Skis for Knees
Anatomy

• ACL
• PCL
• MCL
• LCL
• Meniscus – Medial – Lateral
THE KNEE HISTORY

- Pain (PQRST)
- Contact vs noncontact
- Effusions
- Mechanical symptoms
  - Locking
  - Instability (falls)
- Initial treatment
THE KNEE HISTORY

• Continue work/play?

• PM/SHx
  – Medications

• Occupation/Sport
  – Time tables
ACL: HISTORY

- Contact vs noncontact
- Immediate effusion (first 4-12 hr)
- Unable to continue
- Mechanism = pivot, hyperextension
Physical Exam of the Knee

- Inspection
- Palpation
- Range of Motion
- Special tests
- Neurovascular assessment
INSPECTION

- Effusion
- Erythema
- Ecchymosis
- Edema

- Q angle
- Angular deformities
- Muscular asymmetry
PALPATION

ANTERIOR
- Tibial tubercle
- Infrapatellar tendon
- Quad insertion
- Patellar facets
- Crepitus?

MEDIAL
- MCL
- Meniscus
- Pes anserine insertion
- Tibial plateau
- Femoral condyle
PALPATION

**LATERAL**
- Head of the fibula
- LCL
- Meniscus
- Tibial plateau
- Femoral condyle
- Gerdy’s tubercle

**POSTERIOR**
- Menisci (posterior horns)
- Popliteal fossa
- Hamstring tendons
ACL Special Tests

- Anterior drawer
- Lachman test
- Pivot shift test
- Valgus stress test at full extension!
## Grading Ligament Injuries

<table>
<thead>
<tr>
<th>GRADE 1</th>
<th>No instability</th>
<th>Good endpoint</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRADE 2</td>
<td>Some instability</td>
<td>Fair endpoint</td>
</tr>
<tr>
<td>GRADE 3</td>
<td>Opens wide</td>
<td>Poor endpoint</td>
</tr>
</tbody>
</table>
ACL: PHYSICAL EXAM

• Decreased ROM
• Effusion-hemarthrosis, immediate
• + Instability tests
  – Lachman: most accurate
  – Pivot shift
  – Anterior drawer
• ± MCL and meniscus tests
LIGAMENT EXAM
Translation +
ENDPOINTS!
+ PIVOT SHIFT

Palpable clunk as the lateral tibial condyle reduces on the femur
LIGAMENT INJURIES: DIAGNOSIS

- Serial Exams
- Plain radiography
- Arthrocentesis ?
- MRI??
- KT-2000???
LIGAMENT INJURIES:

- A P
  - Lateral capsular sign: Segond fx
  - Tibial spine avulsion fx
  - Physeal injuries
- Lateral
  - Lateral condyle divot
  - Obliques ?
- Tangential (Merchant)

Lateral capsular disruption
MRI: If you must...
The Use of MRI in Evaluation of Knee Injuries

• Sensitivity
  M. Meniscus  73-100%
  L. Meniscus  55-90
  ACL       91-100

• Specificity
  MM        55-97
  LM        94-98
  ACL       99-100
The Use of MRI in Evaluation of Knee Injuries

- + PV
  - M. Meniscus: 81-98%
  - L. Meniscus: 90-95
  - ACL: 93-100

- - PV
  - MM: 86-100
  - LM: 70-97
  - ACL: 99-100
The REAL Question -

Is MRI \textit{that} much better than clinical exam?

  - Compared accuracy of clinical exam vs MRI
  - In 154 pts, clinical exam was as good as MRI
- Many articles comparing MRI to arthroscopy
“Partial” ACL tear

- > 40% ACL substance
- + Lachman, - pivot shift
- Clinically
  - Most behave functionally as full tears
  - Continued shifting ↑’s risk of meniscus damage
  - Rx as full tear
The Utility of Arthrocentesis

• Indications
  – Diagnosis in question
    • ? Infectious/Metabolic process
  – Tense effusion

