Ligament Injuries to the Knee

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6 Degrees of freedom of knee motion
- Flexion/Extension
- Varus/Valgus Rotation
- Internal/External Rotation
- Anterior/Posterior Translation
- Medial/Lateral Translation
- Proximal/Distal Translation

Knee Ligaments

Knee Injuries
Knee Injuries

ACL injury

- Contact or noncontact injury
- Acute swelling
- Instability or giving out sensation
- Can be associated with MCL and meniscus injuries
ACL tear

- Lachman test
- Anterior drawer
- Pivot shift test

ACL tear

- Operative
  - Young active individual
  - Instability
  - Protect menisci
- Non-operative
  - Older individual
  - No cutting sports
  - Hamstring strengthening / reeducation

PCL Injury

- Mechanisms:
  - Direct anterior blow to proximal tibia (falling directly on knee/dashboard injury) - drives tibia backward
  - Hyperflexion (fall on flexed knee with foot plantar-flexed) - most common cause in sports
  - Hyperextension
  - Knee Dislocation (other ligaments involved)
**POSTERIOR SAG SIGN**

- Knee is placed in a resting position at 90° of flexion.
- (+) = “Sag” posteriorly.
- Compare with the opposite side.

**POSTERIOR DRAWER TEST**

- Hip flexed at 45°, knee flexed at 90°
- With both thumbs placed on the joint line, the tibia is gently pushed posteriorly.
- Excursion of the tibia is compared with the unaffected side.
PCL Injury

- Isolated PCL tear
  - Most often treated non-operatively
  - Can have arthritis/ meniscus tear down the road
- Multi-ligament injury
  - Most often operative treatment
  - Can be staged
  - May need osteotomy

PosteroLateral Corner Injury

- Mechanisms:
  - Isolated injury rare- usually injury occurs with PCL or multiligament injury
  - Knee hyperextension with varus stress (posterolateral force directed vs. proximal tibia with knee at or near full extension)
  - Hyperextension +/- external rotation
  - Severe varus stress or ext. rotation of tibia
  - Injury to LCL, popliteus, biceps insertion on fibula, IT band, varus smaller PL ligaments

PLC Injury
Posterolateral Corner Injury

- For acute complete rupture
  - Want to treat this *operatively* within 3 weeks of injury
- Repair is better than reconstruction
- Reconstruction for more chronic injuries (>3 weeks) or more severe injury

Don’t want to miss this one!

MCL Injury

- **Mechanisms:**
  - Valgus force applied to the flexed knee
  - Ruptures or sprains frequently involve attachment to the medial femoral condyle
  - May be associated with tears of the PM capsule, the ACL, and the medial meniscus
  - A contusion/ fx due to impact of the lateral femoral condyle or lateral tibial plateau is common (bone bruise with lateral pain)
MCL Injury

VALGUS STRESS TESTS

- A Valgus stress is applied both in full extension and in 20-30° of flexion
- Test in extension checks for injury of posteromedial corner structures (capsule, connections of semimembranosus)
- Test in flexion evaluates MCL
- Grading of Injury based on Jt. Space opening:
  - Grade I: 0 to 5 mm
  - Grade II: 6 to 10 mm
  - Grade III: 11 to 15 mm
MCL injury

- Most injuries treated non-operatively
- Heals very well
- Treat with protected brace and protected weight-bearing
- Chronic instability
  - MCL reconstruction
  - Concern with knee stiffness

LCL Injury

- **Mechanisms:**
  - Varus force applied to the internally rotated, flexed knee
  - Isolated injury rarer than MCL injuries
  - More common to see combined with PCL injury or as part of posterolateral corner injury
VARUS STRESS TESTS

- A Varus stress is applied both in full extension and in 20-30° of flexion
- Test in extension checks for injury of posterolateral corner structures (may see some laxity with isolated LCL injury)
- Test in flexion evaluates LCL
- Grading of Injury based on Jt. Space opening:
  - Grade I: 0 to 5 mm
  - Grade II: 6 to 10 mm
  - Grade III: 11 to 15 mm

LCL injury

- Complete tears are mostly treated operatively
- Can be repaired primarily or reconstruction
- Concern with posterolateral corner injury and insufficiency

Don’t want to miss this one!

