THE KNEE

PTA 216
THE KNEE

• Comprised of 2 joints
  • Tibiofemoral
  • patellofemoral

Dutton, 2012. pg. 513
THE KNEE

- Movement occurs in 2 planes
  - Sagittal
    - Flexion
    - Extension
  - Transverse
    - Internal Rotation (IR)
    - External Rotation (ER)

Dutton, 2012. pg. 513
KNEE ANATOMY

Dutton, 2012. pg. 514
LIGAMENTS OF THE KNEE

- Fibular collateral ligament
- Posterior cruciate ligament
- Anterior cruciate ligament
- Tibial collateral ligament
- Patellar ligament

Dutton, 2012. pg. 514
## LIGAMENTS OF THE KNEE

### Table 20-1: Ligaments of the Knee Joint Complex

<table>
<thead>
<tr>
<th>Ligament</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior cruciate ligament (ACL)</td>
<td>Resists anterior translation of the tibia relative to a fixed femur</td>
</tr>
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<td>Resists the extremes of knee extension</td>
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</table>
THE KNEE

- Susceptible to injury due to the positioning of the joint
  - 2 long levers meeting at the joint and stabilized by ligaments

Magee, 2008. pg. 727
Patello-Femoral Syndrome

- Deviations of patellar tracking throughout knee flexion and extension causing pain and inflammation
- Patient may report pain with:
  - Ascending/descending stairs
  - Squatting
  - Kneeling
  - Transferring from sit to stand

*Most common in women secondary to an increased Q-angle

Dutton, 2008. pg. 798
Patello-Femoral Syndrome

- Rehabilitation includes:
  - Stretching the hamstrings
  - Modalities as needed
  - Strengthening the quadriceps
    - (specifically the VMO)
  - Strengthening the hip ABDuctors and hip flexors
  - Bracing and/or taping as needed
Chondromalacia of the Patella

- Softening of the cartilage of the knee, usually following injury
- Characterized by:
  - edema,
  - pain, and
  - degenerative changes
- Rehabilitation includes: decreasing pain and inflammation, increasing strength & flexibility
Dislocation of the Patella

- Occurs when the patella fully dislocates from within the trochlear groove of the femur, resting outside of the knee joint.
- First dislocation is a pre-disposition to further dislocations secondary to the tearing of the medial patello-femoral ligament (MPFL).
- Treatment
  - Strengthening, stabilizing, and bracing.
Dislocation of the Patella

- Surgical intervention
  - Lateral Release: the tight lateral structures are cut to allow better anatomic positioning of the patella in the trochlear groove

- Cautious movement in knee flexion is initiated early to prevent scarring down of the released structures

Shankman, 2011. pg. 281
Rehabilitation Process

- Control of pain and inflammation
- Early stretching
- Gentle strengthening
- Manual patellar stretching
Osteochondritis Dissecans

- Joint disease in which a piece of cartilage and neighboring bone tissue become detached from the articular surface

- Symptoms:
  - Pain
  - Clicking in the joint
  - Tenderness
  - Edema
  - Stiffness
Osteochondritis Dissecans

- Conservative treatment is usually successful:
  - Rest
  - Immobilization
  - Anti-inflammatory medication
  - Modified activity (approx. 6-8 weeks)
  - Physical Therapy: stretching, ROM, strengthening exercises and low impact cardiovascular activity

*Surgical intervention would include stabilization and/or removal of fragments*
Fracture of the Tibial Plateau

- Most commonly:
  - direct trauma (fall)
- Less commonly:
  - a rotational injury
- Displaced or non-displaced

Treatment
- Conservative
  - early ROM, limited weight bearing, gentle strengthening as indicated by physician
- ORIF

Shankman, 2011. pg. 283
Ligamentous Injuries

- Common injuries of the knee
  - can vary significantly in severity

- Can occur
  - straight plane
  - with rotation

- Graded according to severity
Ligamentous Injuries

- **Anterior Cruciate Ligament (ACL)**
  - Result of ER, valgus stress, internal tibial rotation and possibly hyperextension

- **Posterior Cruciate Ligament (PCL)**
  - Result of posteriorly directed trauma

Shankman, 2011. pg. 263, 270
Ligamentous Injuries

- Medial Collateral Ligament (MCL)
  - Result of valgus force, abduction, or rotation
- Lateral Collateral Ligament (LCL)
  - Result of varus force

Shankman, 2011. pg. 272
Grading of Ligamentous Injuries:

- Grade I: Incomplete stretching of the ligament
  - Minimal pain, minimal to no edema, no loss of function, and no clinical instability

Shankman, 2011. pg. 263
Grading of Ligamentous Injuries:

- Grade II: partial loss in ligament fiber continuity, some ligament fibers are torn although the majority of fibers are intact
  - Moderate pain and edema with minimal loss of function and joint stability

Shankman, 2011. pg. 263
Grading of Ligamentous Injuries:

- Grade III: complete tearing of all ligament fibers with no continuity noted
  - Significant pain and edema with loss of function and joint stability

*Please note that edema/pain associated with a Grade III sprain will usually subside in approximately 3-4 days