• Indications for surgery

• Timing of surgery
ACL TREATMENT

• Grade 3- Nonsurgical
  – ? modify activity
  – PRICES
  – Hamstrings, gastroc!
  – Functional bracing?
  – 100% @ 9-12 months
ACL TREATMENT

• Grade 3 Injuries- Surgery
• Indications
  – Most active people will require surgery to restore adequate function and decrease instability
  – Recurrent instability
  – Inability to modify activity
  – Associated injuries: meniscus
  – Age?
• Wait three weeks due to arthrofibrosis risk
• 100% @ 6-12 months
MCL INJURIES

HISTORY

• Mechanism = valgus stress
• Medial joint line pain
• Lack of large effusion
• Difficulty weight-bearing
MCL INJURIES

PHYSICAL EXAM

- Tender to palpation along MCL
- Pain + instability with valgus stress
  - $30^\circ$ flexion = MCL
  - $90^\circ$ flexion = associated ACL
- Pain with Apley’s distraction test
- COMPARE SIDES
MCL INJURIES

Treatment Of Grade 1 & 2

- Early mobilization
- Weight-bearing as tolerated
- Hinged knee brace
- PRICES
- Recovery 4-6 weeks
MCL INJURIES

Treatment of Grade 3 (full tears)

• Isolated = nonsurgical management
• Combined = surgery consistent with associated injuries
• Natural Hx = lack of long-term degenerative changes seen with ACL, meniscus
PCL INJURIES

• Mechanism
  – Sports = fall on flexed knee with foot plantarflexed, hyperextension, pivot
  – MVA = dashboard injury

• Effusion (less than with ACL)

• Shifting/instability (chronic)

• Less distinctive
PCL INJURIES

PHYSICAL EXAM

• + Effusion
• + Posterior drawer test
• + Posterior sag sign
• False positive Lachman test
• Common to have isolated injuries
PCL INJURIES

TREATMENT

• PRICES
• Functional bracing (early)
• Rehab
• Surgery if continued instability, effusions
• Note- 2% of NFL preseason exam with incidental isolated PCL tear
Quad Musculature

- VMO - terminal extension
- VLO
- Rectus femoris
Patellofemoral Arthralgia

Often referred to as chondromalacia patella. This term should be reserved for observed articular cartilage damage.
PFA-HISTORY

- PQRST of pain
- Pain with:
  - Stairs
  - Prolonged sitting
  - Deep squat activities
- Lack of effusions, locking, instability
PFA-HISTORY

- Theatre sign- pain with prolonged sitting (as in theatre or planes)
- Pain with stairs
• Grasshopper eyes
• Genu valgus (high Q angle)
  – Male < 10°
  – Female < 15°
• Pain to palpation peripatellar + crepitus + leg length discrepancy
PHYSICAL EXAM

- Patellar compression/grind tests
- No patellar apprehension
- Poor hamstring flexibility
- ± “J” sign
- Normal ligaments, meniscus
- Lack of effusion
XRAYS

- AP
- Lateral
- Tangential

2 cm
KNEE- LATERAL XRAYS

• Patella alta/baja
  – Insall and Salvati ratio > 1.20
  – Blumensaat
• Patellar poles
• Fat pads/ bursae
• Evaluate avulsion fx
KNEE- TANGENTIAL XRAYS

- Assess patellofemoral joint
- Patellar tilt
- Lateralization
- Depth of trochlear groove
Lateralization and Tilt
PFA MANAGEMENT

• PRICES

• Quad strengthening, hams

• Flexibility

• VMO exercises

• Modalities

• Patellar taping

• Correct leg length discrepancy
PATELLAR INSTABILITY

• Acute patellar dislocation
• Acute patellar subluxation
• Patellar tracking dysfunction
PATELLAR DISLOCATION

History

• Mechanism = pivot
• Immediate effusion
• May visualize patella dislocated laterally
• ± Instability (chronically)

N.B. Patella spontaneously relocates
PATELLAR DISLOCATION

Physical Exam

• Tender peripatellar structures
  – Medial retinaculum
  – Lateral femoral condyle
• Effusion
• ? Patella dislocated laterally

