Management of Acute Knee Injuries

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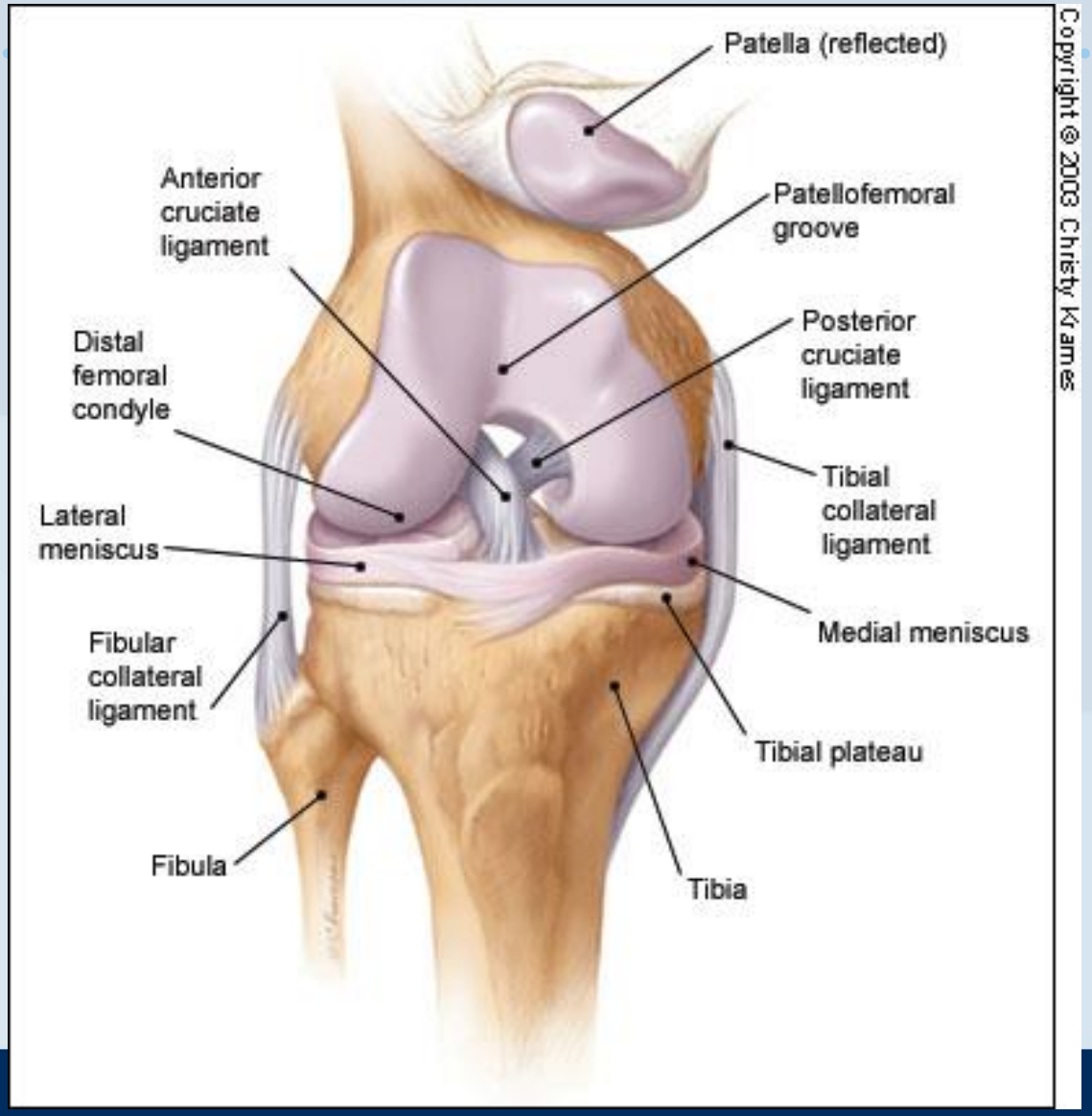
Objectives

- Background
- Anatomy
- History
- Physical Examination
- Radiology and Laboratory
- Case Studies

Anatomy


Patella (reflected)
Anterior cruciate ligament
Patellofemoral groove
Distal femoral condyle
Posterior cruciate ligament
Tibial collateral ligament
Lateral meniscus
Medial meniscus
Fibular collateral ligament
Tibial plateau
Fibula
Tibia
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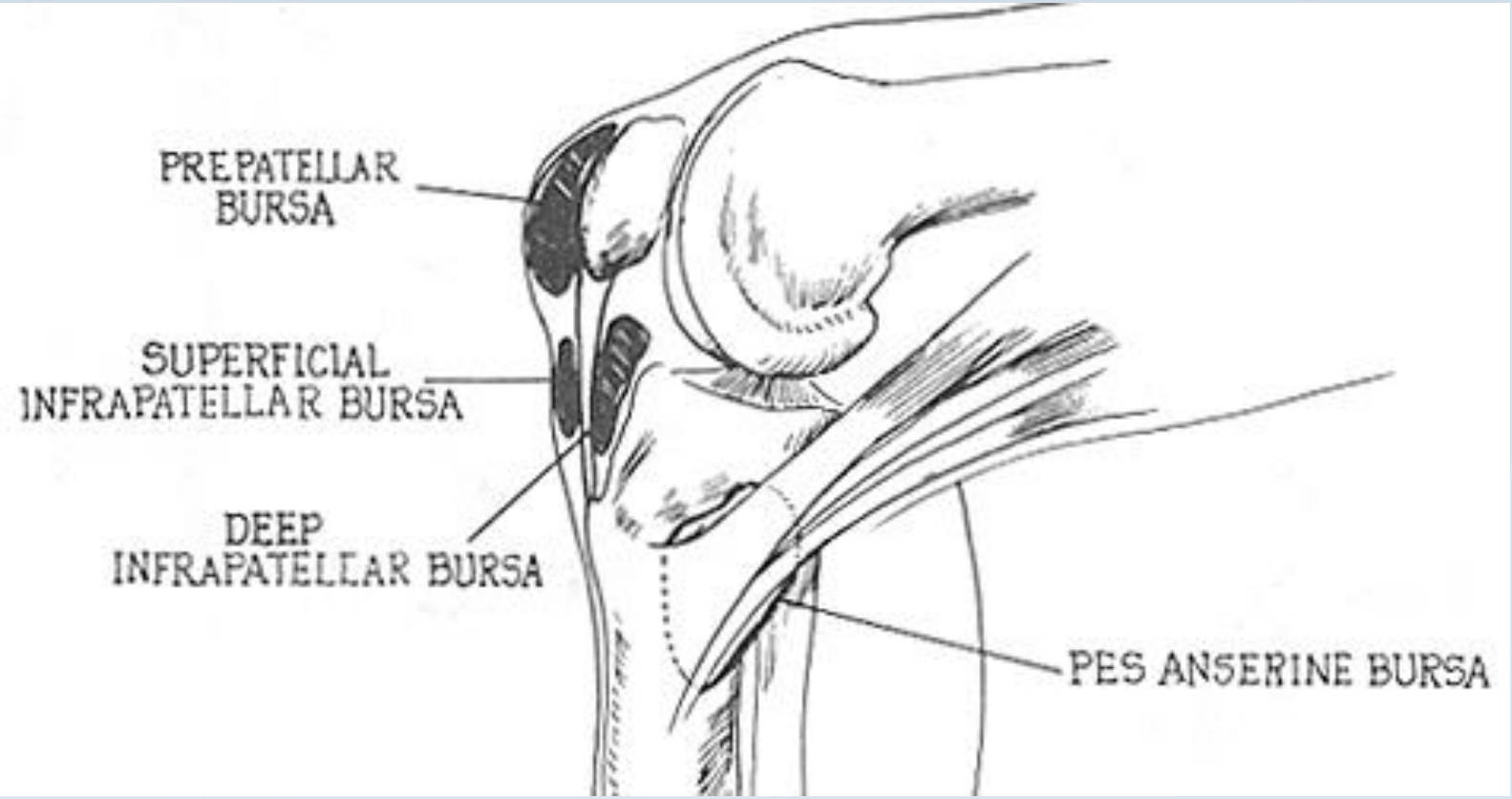
Anatomy


