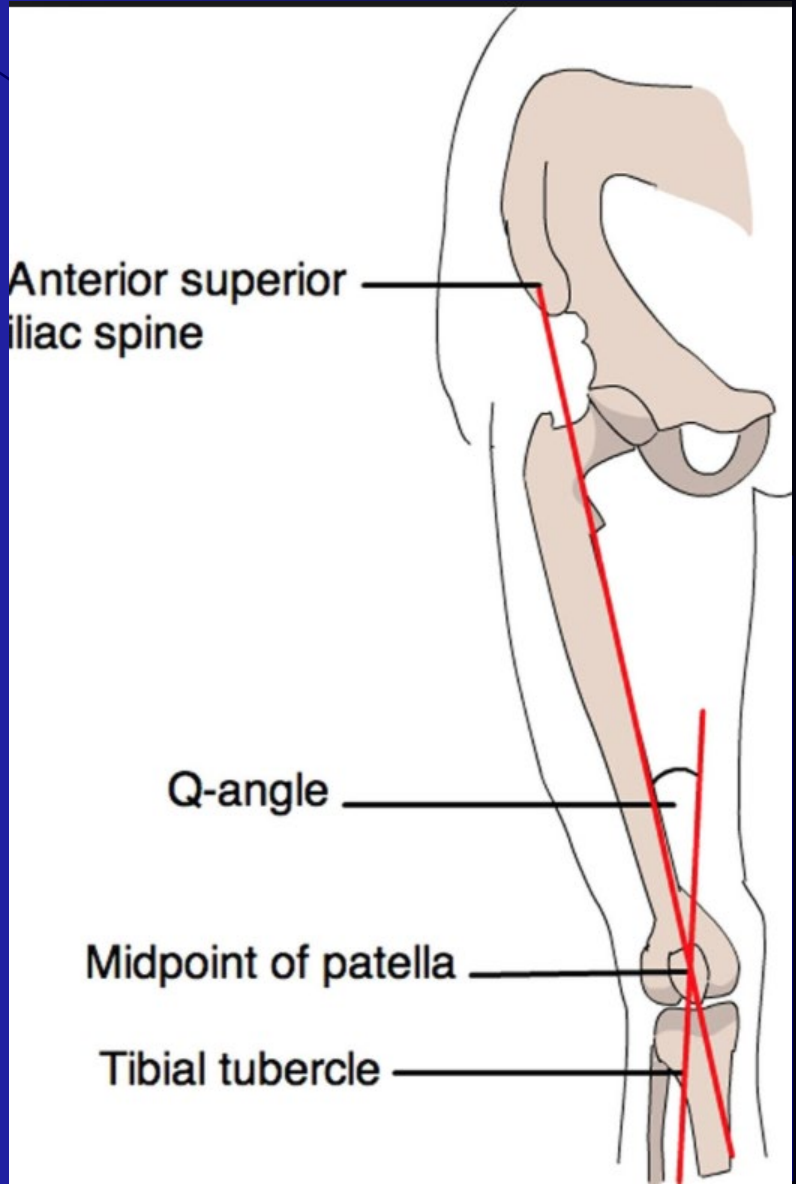
- Report frequent dislocations with minimal trauma
- Females > males
- Ligamentously lax
- Associated structural abnormalities
  - Trochlear dysplasia
  - Patella alta
  - Elevated Tibial tubercle-trochlear groove distance
  - Excessive femoral anteversion
  - Genu valgum

