Chapter 20: The Knee and Other Structures
Guided Notes

• Complex joint that endures great amounts of trauma due to extreme amounts of stress that are regularly applied
• ___________________ joint w/ a rotational component
• Stability is due primarily to ___________________, joint capsule and muscles surrounding the joint
• Designed for stability w/ weight bearing and mobility in locomotion

Functional Anatomy

• Movement of the knee requires ___________________, extension, rotation and the arthokinematic motions of rolling and gliding
• Rotational component involves the “__________________________”
  – As the knee extends it externally rotates because the medial femoral condyle is larger than the lateral
  – Provides increased stability to the knee
  – Popliteus “__________________________” knee allowing knee to flex
• Deeper capsular ligaments remain taut to keep rotation in check
• ______________ prevents excessive internal rotation, limits anterior translation and posterior translation when tibia is fixed and non-weight bearing, respectively
• ______________ stops excessive internal rotation, stabilizes the knee in full extension and prevents hyperextension
• Range of motion includes ______________ degrees of motion
  – Limited by shortened position of hamstrings, bulk of hamstrings and extensibility of quads
• Patella aids knee during extension, providing a mechanical advantage
  – Distributes compressive stress on the femur by increasing contact between patellar tendon and femur
  – Protects patellar tendon against friction
  – When moving from extension to flexion the patella glides laterally and further into trochlear groove

• ______________
  – Directly affected by motions and forces occurring at the foot, ankle, lower leg, thigh, hip, pelvis, and spine
  – With the kinetic chain forces must be absorbed and distributed
  – If body is unable to manage forces, breakdown to the system occurs
  – Knee is very susceptible to ______________ resulting from absorption of forces

Assessing the Knee Joint

• Determining the ______________ of injury is critical
• History- Current Injury
  – Past history
  – Mechanism- what position was your body in?
  – Did the knee collapse?
  – Did you hear or feel anything?
  – Could you move your knee immediately after injury or was it locked?
  – Did swelling occur?
  – Where was the pain
• History - Recurrent or Chronic Injury
  – What is your major complaint?
  – When did you first notice the condition?
  – Is there recurrent swelling?
  – Does the knee lock or catch?
  – Is there severe pain?
  – Grinding or grating?
– Does it ever feel like giving way?
– What does it feel like when ascending and descending stairs?
– What past treatment have you undergone?

• Observation
– Walking, half squatting, going up and down stairs
– Swelling, ecchymosis,
– Leg alignment
  • Genu valgum and genu varum
  • Hyperextension and hyperflexion
  • Patella alta and baja
  • Patella rotated inward or outward
    • May cause a combination of problems
  • Tibial torsion, femoral anteversion and retroversion

• Tibial torsion
  – An angle that measures less than ________ degrees is an indication of tibial torsion

• Femoral Anteversion and Retroversion
  – Total rotation of the hip equals ~__________ degrees
  – If the hip rotates >70 degrees internally, anteversion of the hip may exist
  – Knee Symmetry or Asymmetry
    • Do the knees look symmetrical? Is there obvious swelling? Atrophy?
  – Leg Length Discrepancy
    • Anatomical or functional
    • _________________ differences can potentially cause problems in all weight bearing joints
    • _________________ differences can be caused by pelvic rotations or mal-alignment of the spine

• Palpation - Bony
  • Medial tibial plateau
  • Medial femoral condyle
  • Adductor tubercle
  • Gerdy’s tubercle
  • Lateral tibial plateau
  • Lateral femoral condyle
  • Lateral epicondyle
  • Medial epicondyle
  • Head of fibula
  • Tibial tuberosity
  • Patella
  • Superior and inferior patella borders (base and apex)
  • Around the periphery of the knee relaxed, in full flexion and extension

• Palpation - Soft Tissue
  o Vastus medialis
  o Vastus lateralis
  o Rectus femoris
  o Quadriceps and patellar tendon
  o Sartorius
  o Medial patellar plica
  o Anterior joint capsule
  o Iliotibial Band
  o Arcuate complex
  o Medial and lateral collateral ligaments
- Pes anserine
- Medial/lateral joint capsule
- Semitendinosus
- Semimembranosus
- Gastrocnemius
- Popliteus
- Biceps Femoris

- Palpation of Swelling
  - Intra vs. extracapsular swelling
  - Intracapsular may be referred to as joint effusion
  - Swelling w/in the joint that is caused by synovial fluid and blood is a hemarthrosis
  - Sweep maneuver
  - Ballotable patella - sign of joint effusion
  - Extracapsular swelling tends to localize over the injured structure
    - May ultimately migrate down to foot and ankle