PREPATELLAR BURSA
SUPERFICIAL INFRAPATELLAR BURSA
DEEP INFRAPATELLAR BURSA
PES ANSERINE BURSA

History

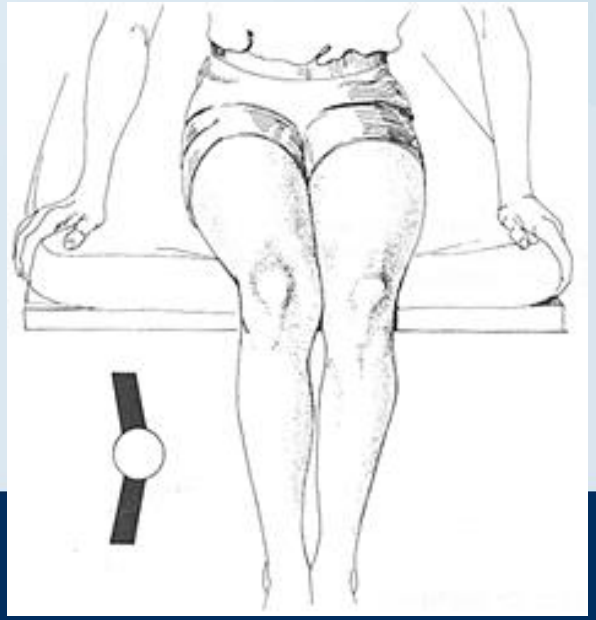
- Patient age
- Current symptoms and duration
- Pain with or after activity/changes in activity
- Catching/locking (“mechanical”) or Instability
- Stairs, squats, “theater sign”
- Exacerbating and relieving factors
- What treatment already tried (Rest, NSAIDs, brace, …)
- Prior knee injury or surgery
- PMH

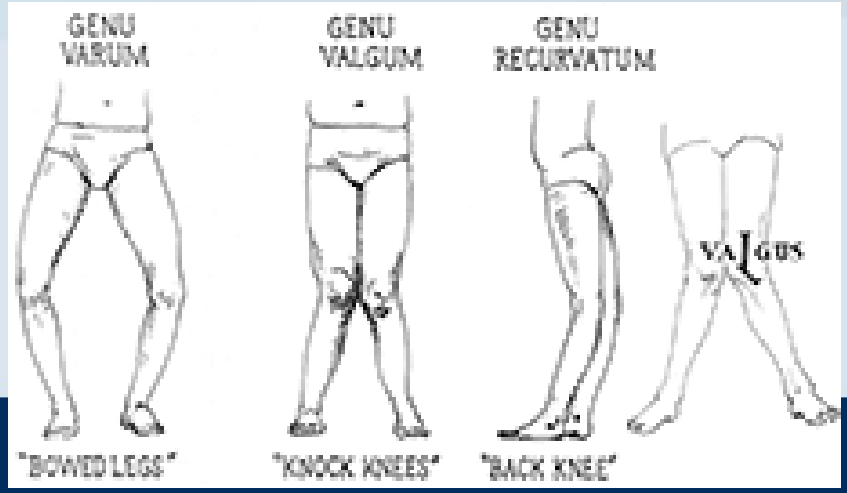
Knee Examination (6-step MSK exam)

- Inspection
- Palpation
- Range of Motion
- Strength
- Neurovascular (rare)
- Special Tests

Knee Examination

- Inspection
  - Alignment of lower extremities
    - Varus, valgus, recurvatum
  - Patellar position and motion (J tracking)
  - Inspection for asymmetries
    - Swelling, torsion, inability to extend knee
    - Atrophy



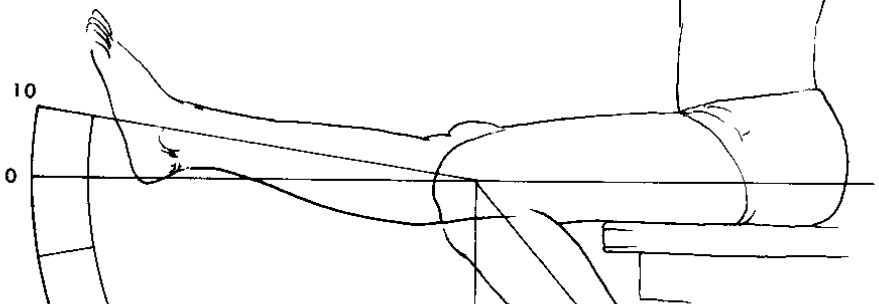


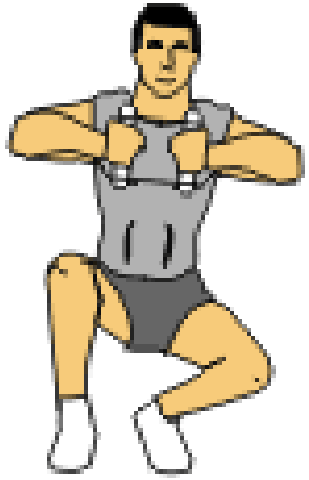
Knee Examination

- Palpate for effusion and warmth
- Palpate for tenderness
  - Tibial tubercle
  - Quadriceps tendons
  - Retropatellar tenderness
  - Joint line
  - Ligaments (MCL/LCL)
  - Bursa (incl. pes anserine)

