Knee Pathology 1

PT 614

Objectives

- Pathology - Patellofemoral
  - Subluxations/dislocations
  - Plica syndrome
  - Osgood-Schlatters
  - Patellar/Quadriceps Bursitis
  - Patellofemoral pain syndrome

- Pathology - Tibiofemoral
  - ACL injury
  - PCL injury
  - Instability
  - Special Tests for each pathology
Patellofemoral Joint Dysfunction

Subluxation/Dislocation

- Mechanism
  - Great majority of dislocations are lateral
  - Contact injury occur from varus or ER directed force while the knee is extended
  - Non-contact injury occur from increased tibial ER with the knee extended
- Recurrent subluxations due to:
  - Increased Q-angle (> 20°)
  - Shallow intercondylar groove
  - Patella alta
  - Most commonly present in adolescent females
  - Tight lateral retinaculum
  - Inadequate medial stabilizers
Subluxation/Dislocation

- Clinical manifestations
  - Pain on the lateral patella and medial soft tissues
  - Swelling medially and laterally with lateral sublux
  - Apprehension with knee extension
  - Increased pain with terminal knee flexion
  - Patient most comfortable with knee in 30-60° of flex (close packed position for PF jt.)
  - Weakness in the VMO
  - Tightness in the ITB

Plica Syndrome

- Plica is a crescent-shaped fold of synovial tissue in the PF joint present in only a portion of the population
- Most commonly found in the medial aspect of the patella
- Pain develops from the plica getting entrapped in the PF joint during AROM
- If acute, tissue is painful with palpation
Plica Syndrome

Patients typically c/o of:
- Pain with sustained knee flexion (theatre’s sign)
- Snapping or popping in the knee during AROM

Diagnosis:
- Palpation will reveal:
  - Thickened ridge medial to patella
  - If flex knee to 30° and push patella medially, often pain is produced
- + Mediopatellar plica test
- + Hughston’s plica test
- + Medial plica test

Plica Syndrome

- Mediopatellar Plica Test
- Medial plica test
- Hughston’s plica test
Osgood-Schlatters Disease

- Defined as separation of the patellar tendon and the cortical bone it attaches too away from the tibial tuberosity
- Considered a disease due to the presence of increased numbers of chondrocytes in the separated bone which then forms cartilage
  - Gradually the cartilage will ossify resulting in a large prominence of the tibial tuberosity
- Presents in adolescents during or following a rapid growth spurt coupled with overuse

Musculoskeletal Impairments III

Osgood-Schlatters Disease

- Predominately occurs in individuals involved in jumping or running sports
- Patients typically complain of:
  - Localized pain and swelling to the tibial tuberosity
  - Pain with running or jumping
  - Pain develops gradually and is rarely severe
- Diagnosis:
  - X-ray or bone scan required for definitive diagnosis and severity of avulsion
  - Palpation of the tibial tuberosity eliciting pain as well as pain with MMT of quadriceps
  - Differential diagnosis with patellar tendonitis or bursitis

Musculoskeletal Impairments III
Patellar Bursitis

- Prepatellar and suprapatellar bursa are most commonly involved
  - AKA “housemaids” or “nursemaids” knee
- Mechanism of injury:
  - Bunt force trauma
  - Repetitive and prolonged compression from kneeling
- Similar presentation to patellar tendonitis and osgood-schlatter’s disease
- Significant swelling on the knee when acute
**Patellar/Quadriceps Tendonitis**

- An overuse injury characterized by pain along the respective tendon
- Contributing factors include:
  - Decreased flexibility of the hamstrings, gastroc and/or ITB
  - Increased foot/ankle pronation
  - Genu valgum/femoral anteverision
  - Decreased strength in the quadriceps (VMO)
- Spontaneous rupture can occur
  - Occurs primarily from forceful eccentric contraction during a fall or from sport/recreational activity

**Clinical manifestations**

- Localized pain along the tendon
- Pain with MMT quadriceps
- Pain best in the morning and progressively increases throughout the day
- Relief with anti-inflammatory medications
- Pain sharp in acute cases
- Typically has only mild swelling
Patellofemoral Pain Syndrome

- Anterior knee pain is estimated to account for 25-40% of all knee problems seen in sports medicine rehab facilities.
- Dye et al. theorizes that PFPS develops from pathological processes including:
  - Peripatellar synovitis
  - Increased intraosseous pressure
  - Increased intraosseous remodeling

Diagnoses associated with PFPS:
- Quadriceps or patellar tendonitis
- Arthritis
- Chondromalacia patella
- Referred pain from lumbosacral or hip
- Osgood-Schlatters disease
Patellofemoral Pain Syndrome

- Predictors (Witvrouw et al.):
  - Tightness in the gastroc and quadriceps
  - Delayed reflex of the VMO
  - Hypermobility of the patella
  - Decreased power of the quadriceps

- Causes:
  - Decreased strength or activation rate of the VMO
  - Increase in Q-angle

Patellofemoral Pain Syndrome

- Causes of change in Q-angle (Cont.):
  - Tibial rotation
    - Increased tibial IR leads to a decreased Q-angle
    - Increased pronation produced tibial IR which decreases the Q-angle
    - Research does not support equal changes in tibial rotation with rearfoot pronation
Patellofemoral Pain Syndrome

- Causes of change in Q-angle (Con't):
  - Femoral rotation
    - Femoral IR may increase Q-angle
  - Occurs from:
    - Compensation for decreased tibial ER in terminal extension
    - Weakness in gluteus medius

Musculoskeletal Impairments III

Patellofemoral Pain Syndrome

- Causes of change in Q-angle (Con't):
  - Knee valgus
    - May occur from increased coxa varum
    - Tends to increase with age
    - Increases Q-angle
    - Leads to increased lateral compression force in PF joint