- Special Tests for Knee Instability
  - Use ______________ feel to determine stability
  - ____________ may also be necessary for assessment
  - Classification of Joint Instability
    - Knee laxity includes both straight and rotary instability
    - Translation (tibial translation) refers to the glide of tibial plateau relative to the femoral condyles
    - As the damage to stabilization structures increases, laxity and translation also increase
  - Collateral Ligament Stress Tests (_______________ and ________________)
    - Used to assess the integrity of the ______________ and ________________ respectively
    - Testing at 0 degrees incorporates capsular testing while testing at 30 degrees of flexion isolates the ligaments
  - Anterior Cruciate Ligament Tests
    - Drawer test at 90 degrees of flexion
      - Tibia sliding ______________ from under the femur is considered a positive sign (ACL)
      - Should be performed w/ knee internally and externally to test integrity of joint capsule
      - Will not force knee into painful flexion immediately after injury
      - Reduces hamstring involvement
      - At 30 degrees of flexion an attempt is made to translate the tibia anteriorly on the femur
      - A positive test indicates damage to the ______________
    - A series of variations are also available for the Lachman Drawer Test
      - May be necessary if athlete is large or examiner’s hands are small
      - Variations include
        - ________________________________
        - Leg off the table approach with athlete supine
        - Athlete prone on table with knee and lower leg just off table
  - Posterior Cruciate Ligament Tests
  - Posterior Sag Test (______________________________)
    - Athlete is supine w/ both knees flexed to 90 degrees
    - Lateral observation is required to determine extent of posterior sag while comparing bilaterally
  - Meniscal Tests
    - ________________________________ Meniscal Test
      - Used to determine displaceable ________________ I tear
      - Leg is moved into flexion and extension while knee is internally and externally rotated in conjunction w/ valgus and varus stressing
A positive test is found when _________________ and ________________ are felt

- Compression Test
  - Hard downward pressure is applied with rotation
  - Pain indicates a meniscal injury

- Apley's Distraction Test
  - Traction is applied with _________________
  - Pain will occur if there is damage to the capsule or ligaments
  - No pain will occur if it is meniscal

- Patient stands on one leg
  - Tested with knee flexed to 5 degrees and 20 degrees
  - Patient then ________________ trunk and knee into internal and external rotation, with clinician supporting patient
  - Positive test results in pain along medial or lateral joint line
  - Perform test on healthy side first for comparison

Patellar Examination

- Palpation of the Patella
  - Must palpate around and under patella to determine points of pain
  - Patella Grinding, Compression and Apprehension Tests
  - A series of glides and compressions are performed with the patella to determine integrity of patellar cartilage

- Lines which bisect the patella relative to the ASIS and the tibial tubercle
  - Normal angle is 10 degrees for males and 15 degrees for females
  - Elevated angles often lead to pathological conditions associated with improper patella tracking

Prevention of Knee Injuries

- Physical Conditioning and _________________
  - Total body conditioning is required
    - Strength, flexibility, cardiovascular and muscular endurance, agility, speed and balance
  - Muscles around joint must be conditioned (flexibility and strength) to maximize stability
  - Must avoid abnormal muscle action through flexibility
  - In an effort to prevent injury, extensibility of hamstrings, erector spinae, groin, quadriceps and gastrocnemius is important

- Decreasing the Risk for ACL Injury
  - Focus on strength, neuromuscular control, balance
  - Series of different programs which address balance board training, landing strategies, plyometric training, and single leg performance
  - Can be implemented in rehabilitation and preventative training programs

- Change in football footwear has drastically reduced the incidence of knee injuries
  - Shoes with more short cleats does not allow foot to become ________________ - still allows for control with running and cutting

Recognition and Management of Specific Injuries

- Etiology
  - Result of severe blow from lateral side (________________________)
- Signs and Symptoms - Grade I
  - Little fiber tearing or stretching
  - Stable valgus test
• Little or no joint effusion
• Some joint stiffness and point tenderness on lateral aspect
• Relatively normal ROM

- Management
  • RICE for at least __________ hours
  • Crutches if necessary
  • Follow-up care will include cryokinetics w/ exercise
  • Move from isometrics and STLR exercises to bicycle riding and isokinetics
  • Return to play when all areas have returned to normal
  • May require 3 weeks to recover

- Signs and Symptoms (Grade II)
  • ___________________ tear of deep capsular ligament and partial tear of superficial layer of MCL
  • No gross instability; laxity at 5-15 degrees of flexion
  • Slight swelling
  • Moderate to severe joint tightness w/ decreased ROM
  • Pain along medial aspect of knee

- Management
  • RICE for ________________ hours; crutch use until acute phase has resolved
  • Possibly a brace or casting prior to the initiation of ROM activities
  • Modalities 2-3 times daily for pain
  • Gradual progression from isometrics (quad exercises) to CKC exercises; functional progression activities