Knee Examination

- ROM
  - Flexion: 130°/135°
  - Extension: 0° to -10°
  - Internal Rotation: 10°
  - External Rotation: 10°
- Strength
  - Hams
  - Quads: squat, duck walk





Knee Examination

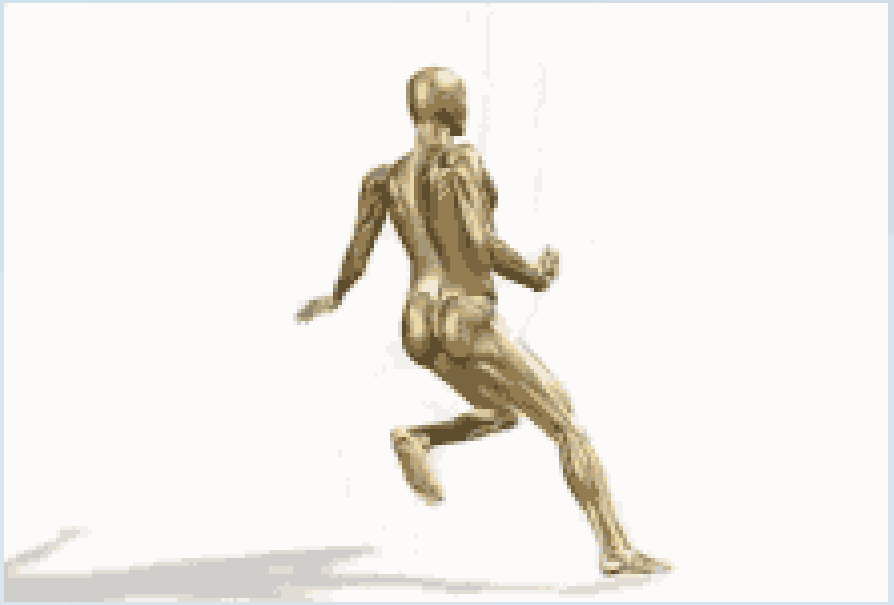
- Special Tests (ligaments)
  - Valgus and Varus Stress Tests (MCL/LCL)
  - Lachman's & Anterior Drawer (ACL)
  - Posterior Drawer & Posterior Sag Test (PCL)
  - Postero-lateral corner
  - Patellar stability
  - Flexibility

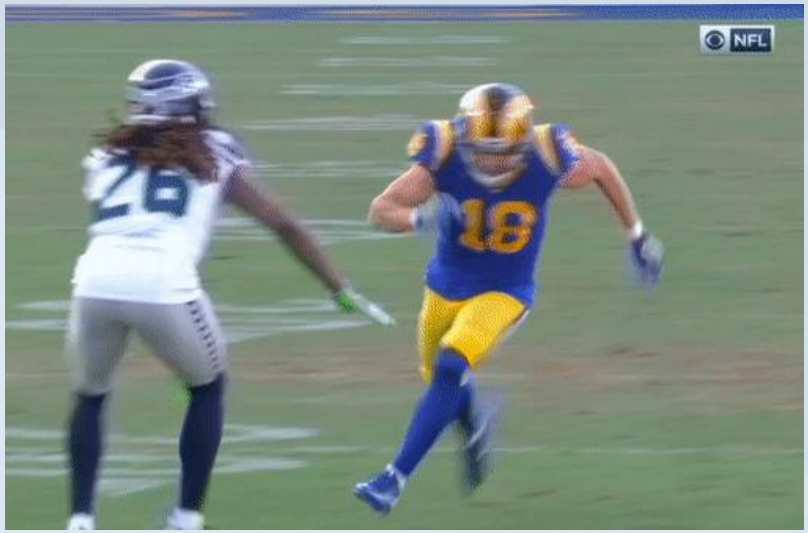
ACL Tear Risk factors

- Female
  - Relative quad deficiency
  - Jump landing pattern
  - Narrow notch (NWI)
  - Trapezoidal notch
- Contralateral injury
  - 16% risk of uninjured leg on return to same sport

ACL Tear Mechanism of injury

- Non-contact
  - Deceleration / direction change
- Contact
  - Usually, a combined injury
- Presentation
  - “POP”
    - I just changed direction and heard/felt something pop
  - Rapid effusion (hemarthrosis)




NFL
26
18

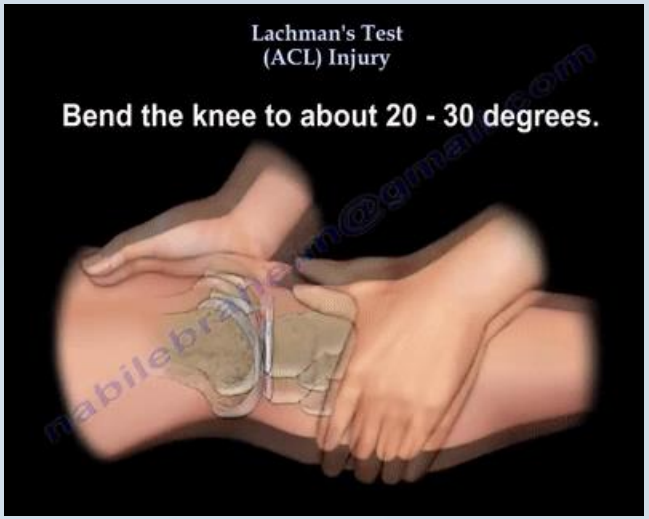
Ligament Exam

If you can’t see it…you can’t examine it

ALWAYS compare to contralateral side

ACL Examination

- Effusion
- Lachman
  - 20-30 degrees knee flexion
  - Anterior tibial translation
- Pivot shift
  - Reduction of tibial plateau
  - IR, valgus, flexion/extension
  - Reflects rotational instability
- Associated instability
  - MCL
  - FCL
  - FCL + PLC