Q angle

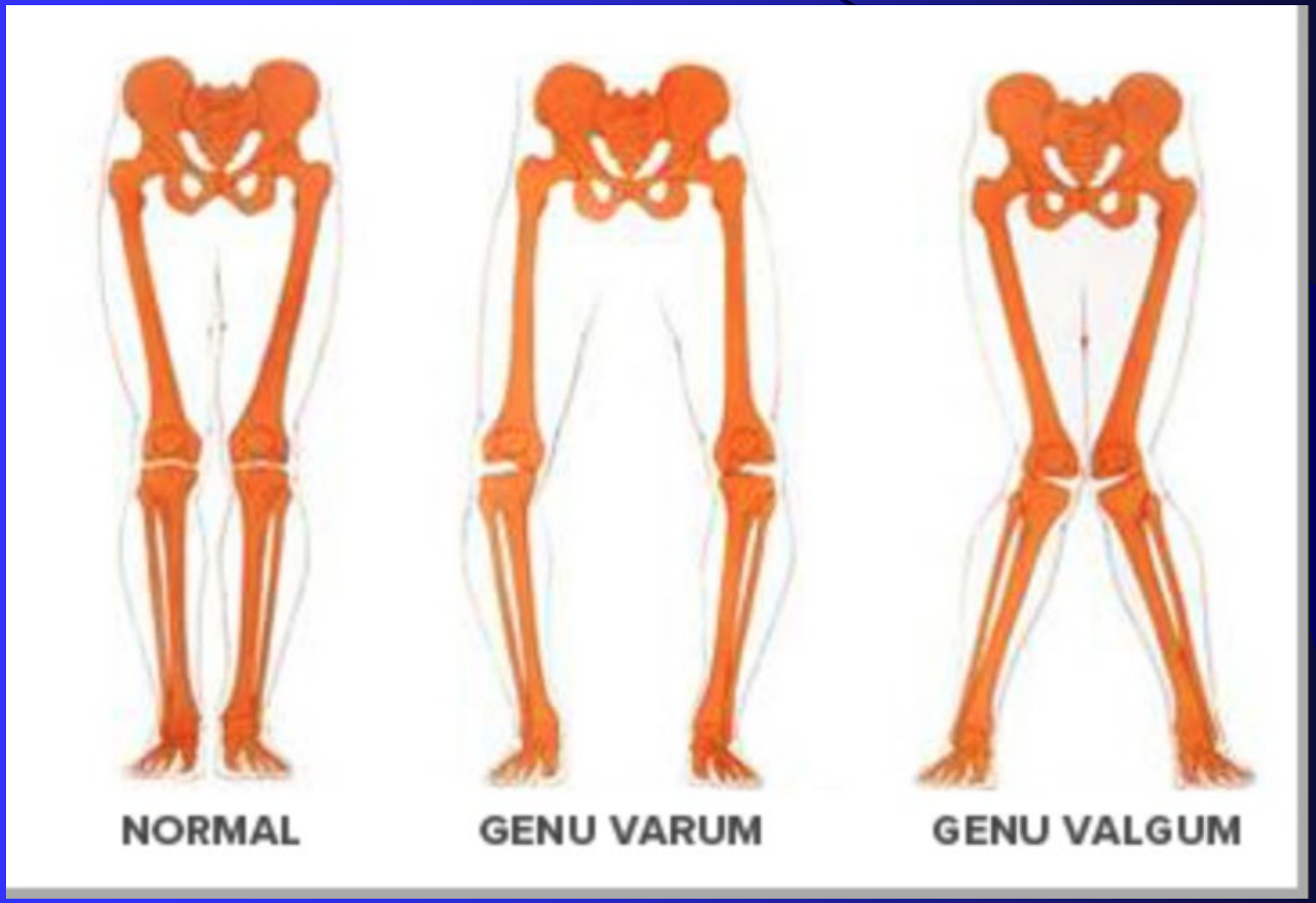
Average Q angles

Males: 14^0
Females: 18^0

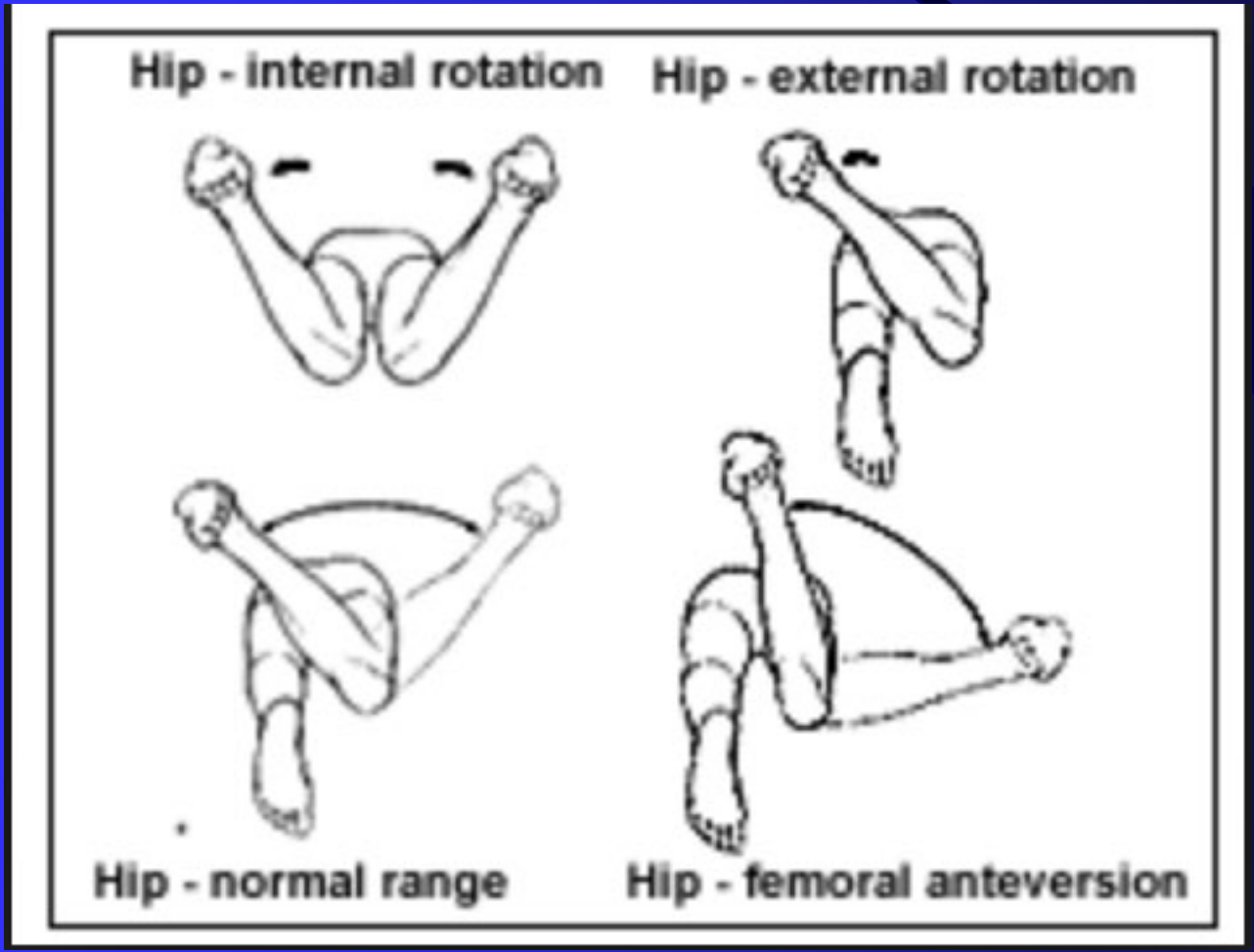
Increased By
- Genu valgum
- Increased femoral anteversion
- External tibial torsion
- Laterally positioned tibial tubercle (TT-TG)
- Tight lateral retinaculum