Meniscal Injury

- Mechanisms:
  - Rotation of the femur against a fixed tibia during flexion and extension (twisting injury)
  - History of twisting, squatting, or cutting
- Clinical signs:
  - joint line pain, giving way, clicking, and effusions. Locking of the joint in fixed flexion may occur after displacement of a meniscal fragment or pseudolock due to hamstring muscle spasms
Meniscal Injury

Joint Line Tenderness

- Palpation of the anterior, middle, and posterior parts of both the medial and lateral joint spaces.

<table>
<thead>
<tr>
<th>Sensitivity</th>
<th>Specificity</th>
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<tbody>
<tr>
<td>85%</td>
<td>30%</td>
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Fowler and Lubliner, 1989
MCMURRAY’S TEST

- Knee is flexed and placed in external rotation
- Examiner applies a valgus or varus force
- Knee is then extended.
- (+) = Pain and/or a popping/snapping sensation.

<table>
<thead>
<tr>
<th>SENSITIVITY</th>
<th>SPECIFICITY</th>
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<tbody>
<tr>
<td>29%</td>
<td>96%</td>
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Fowler and Lubliner, 1989

McMurray TP: The Semilunar Cartilages.

Thessaly Test
Meniscal Tear Treatment

- Treatment based on mechanical symptoms of patient (PT)
- If meniscal tear disrupts mechanics of knee and patient does not respond to physical therapy, surgery is indicated
- Surgical options: Debridement (remove as little as possible) vs Repair

Meniscal Tear Treatment

Meniscus Repair

Meniscus Injuries and Repair
Patella Dislocation

Patellofemoral Instability

- Mechanism:
  - Femoral internal rotation on a fixed, externally rotated tibia
  - Often a twisting injury
  - 38% during athletics (ER + valgus)
- Direct blow to knee
- Acute hemarthrosis

MRI - PF Instability

MRI – PF Instability

Osteochondral fracture

Torn medial patellofemoral ligament
**Quadriceps Rupture**

- **Mechanisms:**
  - Indirect Trauma: forced/eccentric muscle contraction with foot planted and knee flexed
  - Typically patients older than 40 years
  - Young athlete: forced mm contraction/direct trauma
  - 3X more common than Patella tendon ruptures
  - Bilateral ruptures can occur
  - Normal tendons do not rupture under stress loading
  - Midsubstance tears: intrinsic pathology

**Quadriceps Tendon Rupture**

- Extensor lag on straight leg raise
- Tenderness at superior pole of patella
- Patella may be displaced inferiorly or is sitting low
- Swelling, bruising
**Quadriceps Rupture**

- Palpable Quad defect near patellar insertion, patella can be displaced inferiorly

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**Patellar Tendon Rupture**

- **Mechanisms**:
  - Direct Trauma most common cause
  - Typically patients younger than 40 years
  - Bilateral ruptures can occur
  - Avulsion injuries from the inferior pole of the patella > tibial tubercle
  - Midsubstance ruptures unusual
  - Normal tendons do not rupture under stress loading (often a history of pain)

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**Quadiceps rupture**

- Goal is to restore strength, gait
- Surgical repair
- Operative – no role for non-operative treatment
**Patellar Tendon Rupture**

- Extensor lag on straight leg raise
- Tenderness at inferior pole of patella
- Patella can be displaced superiorly or is sitting high
- Swelling, bruising

**Patella Tendon Rupture**

- No role of non-operative treatment
- Acute loss of extensor function
  - Operative intervention
- Brace for 8-10 weeks
- Rehabilitation

**Knee extensor injuries**

- Osgood Schlatter’s Disease
  - 10-16 years old
- Patella tendinitis
  - 20-30 years old
- Patella tendon rupture
  - 30-40 years old
- Quadriceps tendon rupture
  - 40-60 years old

**Knee Ligament Injuries**

- Palpation
- Acute swelling – injury
  - Need to find out the injured area
- Don’t miss
  - Dislocated knee
  - Lateral sided injury