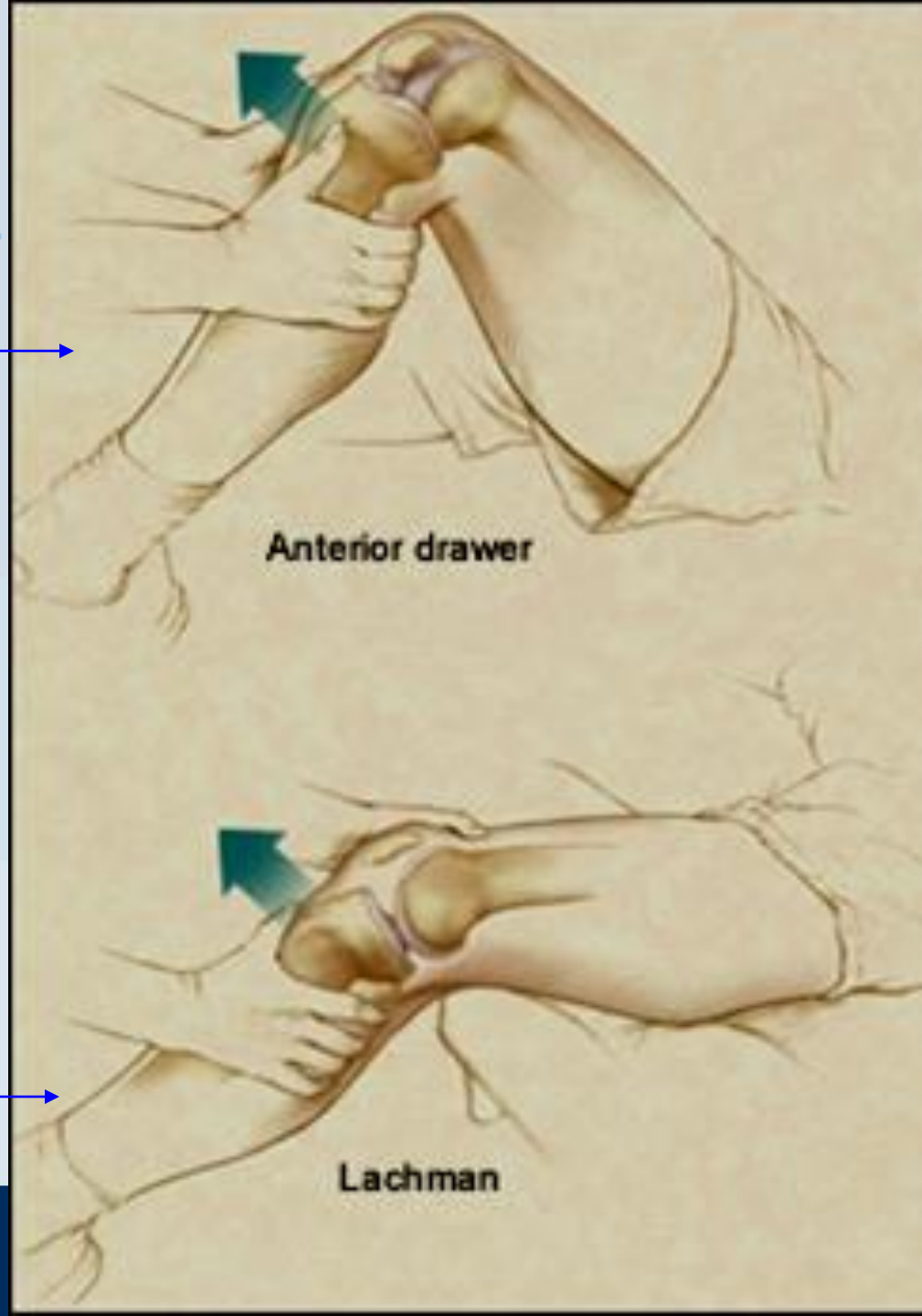
Test of ACL

At 90° Flexion

+ is increased translation or soft end point

At 20-30 ° Flexion

(more sensitive)



Sideline Treatment

- Do not allow athlete to re-enter competition
- Ice, crutches, elevate
- Next steps
  - Referral to Saturday morning / first available clinic

PCL Tear Mechanism of Injury

- Posterior load applied to flexed knee
  - MVA: Dashboard vs tibia
  - Sports: Knee flexed - tibial load (usually with ankle plantarflexed)
- Occasionally hyperextension

PCL Examination

- Anterior tibial abrasion, bruise
- Posterior sag
- Posterior drawer
  - Hip and knee flexed 90 degrees
  - Posterior directed tibia load
- Quadriceps active test
  - Hip at 45, knee at 90 degrees flexion
  - Quadriceps contraction “reduces” tibia “forward”

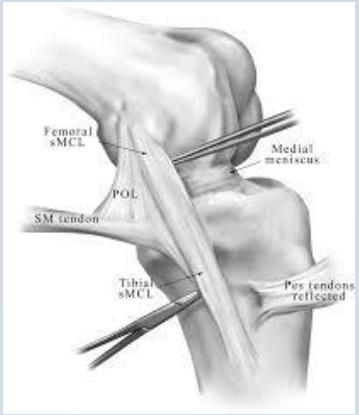
Posterior Sag

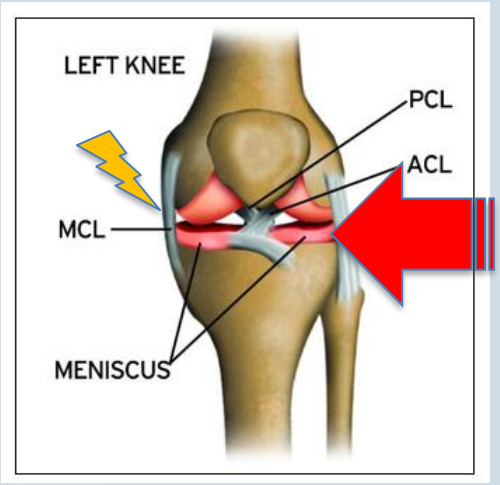
Sideline Treatment

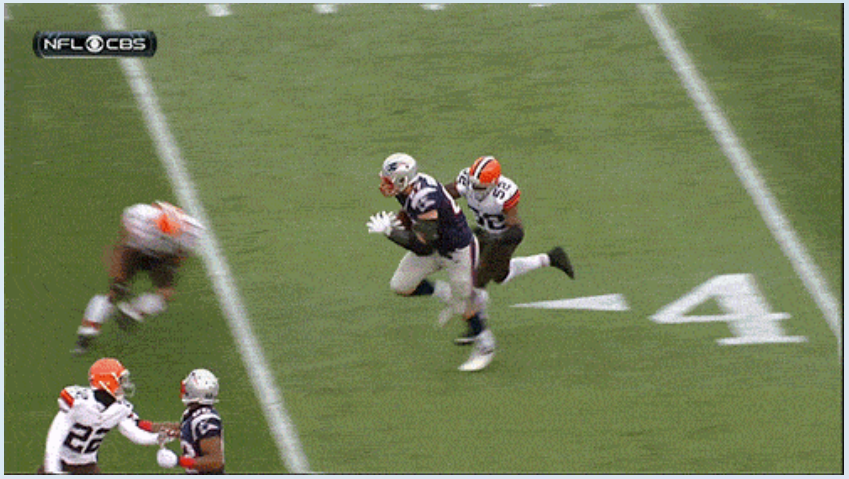
- Do not allow athlete to re-enter competition
- Ice, crutches, elevate
- Next steps
  - Referral to Saturday morning / first available clinic

