Examination and Imaging of the Knee and Leg

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A good History and Physical is Key to a Correct Diagnosis
Grab Sign

Patellofemoral Disorders
Fisted Knuckle Sign = ACL Tear
Normal Alignment
Miserable Malalignment Syndrome

- Increased Femoral Anteverision
- VMO Dysplasia
- VL Excessive Lateral Forces
- Excessive Q Angle
- Patella Subluxation
- External Tibial Torsion
- Foot Pronation
Joint line palpation with knee flexed should produce pain if meniscus is torn.

Externally rotate tibia for medial meniscus tears, Internally rotate for lateral meniscus tears.
Bounce Home Test
Normal Knee Exam: Bounce Home
McMurray’s Test: Medial Meniscus
Patient apprehends another lateral patellar dislocation

Positive apprehension test
Do the anticipated painful test last
Normal Knee Exam: McMurray’s Test
Apley’s Compression Test
Normal Knee Exam: Apley's
McMurray’s Test: Medial Meniscus
Normal Knee Exam: Lateral Aspect
Normal Knee Exam: Ligaments

MCL Exam
Valgus Stress Varus Stress
Knee Instabilities

Bird’s-Eye view of Tibia
Classification of Knee Instabilities
Rotatory, Straight and Combined

• Diagnosis: +1 to +4 by exam
  Grade I to IV
• Diagram
  • Bird’s eye view of tibia
• Involved Anatomic Structure
• Physical findings
• Mechanism and forces
  • Contact vs. Noncontact
  • Varus / Valgus, Flexion / Extension
  • Tibial rotation
Anterior Instabilities

Antero-Medial Rotatory Instabilities (AMRI)

Combined AMRI and ALRI
Knee Instability

Antero-Lateral Rotatory Instabilities (ALRI)

Diagnosis

Involved Anatomic Structures

- ACL
- LCL
- PLC

2+
Posterolateral Instabilities

**Posterolateral Rotatory Instabilities (PLRI)**

1+
- LCL
- PLC

2+
- PCL

3+
- LCL
- PLC
- PCL
- PMC

**Postero-Lateral Rotatory Instabilities (PLRI)**

**Combined ALRI and PLRI**

- ACL
- PLC
- PCL
- Lateral Capsule
Knee Instability

Diagnosis

Involved Anatomic Structures

Posterior

PCL
± Humphrey
± Wrisberg

Straight Posterior
Anterior Drawer
Knee Instability

Antero-Lateral Rotatory Instabilities (ALRI)
Posterior Drawer
Normal Knee Exam: PCL Exam
Knee Instability

Combined ALRI and PLRI

Diagnosis

Involved Anatomic Structures

ACL
PLC
PCL
Lateral Capsule
Normal Knee Exam: Reverse Pivot Shift, ER Recurvatum
Radiographs

- Standing 45° PA, bilateral
- Patellar Views: Merchant or Sunrise Bilateral
- Lateral 45° Flexion
- Notch for Osteophytes

- Standardize Your Views for All Physicians
- Use Goniometer
- Know Your XRay Technicians
Osteoarthritis grading systems:

- Kellgren and Lawrence
- Fairbanks
- Joint space narrowing JSM – standing radiographs
- Ahlback classification

- Numerous studies comparing different classifications—there is disagreement on the definition and grading of osteoarthritis, as well as poor correlation with patient symptoms and progression of osteoarthritis.
References


45 Degree Flexed Weight-Bearing PA View is most sensitive for detecting joint space loss


14 YO punter was crushed by defensive line
16 YO WM Football Athlete
Struck from Lateral Side of Knee
Angular Deformity from 20° Malunion from Proximal tibial growth arrest
MRI scan at time of initial injury
Exam and Imaging of the Knee and Leg

Mary Lloyd Ireland, MD
Anterior opening wedge osteotomy
Post op:
~ 1 week    22 weeks    28 weeks
19 YO Female

- Collegiate basketball athlete
- Landed awkwardly in a game
- PE: ACL Tear, Left knee
Suspected osteochondral fracture LFC, possible anterior aspect LTP fracture
42 YO Male: ACL Tear

- Injured playing soccer
- Beware articular surface injuries
Technetium Bone Scan LE

- Informative for MD + Patient
Bone Bruise

Does That Predict Development of OA?
Bone Bruise Patterns

- Acute patellar dislocation
- Medial patella anterolateral femoral condyle
- No OA from bone bruise, but from articular cartilage injury and mal-tracking
Bone Bruise Patterns

- In soccer, medial tibial plateau bone bruise no long term risk of OA
- In degenerative posterior horn root avulsions, medial tibial bone bruise often seen

? Long-term follow-up for bone bruises needed to determine significance for development of OA
What is the significance of Bone Bruises?