Xrays- osteochondral fracture, effusion
PATELLAR DISLOCATION

Treatment

• Knee extension immobilizer x 4 wks
• Early quad setting exercises
• PRE’s at 4 wks to pain tolerance
• Return to sport
  – Full, painless ROM
  – Normal strength
  – Adequate aerobic fitness
Biology of the Meniscus

- **Medial Meniscus**
- **Semilunar**
- **Narrow anteriorly**
- **Adherent to MCL**
- **Lateral Meniscus**
- **Circular**
- **Covers more of tibia**
- **Uniform size**
- **Less adherent**
Biology of the Meniscus

• Fibrocartilage
• Fibrochondrocytes
• Extracellular matrix
  – Collagens (90% type I)
  – Elastins
  – Proteoglycans
• Lateral has more translation on the tibial plateau
  – Bend but doesn’t break
Types of Meniscus Tears

- Longitudinal
- Horizontal
- Oblique
- Radial

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MENISCAL INJURIES

History

- Mechanism = pivot, twist
- ± heard a “pop”
- Effusion- 12-36° after injury
- Mechanical Sxs- locking, instability
MENISCAL INJURIES

Physical Exam

• Joint line tenderness
  – IR/ER
• Decreased ROM
• McMurray’s test
• Apley’s compression test
MENISCAL INJURIES
Ancillary Studies

- Plain radiographs
  - Other causes mechanical Sxs

- MRI
  - Higher vascularity in peds patients

- CT-arthrography outdated
Meniscus MRI

Bone

Normal Meniscus

Torn Meniscus
MRI of an uninjured knee joint. Arrows show lateral meniscus.
Grading of Meniscal Tears: MRI

- **I**: globular changes
- **II**: linear changes not to margin
- **III**: linear to sup/inf margin
- **IV**: complex linear changes

- Only grade III and IV visible on arthroscopy
MENISCAL INJURIES

Treatment

• Nonoperative (Aggressive Nonsurgical)

• Acute Rehab
  – ROM, Quad setting

• Subacute Rehab
  – ROM, PRE’s

• Bracing (hinged knee brace)

• Continue sport specific drills when tolerable
MENISCAL INJURIES
Treatment

• Operative
  – Partial Menisectomy
  – Meniscal Repair (peripheral)
  – Meniscus Implants
  – Total Menisectomy - outdated
Baker's Cyst and the Meniscus

  • Case-control study
  • Over 1700 MRI's

⇒ 240 Baker's cysts

• 85% had meniscal tears

Data supported by:
Assorted Knee Problems

- Osgood-Schlatter Syndrome
- Patellar, Quad Tendinitis
- Plica
- Iliotibial Band Syndrome
- Discoid Meniscus
- Osteoarthritis
- Osteochondritis dessicans (OCD)
TENDINITIS
Quadriceps and Patellar

History

• Pain with:
  – Jumping
  – Stairs
  – Prolonged sitting

• Mechanism = overuse
TENDINITIS
Quadriiceps and Patellar

Physical Exam

• Tender superior/inferior pole of patella
• Tender tibial tubercle
• Tight hams, Achilles, quads
• Pain with resisted action of muscle
TENDINITIS
Quadriceps and Patellar

Treatment

• P: protection, pain meds
• R: rest
• I: ice
• C: compression
• E: elevation
• S: support, strength/stretch exercises
Traction Apophysitis

- Osgood-Schlatter “disease”
- Sinding-Larsen-Johannson disease
BURSITIS

- Prepatellar bursa
- Infrapatellar bursae
- Pes anserine bursa

- Mechanism = direct blow, overuse
- Physical exam - point tender, nonintraarticular effusion
BURSITIS

Treatment

- NSAID’s
- Ice
- Flexibility exercises
- Steroid injections
- Surgery for chronic cases (prepatellar)
Discoid Meniscus

- Programmed cell death
- More likely to tear
- Often Lateral
- Male > female
- Ages 6-10 yrs
- Xray- wide lateral joint space
- Rx- may require resection if Sx
Discoid Meniscus
Discoid Meniscus