MCL Tear Mechanism of Injury

- Trauma
- Valgus stress (usually hit from the outside)

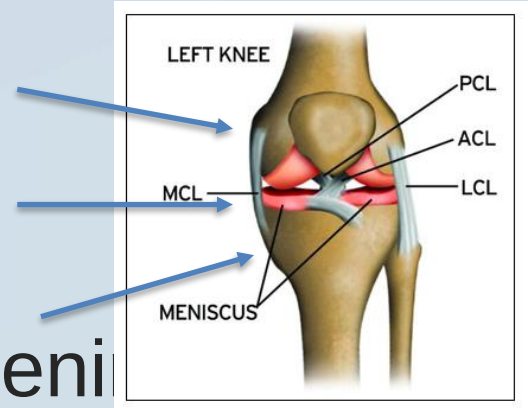






MCL Examination

- Palpation: assess pain or palpable defect
  - Medial condyle
  - Mid-substance
  - Tibial insertion



- Valgus Stress examination: openi… endpoint

  30 degrees flex: superficial MCL only

  0 and 30: superficial and deep MCL; other injury (PCL)

  0 degrees only: PCL and/or ACL

Grading of Ligament Injuries

- I
  - Minor injury
  - Minimal change in ligament length or physical properties
  - “a sprain”
- II
  - Fiber disruption
  - Side-to-side difference on exam BUT an endpoint
- III
  - Complete avulsion from bone
  - Extensive diffuse injury of all layers

Sideline Treatment

- Do not allow athlete to re-enter competition
- Ice, crutches, elevate
- Next steps
  - Referral to Saturday morning / first available clinic

Knee Examination

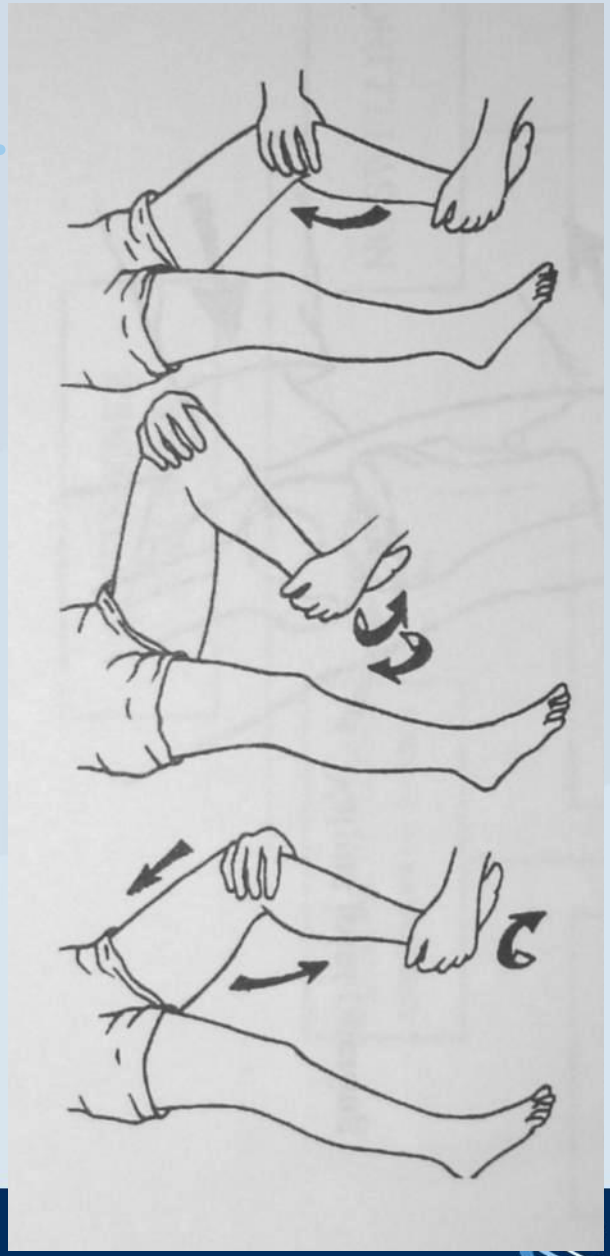
- Meniscal Tests
  - Joint line tenderness
  - Thessaly test
  - McMurray Test
  - Squatting & Duck Walk
- Multiple + tests is JUST as predictive of meniscal tear as MRI

Thessaly Test

- Pt stands on affected leg
- Knee bent at 20 degrees
- Examiner holds pt's hands and rotates pt to both sides 3x
- Positive test: joint line pain

McMurray test for Meniscal injury

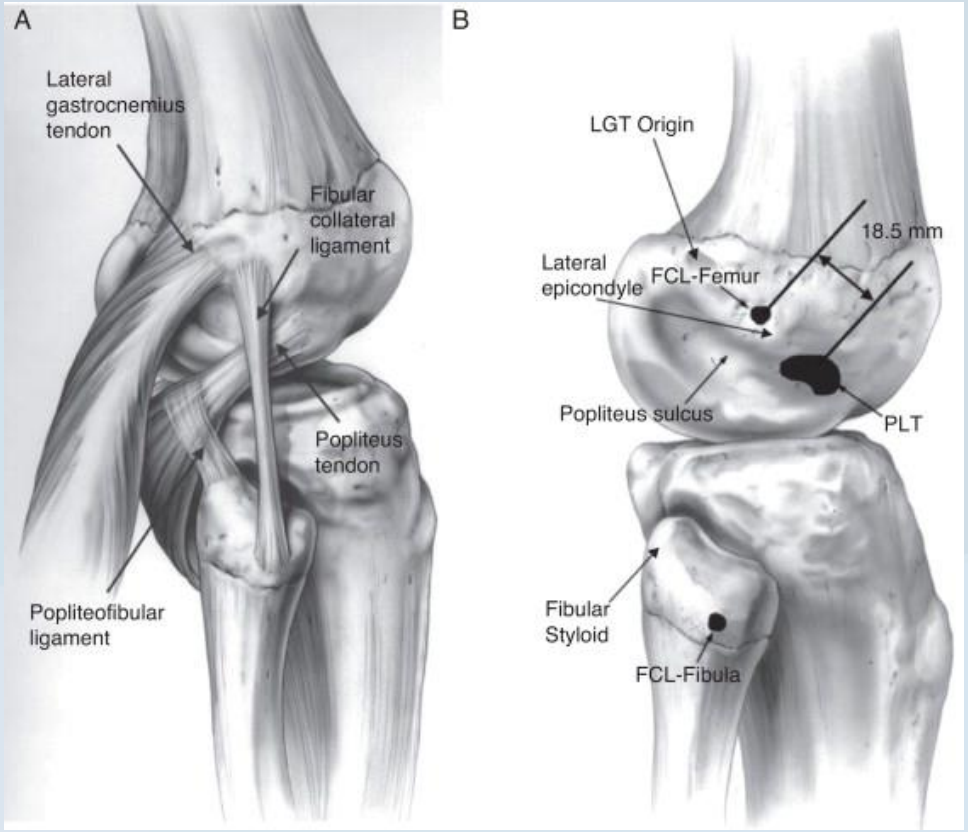
- Test Med and Lat meniscus separately
- 3 concurrent maneuvers:
  - Grind it (Rotate tibia AWAY from it)
  - Crunch it (varus or valgus)
  - Full ROM (flex/extend knee)
- Positive: Painful “pop”