- Signs and Symptoms (Grade III)
  • Complete tear of supporting __________________________
  • Complete loss of medial stability
  • Minimum to moderate____________________
  • Immediate pain followed by ache
  • Loss of motion due to effusion and hamstring guarding
  • Positive valgus stress test

- Management
  • RICE
  • Conservative non-operative versus surgical approach

- Limited immobilization (w/ a brace); progressive weight bearing and increased ROM over 4-6 week period
  • Rehab would be similar to Grade I & II injuries

- Etiology
  • Result of a __________________ force, generally w/ the tibia internally rotated
  • If severe enough damage can also occur to the cruciate ligaments, ITB, and meniscus, producing bony fragments as well

- Signs and Symptoms
  • Pain and tenderness over____________________
  • Swelling and effusion around the LCL
  • Joint laxity w/ varus testing

- Management
  • Follows management of MCL injuries depending on severity

- Etiology
  • MOI - tibia ___________________________ rotated and valgus force at the knee (occasionally the result of hyperextension from direct blow)
  • May be linked to inability to decelerate valgus and rotational stresses - landing strategies
  • Male versus female
  • Research is quite extensive in regards to impact of femoral notch, ____________________________, malalignments (Q-angle) & faulty biomechanics
factors may include, conditioning, skill acquisition, playing style, equipment, preparation time

May also involve damage to other structures including meniscus, capsule, and MCL

- Signs and Symptoms
  - Experience ____________ w/ severe pain and disability
  - Positive anterior drawer and Lachman’s
  - Rapid swelling at the joint line
  - Other ACL tests may also be positive

- Management
  - RICE; use of ______________
  - Arthroscopy may be necessary to determine extent of injury
  - Could lead to major instability in incidence of high performance
  - W/out surgery joint degeneration may result
  - ________________ may factor into surgical option
  - Surgery may involve joint reconstruction w/ grafts (tendon), transplantation of external structures
  - Will require brief hospital stay and 3-5 weeks of a brace
  - Also requires ________________ months of rehab

- Posterior Cruciate Ligament Sprain
  - Etiology
    - Most at risk during ____________ degrees of flexion
    - ________________ knee is most common mechanism
    - Can also be damaged as a result of a rotational force
    - Sometimes referred to as a “________________________”
      - May result when flexed knee of car driver or passenger hits the dashboard
  - Signs and Symptoms
    - Feel a pop in the ______________ of the knee
    - Tenderness and relatively little swelling in the popliteal fossa
    - Laxity w/ posterior ______________
  - Management
    - RICE
    - Non-operative rehab of grade I and II injuries should focus on quad strength
    - Surgical versus non-operative
      - Surgery will require 6 weeks of immobilization in extension w/ full weight bearing on crutches
      - ROM after 6 weeks and PRE at 4 months

- Medial meniscus is more commonly injured due to ligamentous attachments and decreased mobility
  - Also more prone to disruption through torsional and valgus forces
  - Most common MOI is rotary force w/ knee flexed or extended
  - Tears may be longitudinal, oblique or transverse

- Signs and Symptoms
  - Effusion developing over ______________ hour period
  - ________________ pain and loss of motion
  - Intermittent locking and giving way
  - Pain w/ squatting
  - Portions may become detached causing locking, giving way or catching w/in the joint
  - If chronic, recurrent swelling or muscle atrophy may occur

- Management
  - If the knee is not locked, but indications of a tear are present further diagnostic testing may be required
• If locking occurs, anesthesia may be necessary to unlock the joint w/ possible arthroscopic surgery follow-up
• W/ surgery all efforts are made to____________________ the meniscus -- with full healing being dependent on location
• ______________________ rehab allows partial weight bearing and quick return to activity
• Repaired meniscus will require immobilization and a gradual return to activity over the course of 12 weeks

• Joint Contusions
  – Etiology
    • ______________________ to the muscles crossing the joint (vastus medialis)
  – Signs and Symptoms
    • Present as knee sprain, severe _____________, loss of movement and signs of acute inflammation
    • Swelling, discoloration
    • Possible capsular damage
  – Management
    • RICE initially and continue if swelling persists
    • Gradual progression to normal activity following return of ROM and padding for protection
    • If swelling does not resolve w/in a week a chronic condition (synovitis or bursitis) may exist requiring more rest

• Bursitis
  – Etiology
    • Acute, chronic or recurrent swelling
    • ______________________ = continued kneeling
    • Infrapatellar = overuse of patellar tendon
  – Signs and Symptoms
    • Prepatellar bursitis may be localized swelling above knee that is ________________
    • Swelling in popliteal fossa may indicate a ______________________
      • Associated w/ semimembranosus bursa or medial head of gastrocnemius
      • Commonly painless and causing little disability
      • May progress and should be treated accordingly
  – Management
    • Eliminate cause, RICE and NSAID’s
    • ______________________ and steroid injection if chronic