Shankman, 2011. pg. 263
Ligament Reconstruction:

- 2 types of grafts used for reconstruction purposes
  - Autograft: tissue harvested from the body of the patient
    - Hamstring, Achilles, patellar, quadriceps
  - Allograft: tissue harvested from the body of a donor (usually from a cadaver)

Autograft (quadriceps tendon)

Allograft (patellar tendon and Achilles tendon)

Dutton, 2012. pg. 530
Meniscal Injuries

- Meniscus: cartilagenous tissue which serves as an extension of the tibia providing support of the femoral condyles on the surface of the tibia
- Functions of the meniscus:
  - Stability
  - Shock Absorption
  - Load transmission
  - Control of motion
  - Nutrition
  - Lubrication

Shankman, 2011. pg. 274
Meniscal Injuries:

- Mechanism of injury:
  - Trauma (usually a combination of knee flexion, rotation, compression, and shear)
  - Gradual degeneration: subtly with no specific injury
Meniscal Injuries:

- Injuries are marked by edema, catching and/or locking within the joint
- Management of these injuries is based upon the severity and location of the tear
  - Surgical Treatment:
    - removal of the damaged portion of the meniscus
  - Non-surgical Interventions:
    - decrease pain and inflammation, increase strength and increase joint stability

Examples of Meniscal Injuries

Shankman, 2011. pg. 276
Knee Arthroplasty

- Removal of the articular surface of the tibia and femur (occasionally includes the patella) and replacing them with metal or plastic
- Primary indications for total knee arthroplasty (TKA) include:
  - Osteo-arthritis (OA)
  - Degenerative Joint Disease (DJD)

Shankman, 2011. pg. 285
SPECIAL TESTS FOR THE KNEE
Patellar Apprehension Test

- Patient lies supine with the test leg relaxed in approximately 30 degrees of flexion. The examiner places both hands on the medial border of the patella.
- The patient remains relaxed with no quadriceps contraction while the examiner gently pushes the patella laterally.
Patellar Apprehension Test

- This test is considered positive if:
  - the patient contracts the quadriceps or reacts apprehensively to the test.

- Indicative of:
  - patellar subluxation
  - and/or dislocation

Cook, 2013. pg.469
Apley Compression Test

- The patient lies prone
  - test knee flexed to 90°
- The examiner stands
  - proximal hand on the patient’s forefoot
  - the distal hand on the patient’s heel
- The tester medially and laterally rotates the tibia while applying a downward pressure through the heel.
Apley Compression Test

- Positive finding:
  - Pain, clicking, or movement restriction
    - indicating a medial or lateral meniscus tear (depending on location of symptoms)

Konin, 2006. pg. 310
Clarke’s Test

- With the patient in supine with knees supported
- The tester places the web of the thumb on the superior border of the patella applies a downward and inferior pressure on the patella as...
- The patient is asked to contract the quadriceps muscle
- Pain and/or inability to complete the test are indicative of chondromalacia of the patella

Konin, 2006. pg. 255
Godfrey 90/90 Test

- The patient is supine on a plinth with the hip and knee of the involved side flexed to 90°
  - stabilize the position of the patient’s hip and knee while observing the location of the tibia
  - if the tibia is resting more inferiorly on one side, it may indicate a posterior cruciate sag, which would indicate possible PCL injury

Cook, 2013. pg. 453
Anterior Lachman’s Test

- The patient supine with the test knee flexed to 15 degrees, the examiner on the involved side with one hand on the patient’s distal thigh and the other hand on the patient’s proximal tibia.
- The tester will apply an anterior force on the tibia with the distal hand while stabilizing the femur.

Cook, 2013. pg. 445
Anterior Lachman’s Test

- Increased anterior translation of the tibia as compared to the contra-lateral side, with a diminished or absent end point is indicative of partial or complete tear of the ACL.
Valgus Stress Test

- With the patient’s knee in full extension and the examiner on the involved side
  - The tester will have the distal hand on the medial ankle and the proximal hand on the lateral knee
- The tester applies a medial (valgus) force at the knee

Cook, 2013. pg. 467
Valgus Stress Test

- Medial knee pain and/or increased valgus movement with a diminished or absent end point may be indicative of ACL, PCL, or joint capsule involvement in full knee extension.
- In 20-30° of flexion, a similar positive finding would be indicative of MCL involvement.
Varus Stress Test

- With the patient in supine and the knee fully extended, the tester stands on the involved side with the proximal hand on the patient’s medial knee and the distal hand on the lateral ankle.

- With the ankle stabilized, the tester applies a varus (lateral) force to the knee with the proximal hand.

Cook, 2013. pg. 468
Varus Stress Test

- Lateral knee pain and increased varus movement with a diminished or absent end feel is indicative of ACL, PCL, or joint capsule involvement in full extension.
- Positive findings in 20-30° of knee flexion is indicative of LCL involvement.
Exercises for the Knee
Heel Slide
Step Ups
Resisted Walking
Single Leg Stance
Straight Leg Raises (SLR)
Straight Leg Raises (Extension)
Straight Leg Raises in Abduction (ABD)
Short Arc Quads (SAQ)
Standing Hamstring Curls
Bibliography