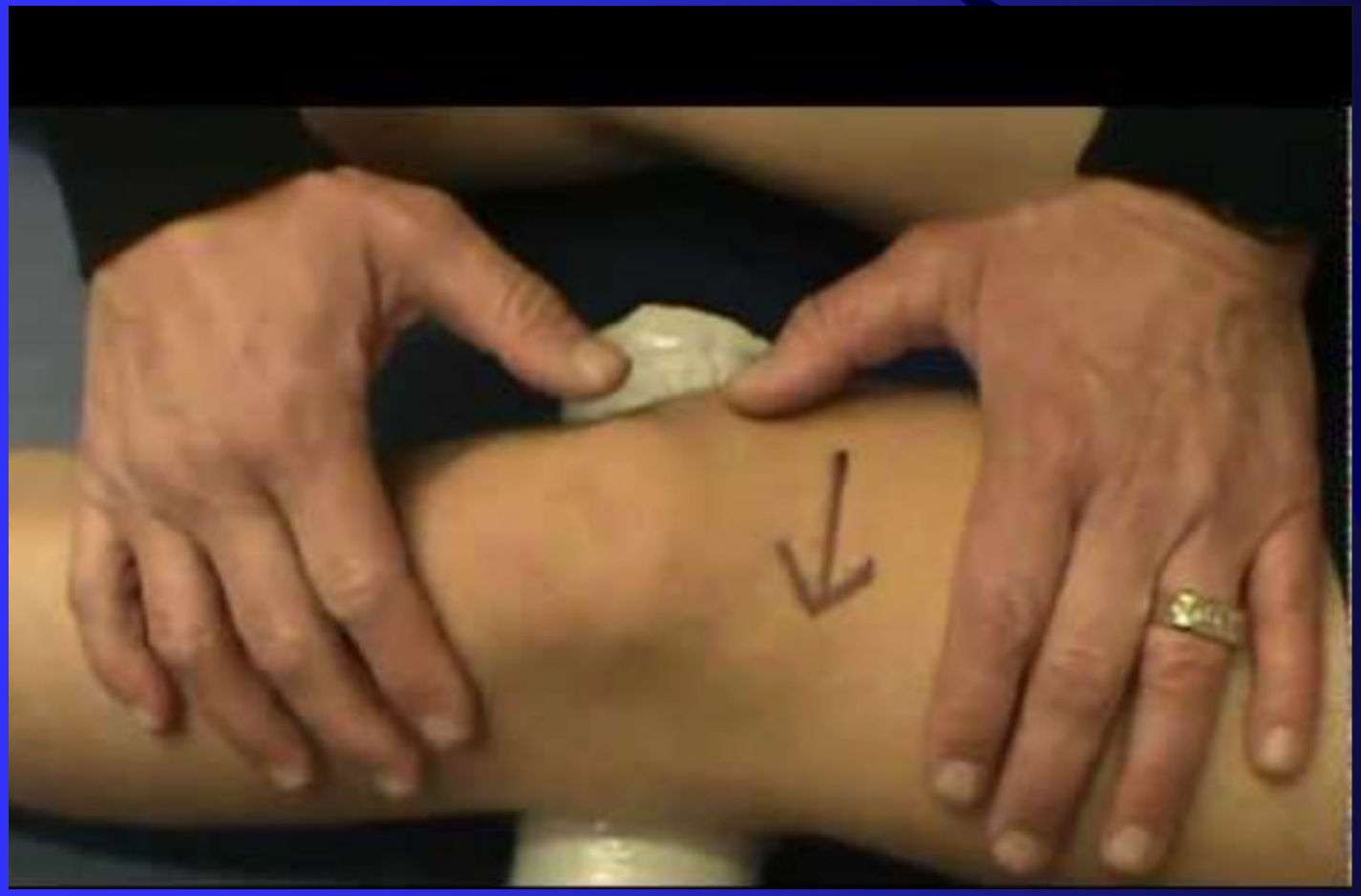
Standing Alignment



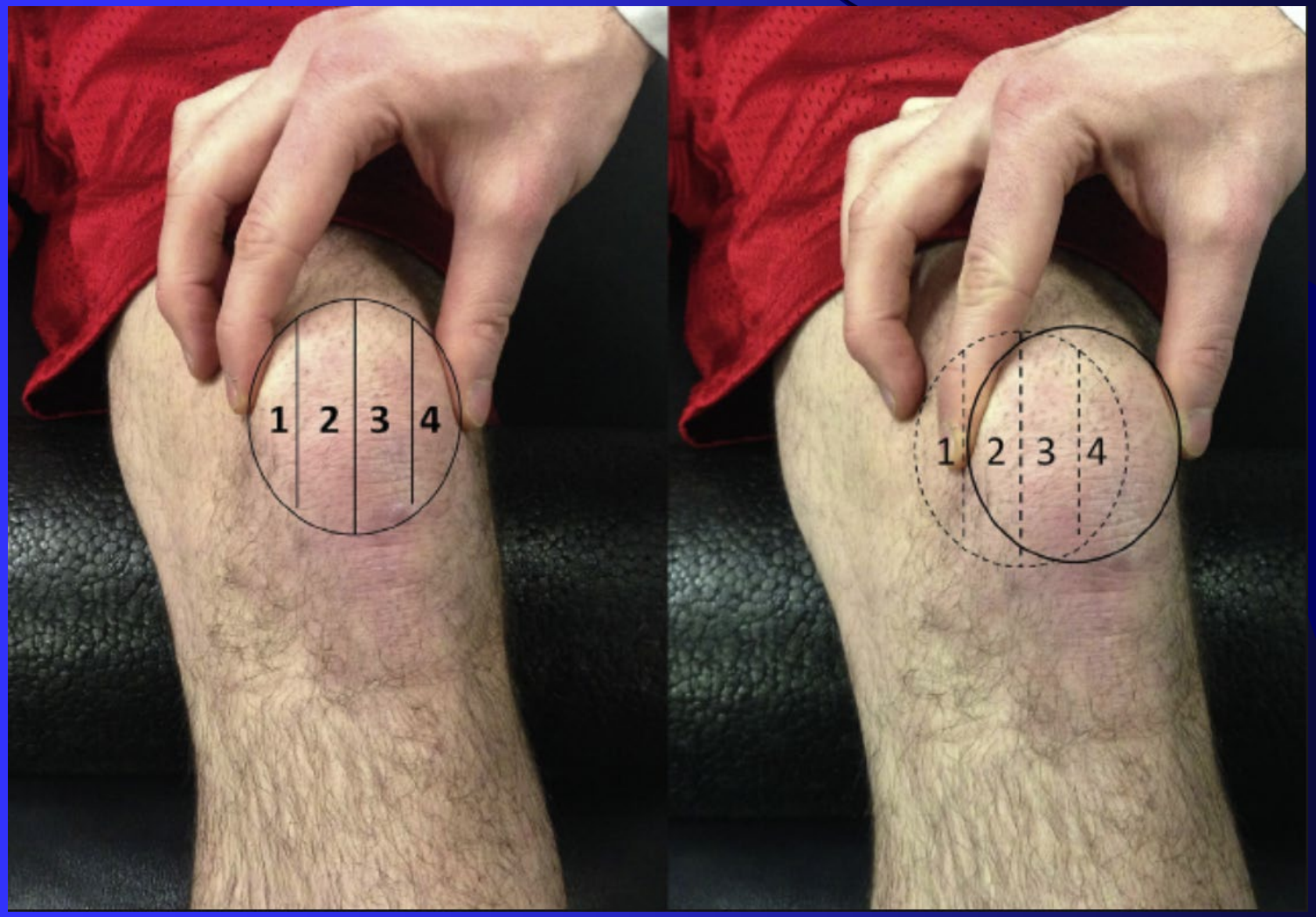
Hip Range of Motion



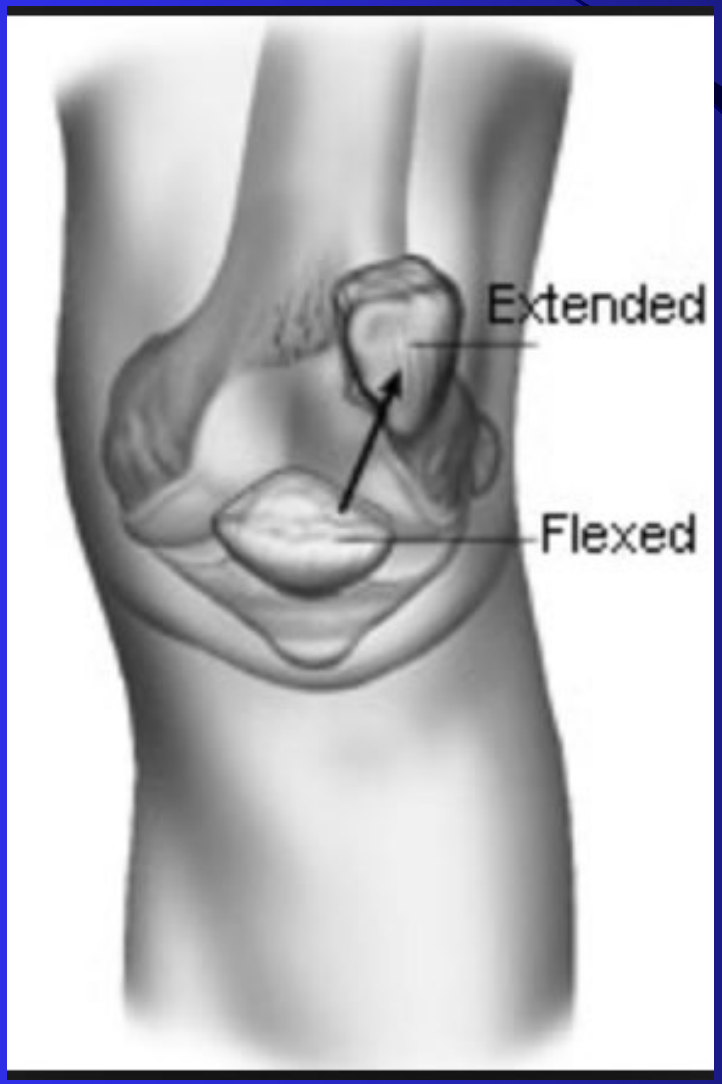
Patellar Apprehension



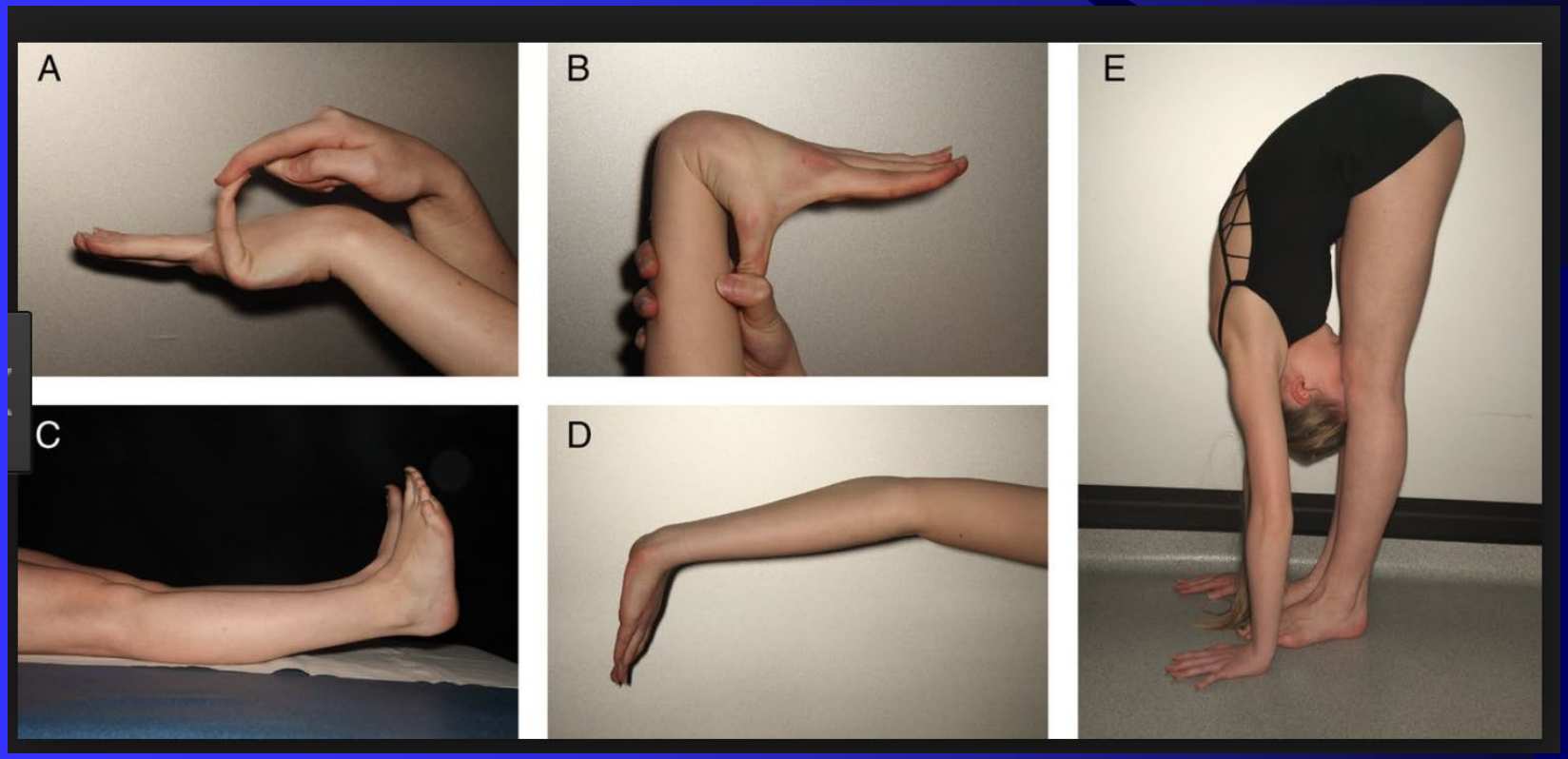
Patellar Glide