• Patellar Fracture
  – Etiology
    • Direct or indirect trauma (__________________________________________)
    • Semi-flexed position with forcible contraction (falling, jumping or running)
  – Signs and Symptoms
    • Hemorrhaging and joint effusion w/ generalized ______________________
    • Indirect fractures may cause capsular tearing, separation of bone fragments and possible quadriceps tendon tearing
    • Little bone separation w/ direct injury
  – Management
    • X-ray necessary for confirmation of findings
    • RICE and ______________________ if fracture suspected
    • ______________________ and immobilize for 2-3 months

• Acute Patella Subluxation or Dislocation
  – Etiology
    • Deceleration w/ simultaneous ______________________ in opposite direction (valgus force at knee)
    • Quad pulls the ______________________ out of alignment
    • Some individuals may be predisposed
    • Repetitive subluxation will stress medial restraints
- Signs and Symptoms
  - W/ subluxation, pain and swelling, restricted ROM, palpable tenderness over adductor tubercle
  - Results in total ________________

- Management
  - Reduction is performed by flexing hip, moving patella medially and slowly extending the knee
  - Following reduction, immobilization for at least 4 weeks w/ use of crutches and isometric exercises during this period
  - After immobilization period, horseshoe pad w/ ____________________ should be used to support patella
  - Muscle rehab focusing on muscle around the knee, thigh and hip are key (STLR’s are optimal for the knee)
  - Possible ____________________ to release tight structures
  - Improve postural and biomechanical factors

• Injury to the ____________________
  - Etiology
    - May become wedged between the tibia and ____________________
    - Irritated by chronic kneeling, pressure or trauma
  - Signs and Symptoms
    - Capillary hemorrhaging and swelling
    - Chronic irritation may lead to scarring and calcification
    - Pain below the ____________________ (especially during knee extension)
    - May display weakness, mild swelling and stiffness during movement
  - Management
    - Rest from irritating activities until inflammation has subsided
    - Utilize therapeutic modalities for __________________________
    - __________________________ to prevent irritation during extension
    - Hyperextension taping to prevent full extension

• Patellofemoral Stress Syndrome
  - Etiology
    - Result of _____________________________ while tracking in femoral groove
      - Tight structures, pronation, increased Q angle, insufficient medial musculature
  - Signs and Symptoms
    - ____________________ of lateral facet of patella and swelling associated w/ irritation of synovium
    - Dull ache in center of knee
    - Patellar compression will elicit pain and crepitus
    - Apprehension when patella is forced laterally
  - Management
    - Correct _____________________________ (strength and flexibility)
    - _____________________________ taping
    - Lateral retinacular release if conservative measures fail

• Patellar Tendinitis (%Knee)
  - Etiology
    - ____________ or kicking- placing tremendous stress and strain on patellar or quadriceps tendon
    - Sudden or repetitive extension
  - Signs and Symptoms
    - Pain and tenderness at inferior pole of patella
      - ____________ phases - 1)pain after activity, 2)pain during and after, 3)pain during and after (possibly prolonged) and may become constant
  - Management
    - Ice, phonophoresis, iontophoresis, ultrasound, heat
    - Exercise
    - Patellar tendon bracing
        ____________________________________
• **Etiology**
  - Sudden, powerful __________________________
  - Generally does not occur unless a chronic inflammatory condition persists resulting in tissue degeneration
  - Occur primarily at point of attachment

• **Signs and Symptoms**
  - __________________________, lack of knee extension
  - Considerable swelling and pain (______________________)

• **Management**
  - Surgical repair is needed
  - Proper conservative care of jumper’s knee can minimize chances of occurring
  - If steroids are being used, intense knee exercise should be avoided due to weakening of collagen

• **Iliotibial Band Friction Syndrome (___________________________________________)**
  - **Etiology**
    - General expression for repetitive/overuse conditions attributed to mal-alignment and structural asymmetries
  - **Signs and Symptoms**
    - ______________
      - Irritation at band’s insertion - commonly seen in individual that have genu varum or pronated feet
      - Positive Ober’s test
    - Pes Anserine Tendinitis or Bursitis
      - Result of excessive genu valgum and weak vastus medialis
      - Often occurs due to running with one leg higher than the other (running on a slope or crowned road)
  - **Management**
    - Correction of mal-alignment
    - ______________ before and after activity
    - Utilize proper warm-up and stretching techniques
    - Avoidance of aggravating activities
    - NSAID’s and orthotics