McMurray test

Lateral Side Injuries

- FCL (aka LCL)
- PLC
  - Fibular collateral, Popliteus, PFL



Posterolateral corner (PLC)
Dial Test

- Normal

Abnormal (PLC tear)

FCL

- Rarely isolated
- Medial side impact (varus injury)
- More common as a combined injury
  - Multiligament injury

Lateral Side Exam

- Lateral side opening to varus stress
  - 30 degrees only = isolated
  - 0 and 30 degrees = combined
- Increased ER (aka Dial test) on side of injury
- Neurovascular exam

Knee Dislocation

- Multiligament
- High energy
  - Sports
  - MVA
  - Industrial
- Low energy
  - Morbid obesity

Associated injuries

- Neurovascular 30-50%
- Popliteal artery
  - Posterior dislocation >>Direct transection
  - Anterior dislocation >> Intimal tear/flap
- Peroneal nerve
  - Nerve traction as it courses around fibular neck
- Compartment syndrome

Knee Dislocation

- Beware associated vascular injury!!
- MUST have high index of suspicion
  - Based on mechanism of injury
  - Based on associated injuries
  - Based on initial clinical presentation
- Missed vascular injury >>>Amputation
  - Pulses
    - Initially present?
    - Return post-reduction?

Revascularization

- 6-8 hr window (max)
- Delayed revascularization
  - Myonecrosis
  - Rhabdomyolisis
  - Hyperkalemia
  - Compartment syndrome

Sideline Treatment

- Do not allow athlete to re-enter competition
- Ice, crutches, elevate
- Next steps
  - Immediate transportation to the ER

Take home points….

- Positive “theater sign”. **Patellofemoral Syndrome**
- Knee pain with locking. **Meniscal Injury**
- Twisted planted foot and heard “pop”. **ACL Injury**
- Knee “came out of socket”. **Patellar Subluxation**
- Good test for meniscal tears (hint: Disco) **Thessaly test**
- Lateral knee pain training for marathon. **ITB Syndrome**
- Anterior knee pain worse with jumping. **Patellar tendinopathy**
- PFS best treatment: **Try LOTS of things**
- Knee OA: **Try LOTS of things: exercise, glucosamine**
  Viscosupplementation injection, etc.

Questions???


END OF SEASON
SALE
EVERYONE MUST GO!!
ALL PLAYERS
50% OFF
10-4
www.ucomics.com
MOORE

Cases for Review

Case #1

- 16 y.o. female soccer player presents to clinic 1 week after injury.
- Reports she was cutting while dribbling. Heard a pop in her knee and had pain. Taken from field and couldn't return to game. Noticed that night knee was swollen.
- Now, 1 week later, almost normal gait. Knee feels much better.

Case #1

Physical exam

- Joint effusion present
- No sag
- No joint line tenderness
- No LCL/MCL laxity
- Negative McMurray/Thessaly
- Positive Lachman

Diagnosis: ACL Injury

Anterior Cruciate Ligament Injury

Clinical symptoms

- 1/3-2/3 report audible pop
- Mechanism of injury

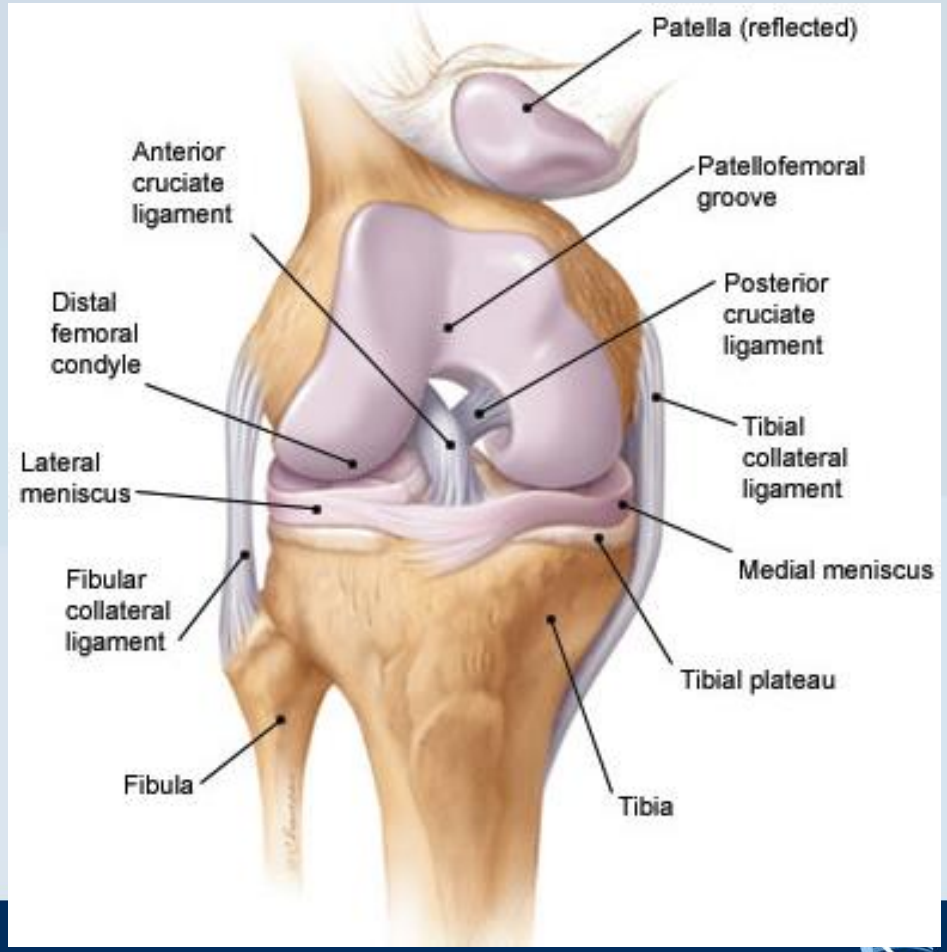
Non-contact--twisting with the foot planted

