Ligament Injuries to the Knee

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Knee Ligaments

6 Degrees of freedom of knee motion

- Flexion/Extension
- Varus/Valgus Rotation
- Internal/External Rotation
- Anterior/Posterior Translation
- Medial/Lateral Translation
- Proximal/Distal Translation

Different injury mechanism gives you different injuries
Common Knee Injuries

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

ACL Injury
**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
- Hyperflexion
  - fall on flexed knee with foot plantar-flexed
- Hyperextension
- Knee Dislocation (other ligaments involved)
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**

- Lateral collateral ligament, popliteus tendon, popliteofibular ligament

**Mechanisms**
- Isolated injury rare
  - usually injury occurs with PCL or multiligament injury
- Knee hyperextension with varus stress
  - posterolateral force to knee
- Severe varus stress or ext. rotation of tibia

**VARUS STRESS TESTS**

- Varus stress is applied both in full extension and in 20-30° of flexion
- Test in extension checks for injury of posterolateral corner structures
- 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
**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
- Injuries mostly at the medial femoral condyle
- Can be associated with tears of the PM capsule, the ACL, and the medial meniscus
- Contusion/ fx of the lateral femoral condyle or lateral tibial plateau is common

**Symptoms**
- Pain along the MCL
- More common on the femoral insertion
**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

**VALGUS STRESS TESTS**

- Valgus stress is applied both in full extension and in 20-30° of flexion
- Test in extension checks for injury of posteromedial corner structures
- 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**

- Shock absorbers of the knee
  - Acute injuries
  - Degenerative injuries
- 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

**Meniscus Injury**

- Shock absorbers of the knee
  - Acute injuries
  - Degenerative injuries
- 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
Meniscus Injury

JOINT LINE TENDERNESS

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

Fowler and Lubliner, 1989

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<th>SENSITIVITY</th>
<th>SPECIFICITY</th>
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<td>30%</td>
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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.

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<th>SENSITIVITY</th>
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<td>96%</td>
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Fowler and Lubliner, 1989

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
Meniscus Injuries and Repair

Mechanism:
- Femoral internal rotation on a fixed, externally rotated tibia often a twisting injury
- 38% during athletics
- Direct blow to knee
- Acute hemarthrosis

Patellofemoral Instability

Mechanism:
- Femoral internal rotation on a fixed, externally rotated tibia often a twisting injury
- 38% during athletics
- Direct blow to knee
- Acute hemarthrosis
**MRI - PF Instability**

- Torn medial patellofemoral ligament
- Osteochondral fracture

**Patella Dislocation**

- First time dislocation
  - Most often non-operative rx
  - Operative treatment
    - If there are loose fragments or fractures
    - Avulsion injuries
- Immobilize with brace for first 3-4 weeks, then start ROM
- Avoid cutting sports early on

**Quadriceps Rupture**

**Mechanisms:**

- Indirect Trauma: forced/eccentric muscle contraction with foot planted and knee flexed
- Typically patients older than 40 years
- 3X more common than Patella tendon ruptures
- Bilateral ruptures can occur
  - Usually for patients with chronic disease or steroid use
- **Normal tendons** do not rupture under stress loading
**Quadriceps 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**

- Extension Lag

**Quadriceps Rupture**

- Palpable Quad defect near patellar insertion, patella can be displaced inferiorly
Quadriiceps rupture
- Goal is to restore strength, gait
- Surgical repair
- Operative – no role for non-operative treatment

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)

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 - Pain can tell you where the injury is
- Acute swelling – injury
  - Immediate swelling
    - ACL/PCL
    - Patella dislocation
    - Fractures
  - Delayed swelling – 24 hours
    - Meniscus
    - Localized swelling
      - MCL

**Don’t Miss**
- Dislocated knee
- Lateral sided injury
- Extensor mechanism injuries
  - Active extension
  - Not just straight leg raise