Unknown... 

- Long term Bone Bruise ≠ OA
- In ACL injuries noncontact compartments:
  - Lateral / acute
  - Medial / chronic OA
- Classification systems for bone bruises need further development
Late Results After Meniscectomy


Mayo clinic retrospective review
- 1005 patients undergoing meniscectomy
- 1936-1956
- 113 examined, 100 questionnaires
  - Males did better
  - Best results in bucket-handle resection leaving peripheral rim
  - Do not leave posterior horn if torn

• **Discussion by Dr. Don H. O’Donoghue**, Oklahoma City, Oklahoma

  • I would therefore not accept the conclusion that:
    • Delay in operation does not affect the ultimate result
    • Patients under twenty years of age have fewer satisfactory results
    • Leaving the peripheral ring will give the best results in bucket-handle fractures
    • Conclusions are not valid based on evidence presented

• **Discussion by Dr. Don H. O’Donoghue**, Oklahoma City, Oklahoma
  
  • I think the authors are to be congratulated on their efforts to obtain a valid series. As I have indicated, it is extremely difficult to get an uncontaminated series. Probably a study should be initiated, not after operation but before operation, on patients whose surgery would qualify as relatively uncomplicated meniscectomy.
History & PE

- 55 YO Female
- Difficulty walking due to left knee out of alignment
- Fell 10 years ago and was told she had meniscal tears
- PE: Height 5’ 5½”, weight 303: BMI 43
- Bilateral Knees:
  - Diffuse crepitus and pain
  - Mild effusion
  - No calf tenderness
Left Knee
Right Knee

What test would you do next?
Are more tests needed?
MRI Scan in the Arthritic Knee After 50 years

- Not Helpful for Articular Cartilage
- Meniscal Signal Will Usually Be Abnormal and come to the tibial surface.
MRI Scan in the Arthritic Knee After 50 years

- Is the root of the Medial Meniscus Avulsed?
- What about my Baker’s Cyst?
- Think tree - MRI Scan
  - In a Big Forest – Arthritis
    — The Plain Xrays show us the reason for stiffness & pain: Arthritis
IMAGING THE ARTHRITIC KNEE

- Use goniometer to assure comparable Xrays year to year and for outcome studies

- Let the Orthopaedist Order the MRI Scan in the Arthritic Knee Patient.
  - May want DESS or special articular cartilage sequences.
  - In most cases MRI scans in patients over age 50 would not change treatment plan.
  - I don’t need an MRI scan to know what to do arthroscopically! I was scoping knees prior to MRI scans!
Conclusions

- Make the connection between:
  - Anatomy
  - Function
  - History and Physical Exam
- In relation to:
  - Functional disability
  - Specific diagnosis
"The Knee as a Biologic Transmission with an Envelope of Function"


Envelope of Knee Function

- **Factors:**
  - Anatomy
  - Kinetics
  - Physiology
  - Treatment
The Knee as a Biologic Transmission with an Envelope of Function

A Knee Injury is like a car wreck
Goal of Treatment of Knee Disorders

- Broaden envelope of function
- Resume activity safely
- Inform patients of “lowered threshold” of function
Pyramid Approach to the Management of Osteoarthritis

- Surgery
- Topical analgesics
- Prescription NSAIDs
- IA steroids/hyaluronic acid
- Acetaminophen
- Patient education
- Physical and occupational therapy
- Weight reduction, exercise, assistive devices

You May Not Have Seen It, But It Has Seen You
Right distal femur osteosarcoma
S/P Excision Curettage Cementation
You Look for What You Know and You Find What You Look For
The End . . .

Thank You!

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ACSM TPC Part 2
Miami, Florida
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