Contact--valgus stress with twisting

- Immediate swelling (hemarthrosis)
- Usually non-ambulatory after injury

Anterior Cruciate Ligament Injury

- Half occur with meniscal tear; lateral more common with acute
- Can occur with MCL tear
- Rare with LCL or PCL tear



Features that should prompt an xray after acute knee injury include:

1. Unable to bear weight
2. Can’t flex >90 degrees
3. Patella TTP
4. Fibular head TTP
5. Age <18 or >55
6. All of the above

5 Ottawa Knee Rules

i.e. When to order a knee xray after acute injury

- Age > 55 or < 18
- Unable to walk
- TTP on PATELLA
- TTP on FIBULAR HEAD
- Unable to flex 90 deg

ACL: Radiographic Findings

- Avulsion of the intercondylar tubercle
- Anterior displacement of the tibia with respect to the femur
- Segond fracture (a thin sliver of bone avulsed from the proximal lateral tibia with the lateral capsular ligament)

Segond Fracture

Anterior Cruciate Ligament Injury

- Management
  - Brace knee first week (immobilizer)
  - Crutches for comfort, ice, advance to toe-touch and wean from crutches as tolerated
  - Work on ROM, edema control, quad strength
  - Imaging
    - Initially, plain films
    - MRI if high clinical suspicion, likely refer first

Questions?

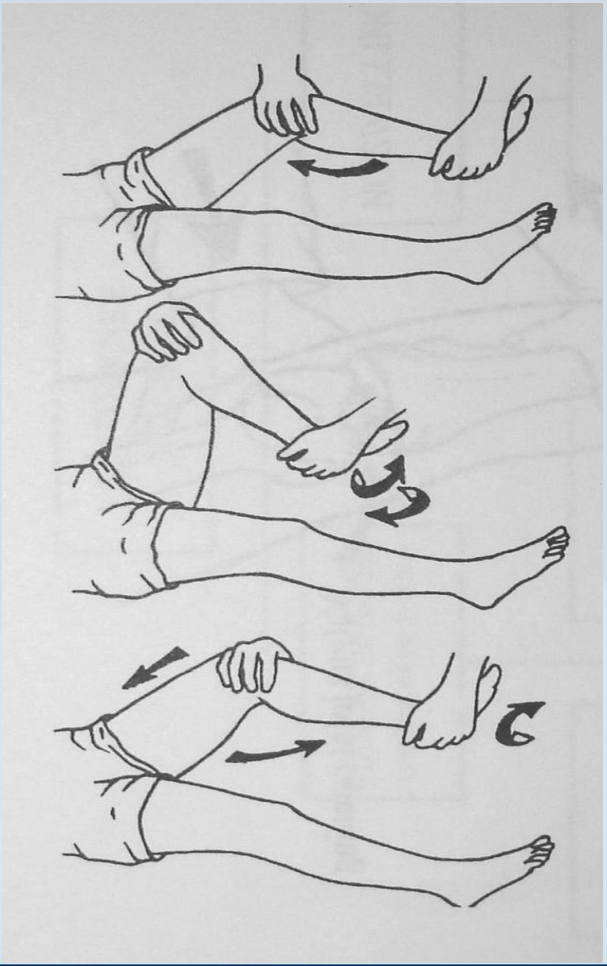
Case #2

- 16yo tennis player presents day after match for knee pain
- Remembers painful twist with planted foot during the game, but kept playing
- Swelled up overnight
- Now feels tight, sharp pain with twisting

Case #2

Physical exam

- Effusion
- Joint line tenderness
- Limited knee range of motion
- McMurray and Thessaly tests positive with painful click