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Patellofemoral Dysfunction

- Clark Sign (49/75)
- Q-angle (NT/NT)
- Lateral pull test (25/100)
- Vastus medialis coordination test (17/93)
- Eccentric step test (42/82)

Knee Instability
Swelling

- Measurement of muscle bulk/effusion
  - PT marks at various levels
  - Common points:
    - 6 inches below apex of patella
    - Apex of patella or joint line
    - 2”/4”/6”/9” above base of patella

Knee Instabilities

[Diagram showing knee structures and instabilities]
**Knee Instabilities – anterior/medial**

Table 16-1

Primary and Secondary Restraints of the Knee

<table>
<thead>
<tr>
<th>Tibial Motion</th>
<th>Primary Restraint</th>
<th>Secondary Restraints</th>
</tr>
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<tbody>
<tr>
<td>Anterior translation</td>
<td>ACL, MCL, LCL</td>
<td>middle third of medial and lateral capsule; iliotibial band</td>
</tr>
<tr>
<td>Posterior translation</td>
<td>PCL, MCL, LCL</td>
<td>posterior third of medial and lateral capsule; popliteus tendon; anterior and posterior meniscofemoral ligaments</td>
</tr>
<tr>
<td>Valgus rotation</td>
<td>MCL, ACL, PCL</td>
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</tr>
<tr>
<td>External rotation</td>
<td>MCL, LCL</td>
<td>Anterior and posterior meniscofemoral ligaments</td>
</tr>
<tr>
<td>Internal rotation</td>
<td>ACL, PCL</td>
<td></td>
</tr>
</tbody>
</table>


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**Knee Instabilities – Medial**

Musculoskeletal Impairments III
Knee Instabilities – Medial

![Image of knee structures]

**Figure 21-10**
Superior view of the cruciate ligaments. (Reproduced from Scott WN, The Knee, St. Louis, MO, Mosby, 1994, p. 20, with permission from Elsevier.)

Musculoskeletal Impairments III

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**Knee Instabilities – posterior/lateral**

**Table 16-1**
Primary and Secondary Restraints of the Knee

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</tr>
<tr>
<td></td>
<td>PCL</td>
<td>MCL, LCL; posterior third of medial and lateral capsule; popliteus tendon; anterior and posterior meniscofemoral ligaments</td>
</tr>
<tr>
<td>Posterior translation</td>
<td>MCL</td>
<td>ACL, PCL; posterior capsule when knee is fully extended</td>
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<td>Internal rotation</td>
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</tbody>
</table>


ACL, anterior cruciate ligament; MCL, medial collateral ligament; LCL, lateral collateral ligament; PCL, posterior collateral ligament.

Musculoskeletal Impairments III
Knee Instabilities – Lateral

Knee Instabilities – Medial
Posterolateral Instability/Pain

PCL Injury

- Function in limitation of motion:
  - Strongest of all ligaments in the knee
  - Able to resist twice the force as the ACL
  - Has a blood supply from the middle genicular artery
  - Has a nerve supply from the posterior tibial nerve
  - Provides substantial proprioceptive information to the brain
  - A major restraint to rotation of the tibia when the knee is flexed
  - Tension in the PCL increases with tibial IR
  - Primary function is to resist posterior translation of the tibia providing 90 to 95% of the total restraint
  - Maximal tension to the PCL occurs in full knee flexion
  - Most common mechanism of injury is when the knee is maximally flexed and the tibia is IR
Posterolateral Instability

- Injury to the PCL, LCL, arcuate ligament and popliteus
- Posterolateral compartment is the primary restraint to posteriorly directed forces at 30 degrees of knee flexion
- Undiagnosed injuries lead to increased stress to the ACL and medial meniscus
- Mechanism of injury is hyperextension with lateral rotation

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Posterolateral Instability

- Clinical manifestations
  - Patients c/o a feeling of instability in hyperextension due to excessive external rotation with the screw home mechanism
  - Pain gradually moves from the lateral compartment to the medial compartment as the ACL and medial meniscus become strained

Musculoskeletal Impairments III
PCL/Posterior Rotary Instability

- Posterior:
  - Posterior Drawer (90/99)
  - Posterolateral drawer test
- Posterolateral:
  - Arcuate spin test
  - Jakob Test (reverse-pivot-shift) (26/95)
- Posterolateral:
  - Dial test

Anteromedial Instability/Pain
**Function in limitation of motion:**
- At 30 and 90° of knee flexion provides 85% of the restraining force to anterior tibial translation
- Anteromedial bundle provides this restraint
- Posterolateral bundle will restrain anterior translation from 20° flexion to full extension
- Greatest amount of laxity found at 40° of flexion
- Has a direct blood supply from the middle genicular artery
- Has a nerve supply from the posterior tibial nerve
- Provides substantial proprioceptive information to the brain

**Mechanism:**
- Most frequent between 20 – 40 y.o.
- Most commonly injured ligament
- Contact
  - Blow to lateral knee (valgus force)
  - “unhappy” triad
- Non-contact
  - Rotational mechanism (tibial ER)
  - Forceful hyperextension
- Quadriceps avoidance gait
  - ACL deficient knee
  - Reduction in magnitude of flexion moment during limb loading
Collateral Ligament Injury

- MCL/LCL:
  - Valgus/varus Stress (100/NT)
- Anterior:
  - Lachman’s (96/100)
  - Anterior Drawer (39/78 – acute; 92/91 – chronic)
  - Anterior drawer modification #2
  - Anterior drawer modification #3
  - Anterior drawer modification #4
- Anterolateral
  - Pivot-shift (6/100)
  - Soft pivot-shift

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