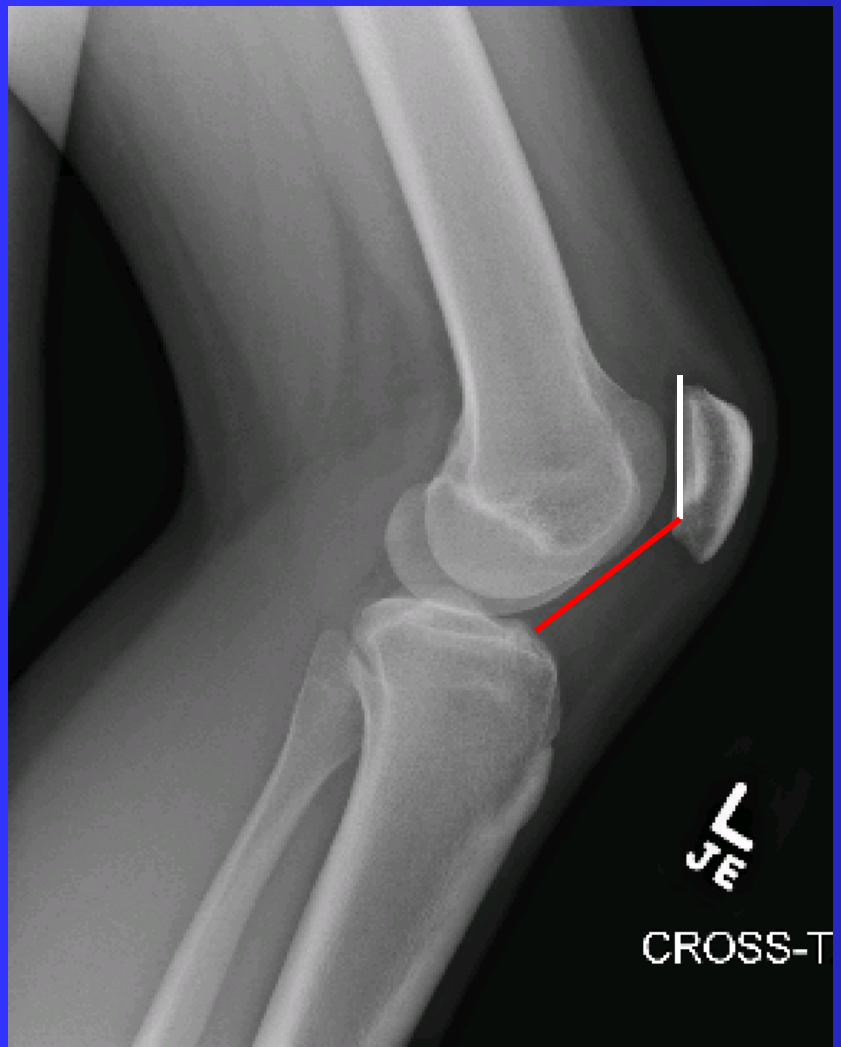
J Sign



Beighton Score



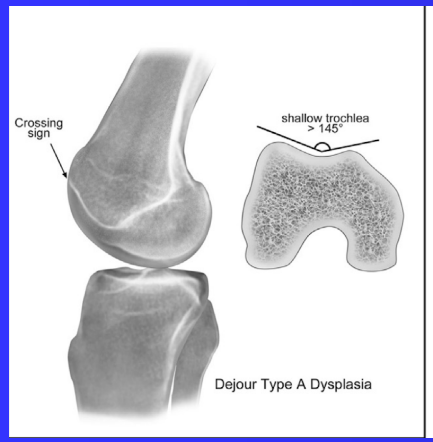
Patellar Height

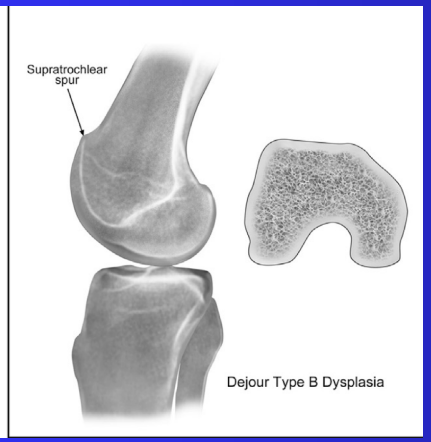


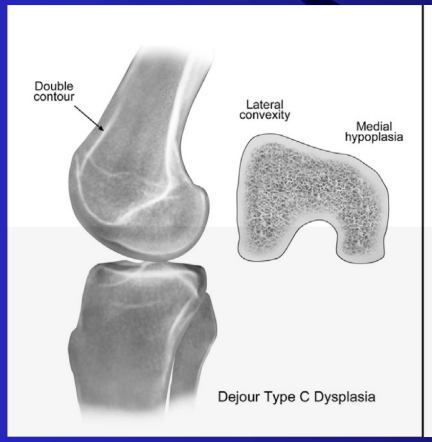
Caton
Deschamps
Normal 0.6-1.3