Diagnosis: Meniscal Injury

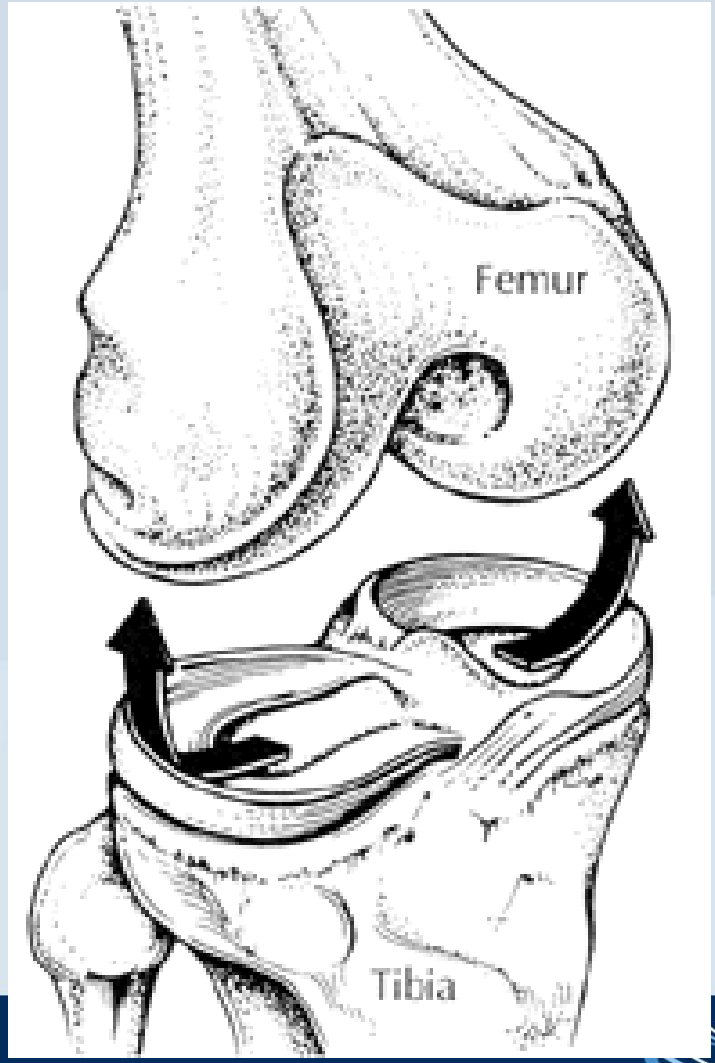
Meniscal Tear

Anatomy

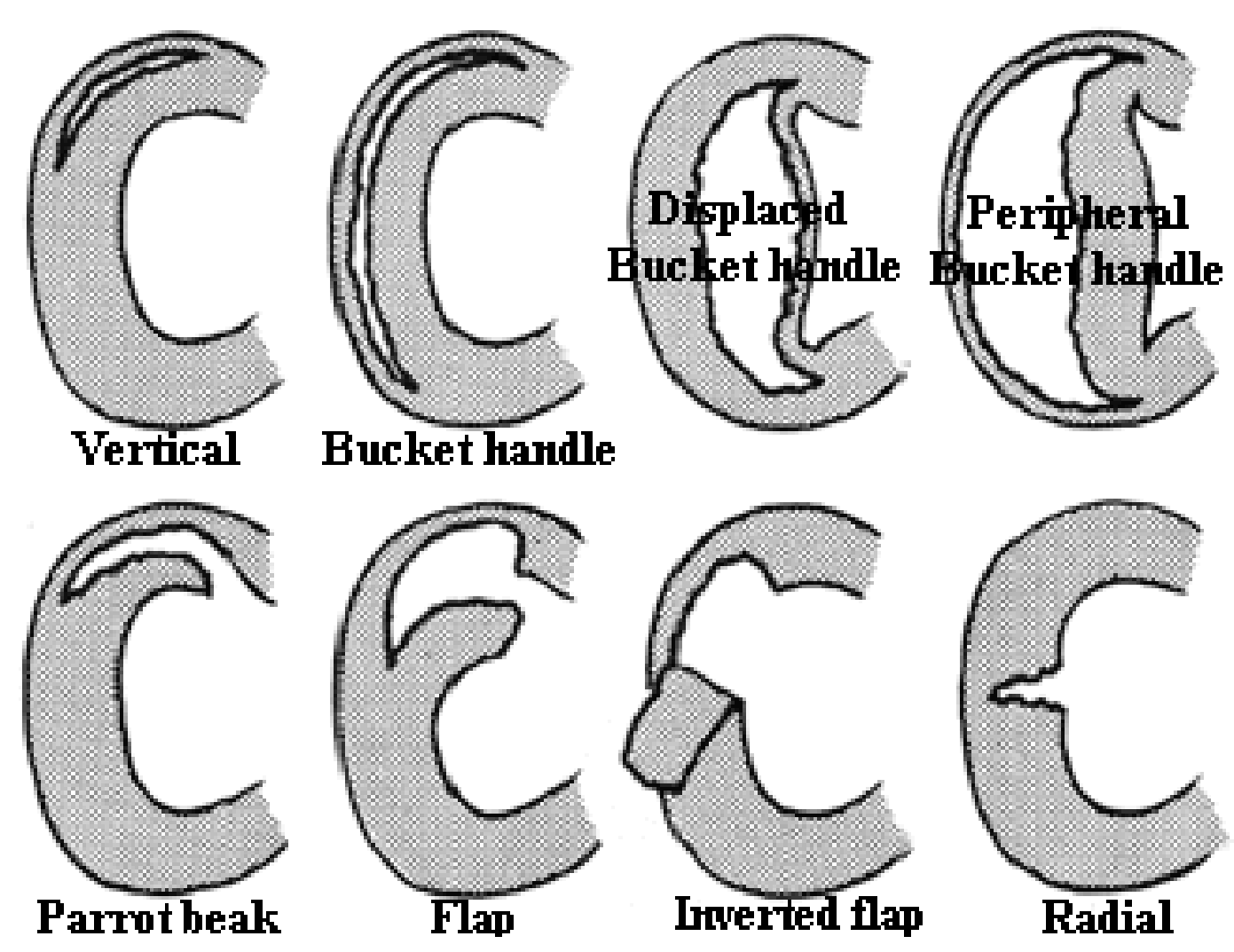
- Avascular inner 2/3, partly vascular outer 1/3
- Minimal innervation
- Held in place by coronary ligaments, painful when torn (meniscotibial ligaments)
- Lateral meniscus less firmly attached, less prone to injury

Meniscal Tear

- Function
  - Lubrication
  - Nutrition of joint
  - Shock absorption
  - Reduce friction
  - Disperse stress / weight
  - Decrease cartilage wear



Meniscal Tear



Meniscal Tear

Clinical symptoms

- Traumatic tears
  - Twisting or hyperflexion injury
- Degenerative tears
  - In older patients, minimal or no trauma
- Insidious swelling (overnight or 2-3 days)
- Mechanical symptoms: locking, catching, popping
- Pain medial or lateral sides of knee, particularly with twisting or squatting

Meniscal Tear

- Management
  - Physical therapy, maximize ROM/strength
  - Non-surgical if no mechanical symptoms
  - Refer for catching, continued effusions, locked knee, symptoms more than 2 weeks, failed NSAIDs/PT
  - Surgery for:
    - Locking/catching
    - Persistent pain greater than 4-6 weeks

Case Knee “came out of socket”

- 16 y.o. male lacrosse player made sharp cut yesterday. Felt knee “come out of socket”. Immediate pain and swelling.
- Went to ER and x-rays negative for fracture.
- One week out can’t fully bend knee due to pain.

Case Knee “came out of socket”

Physical exam

- Patellar apprehension
- Medial patellar tenderness
- Increased patellar mobility

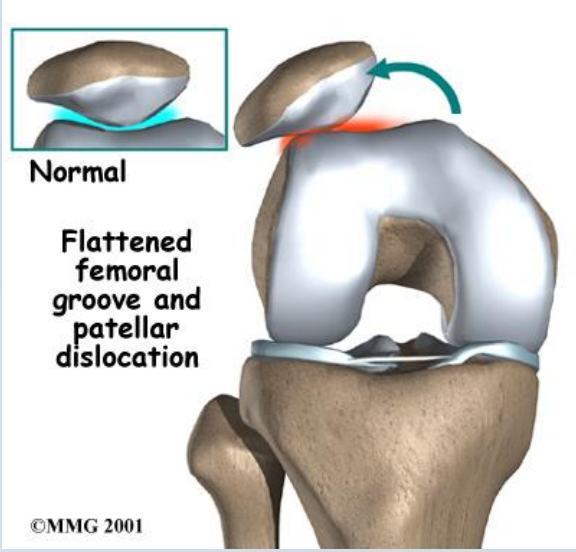
Diagnosis:

Patellar Subluxation

Patellar dislocation/subluxation

Clinical symptoms

- Severe pain
- Sometimes pop
- Occasionally see a deformity, usually lateral dislocation
- Often reduces spontaneously
- Swelling
- Loss of motion



Patellar dislocation/subluxation

Mechanism of injury

- Direct trauma
- Rotation over planted foot (ie. softball swing)
- Sudden cutting movements
- “Stretched out” tissues from prior injury predispose for recurrence

Patellar dislocation/subluxation

- Management
  - Straight leg immobilization x 1-2 weeks
  - Weight bearing as tolerated
  - Cylinder cast if question compliance
  - MRI if skeletally immature to r/o sleeve fracture (peeling off sleeve of cartilage and periosteum) requiring surgical repair
  - Physical therapy after immobilization to return strength/motion
- Refer to Ortho for fracture, ligament injury, recurrence, swelling/catching symptoms