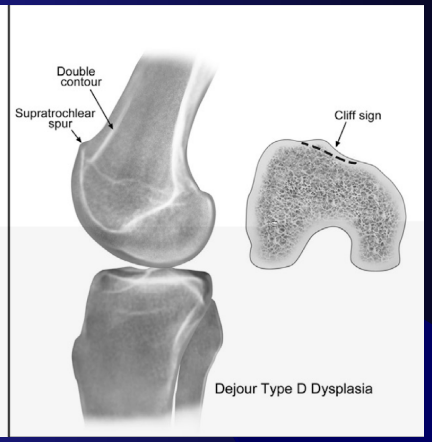
Tendon / Patella = 1.3

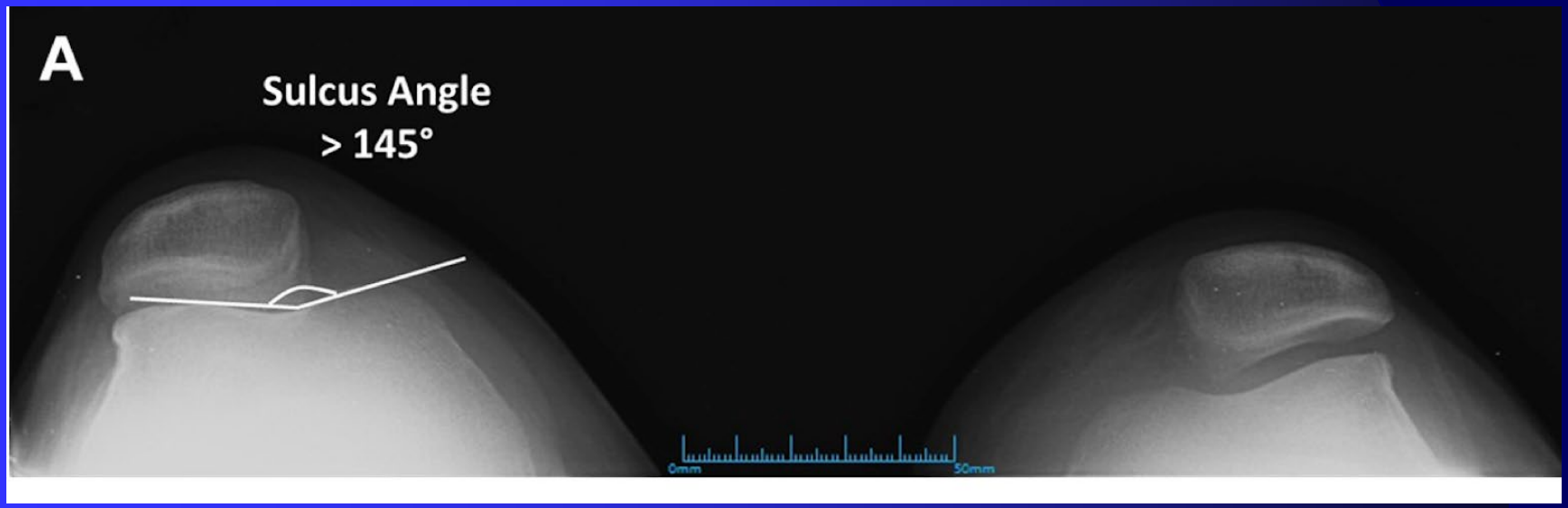
Trochlear Dysplasia



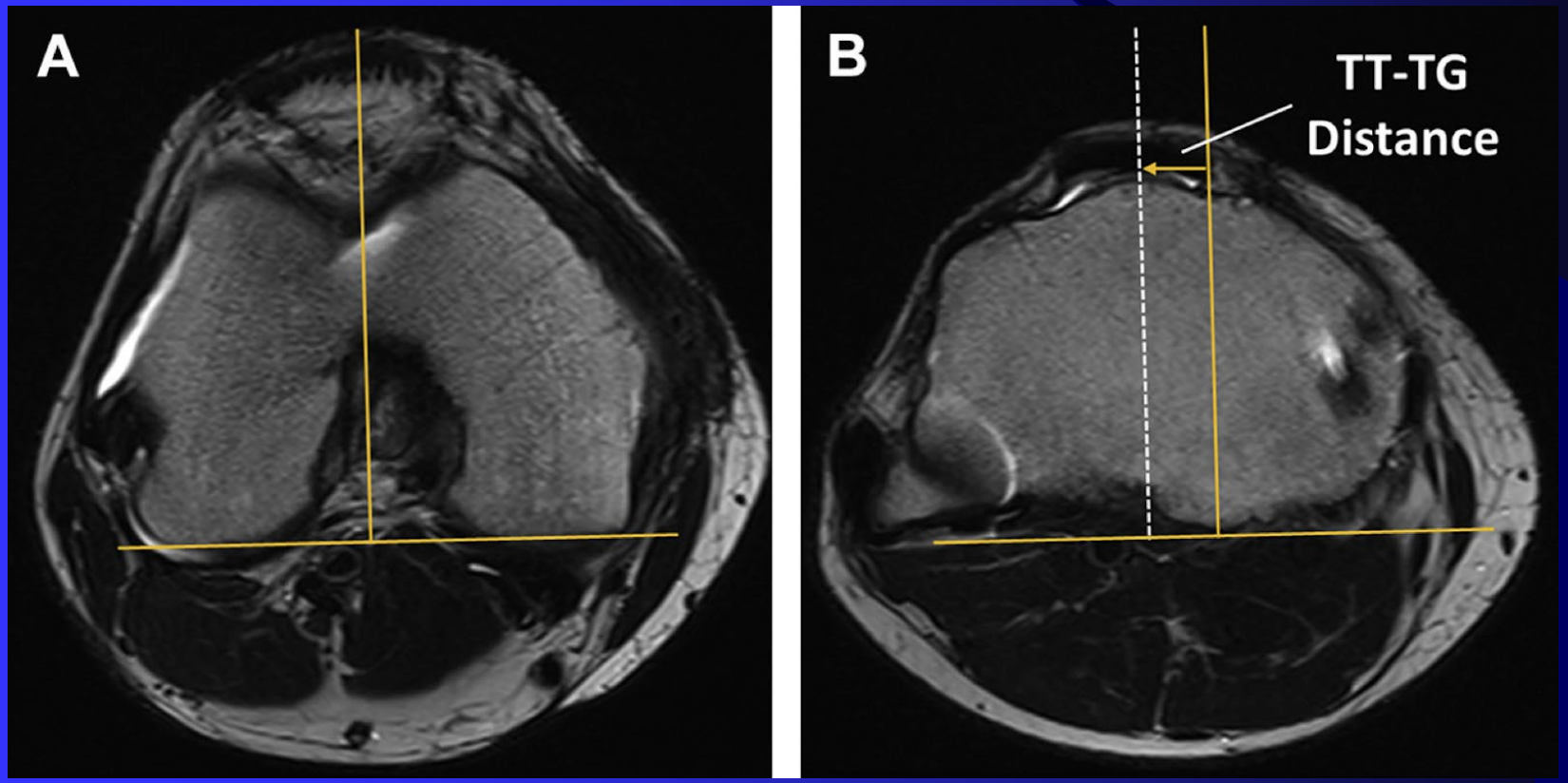








TT-TG



Factors Contributing to Instability

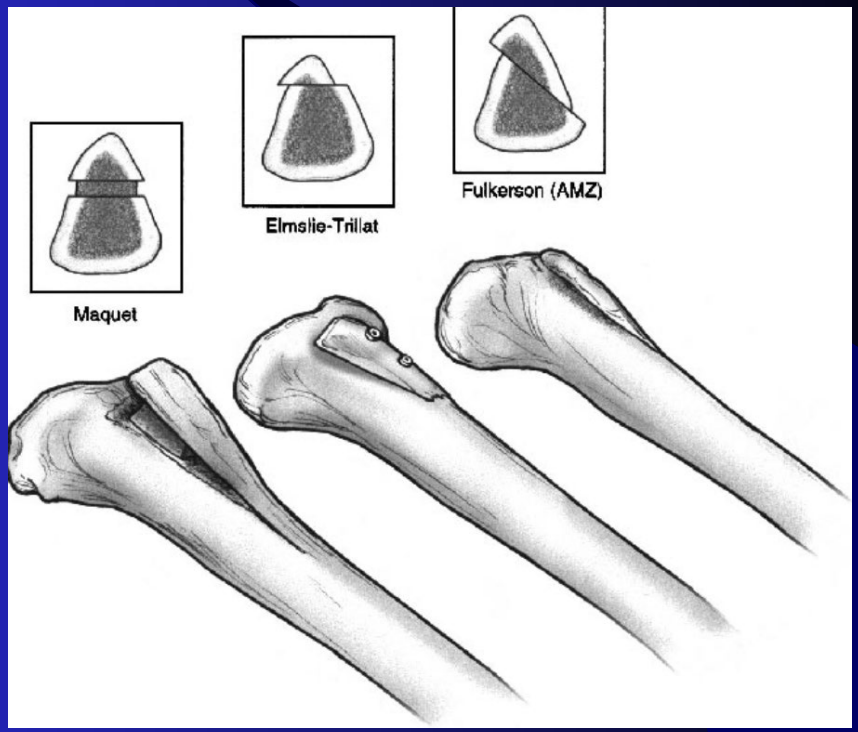
- Valgus alignment
- Patella Alta ✓
- Trochlear Dysplasia ✓
- Elevated TT- TG ✓
- History of previous dislocation ✓
- Generalized ligamentous laxity ✓
- Excessive femoral anteversion ✓

Surgical Plan

- Tibial Tubercle osteotomy to decrease elevated TT-TG and patella alta
- MPFL reconstruction to reconstruct attenuated Medial patellofemoral ligament

Tibial Tubercle Osteotomy

- Maquet
- Straight anterior
- + decrease PF contact pressure
- - High risk skin necrosis



Emslie-Trillat

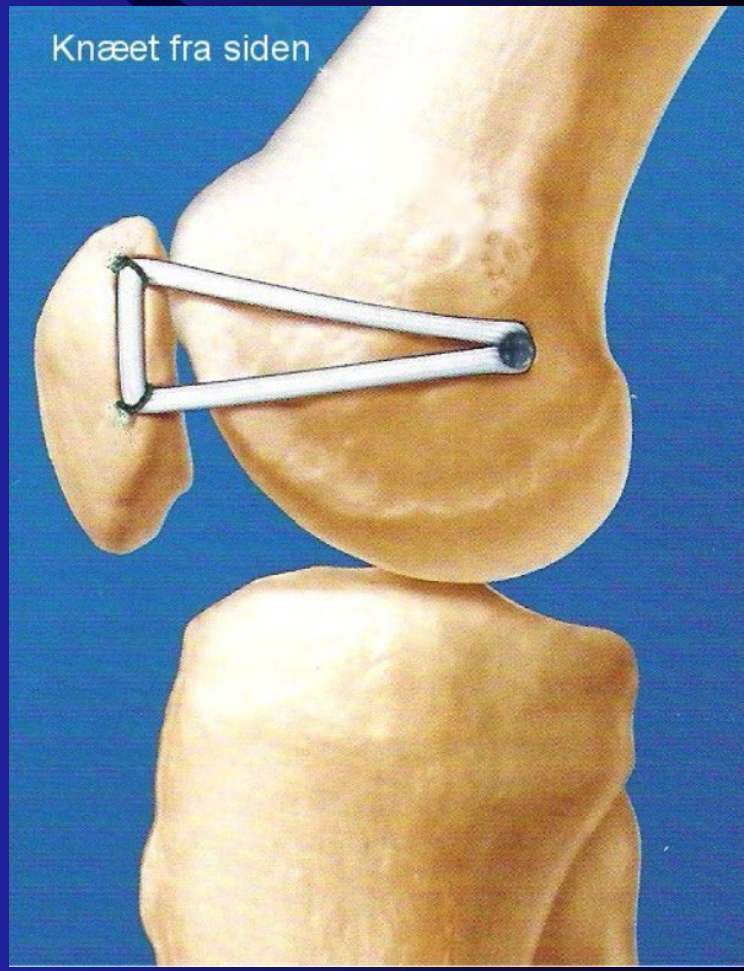
- Straight medial
- + Decrease q angle

Fulkerson

- Anterior/medialization
- + shifts contact pressure to medial and inferior

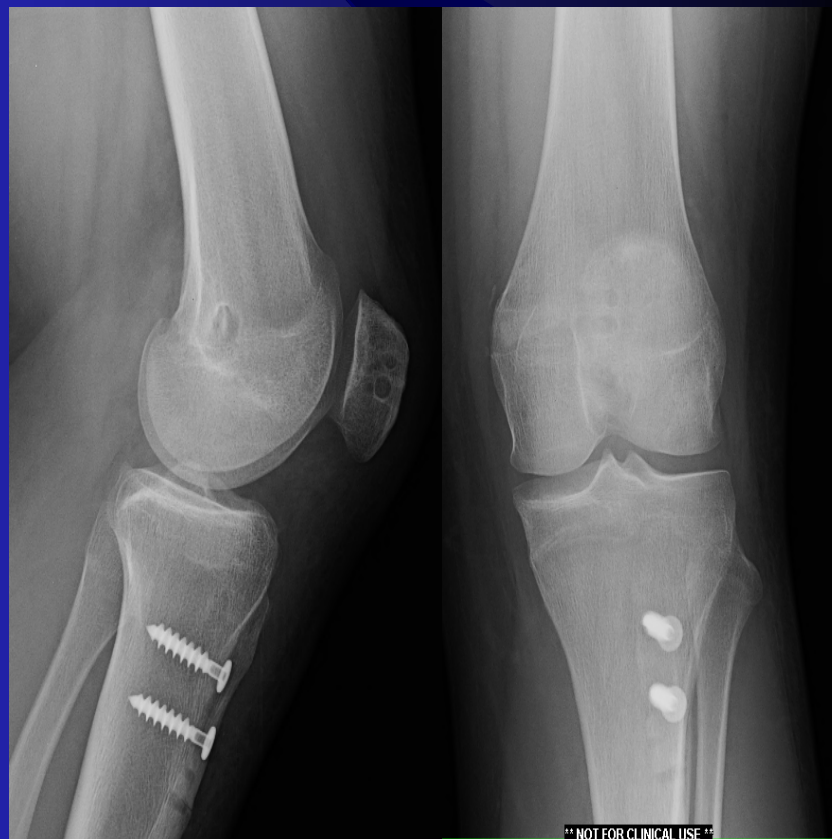
MPFL Reconstruction

- Hamstring autograft
  - Semi-T
- Suture anchors in patella
- Tunnel in femur
- Make sure to check isometry
- Tension between 60 and 30 degrees
- Do NOT over tension



MPFL/TTO

- Brace locked in extension for 2 weeks than progressive flexion to 90 degrees over 6 weeks
- ASA x 4 weeks for DVT prophylaxis
- Toe touch WB x 6 weeks
- DC brace at 6 weeks
- Return to sports approximately 10 – 12 months



Outcomes

- Recurrent dislocation rates are low but not zero
  - 10-20% after surgery
- Recurrent dislocations rates are similar after first time dislocations

Take Home Points

- Inability to actively extend the knee is concerning for a patellar or quad tendon rupture
- Anterior knee pain is a common diagnosis in adolescents and characterized by normal knee examination, hamstring tightness and gluteus weakness
- Osgood Schlater is seen in skeletally immature patients and often resolves with rest
- Nonoperative treatment is appropriate following a first time knee dislocation without associated fracture
- Operative intervention with stabilization indicated for recurrent patellar instability.

References

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Thank You

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