ADVANCED PHYSICAL DIAGNOSIS

“THE KNEE”

Molly Booy and Radhika Takiar
Overview

- Cases
- Knee anatomy
- Soft tissue injury/tears: ACL, PCL, meniscal, collateral ligament, patellar tendon tears
- Iliotibial band syndrome
- Patellofemoral syndrome
- Bursitis
- Osteoarthritis
Cases

Case 1
- 20 year old M presents w/knee pain after playing basketball
- Fell on the back of his calf after jumping for a rebound
- Heard “pop” after standing
- Immediate swelling + pain
- Could not walk after injury

Case 2
- 70 year old F presents with chronic knee pain + swelling
- Experienced a fall several weeks ago
- Pain exacerbated with walking down stairs
- No improvement with tylenol
Knee anatomy

- Patellar surface
- Groove for medial meniscus
- Groove for lateral meniscus
- Notch for anterior cruciate ligament
- Posterior cruciate ligament
- Anterior cruciate ligament
- Coronary ligament (cut edge)
- Medial meniscus
- Tibial collateral ligament
- Sartorius tendon
- Apex of patella (patella is inverted)
- Nonarticular area
- Medial vertical facet
- Base of patella
- Quadriceps tendon
- Intercondylar notch
- Medial epicondyle
- Posterior meniscofemoral ligament
- Lateral epicondyle
- Lateral meniscus
- Fibular collateral ligament
- Tibial collateral ligament
- Posterior cruciate ligament
- Popliteal surface of tibia
- Head of fibula
**Consider the history**

- Mechanism of injury, duration
- Where is the pain: focal vs. non-focal?
- Prior to pain, was there a change in activities?
- Injury to LE and direction of force?
- Was there a ‘pop’ and immediate swelling?
- Pain elsewhere: hip, ankle, back?
- Is the knee catching/locking with extension/flexion?
### Special Tests

<table>
<thead>
<tr>
<th>Finding (Reference)</th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
<th>Likelihood Ratio† if Finding Is Present</th>
<th>Absent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Detecting Anterior Cruciate Ligament Tear</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anterior drawer sign(^{48,62,71-75})</td>
<td>27-94</td>
<td>91-99</td>
<td>13.6</td>
<td>0.4</td>
</tr>
<tr>
<td>Lachman sign(^{48,62,71-73,75})</td>
<td>48-96</td>
<td>90-99</td>
<td>19.5</td>
<td>0.2</td>
</tr>
<tr>
<td>Pivot shift sign(^{48,71,73,75})</td>
<td>6-61</td>
<td>95-99</td>
<td>8.8</td>
<td>0.7</td>
</tr>
<tr>
<td><strong>Detecting Posterior Cruciate Ligament Tear</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Posterior drawer sign(^{47,76})</td>
<td>90-95</td>
<td>99</td>
<td>97.8</td>
<td>0.1</td>
</tr>
<tr>
<td><strong>Detecting Meniscal Injury</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>McMurray sign(^{49,50,77-82})</td>
<td>17-80</td>
<td>77-98</td>
<td>4.0</td>
<td>0.6</td>
</tr>
<tr>
<td>Joint line tenderness(^{50,77-79,83,84})</td>
<td>55-92</td>
<td>30-83</td>
<td>1.8</td>
<td>0.5</td>
</tr>
<tr>
<td>Block to full extension(^{50})</td>
<td>44</td>
<td>86</td>
<td>3.2</td>
<td>0.7</td>
</tr>
<tr>
<td>Pain on forced extension(^{50,77})</td>
<td>47-51</td>
<td>67-70</td>
<td>1.6</td>
<td>0.7</td>
</tr>
<tr>
<td><strong>Detecting Medial Collateral Ligament Injury</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valgus stress laxity(^{48,85,86})</td>
<td>79-89</td>
<td>49-99</td>
<td>7.7</td>
<td>0.2</td>
</tr>
<tr>
<td><strong>Detecting Lateral Collateral Ligament Injury</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Varus stress laxity(^{86})</td>
<td>25</td>
<td>98</td>
<td>16.2</td>
<td>NS</td>
</tr>
</tbody>
</table>
Anterior Cruciate Tears

Anterior Drawer test: high sensitivity and specificity in chronic condition, not accurate in acute injury

Pivot Shift Test: difficult to perform due to guarding; specific but insensitive

Lachman Test: most useful test
Posterior Cruciate Tears

Least likely ligament to be injured

Posterior drawer test is the conventional, most accurate test

Posterior sag sign has not been studied acutely

<table>
<thead>
<tr>
<th>Exam Maneuver</th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posterior Sag Sign</td>
<td>90</td>
<td>99</td>
</tr>
<tr>
<td>Quadriceps Active Test</td>
<td>54-98</td>
<td>97-100</td>
</tr>
</tbody>
</table>
PCL cont.
Meniscal Tears

- Mode of injury?
- Why does locking occur?
- More prevalent: lateral vs. medial?
Meniscal tears cont.

Hold your balance on the “MAT!”

McMurray

LR: 4
Low sensitivity

Low sensitivity

Sensitivity 90%
Specificity 96%
**Collateral Ligament Tears**

Medial collateral tear
- Blow to lateral knee
- Valgus test (+)

Lateral collateral tear
- Least common knee injury
- Blow to medial knee
- Varus test (+)
For Example...
**Patellar Tendon Tear**

Mode of injury: landing after a jump or falling backwards on foot while feet are fixed

Exam findings:
- Hemarthrosis/ecchymosis + edema
- Patella alta
- Palpable rupture
- Loss of active extension or extensor lag
Iliotibial Band Syndrome

Focal tenderness at the distal ITB where is courses over the LFE

Noble compression test is considered the single best test; no available statistics

The IT Band runs down the lateral aspect of the thigh and knee. If the IT Band is too tight it will lead to pain on the lateral aspect of the knee.
Patellofemoral Syndrome

Anterior knee pain
Characteristically pain around or behind patella, aggravated by bearing weight on flexed knee
Multifactorial causes
Diagnosis of exclusion

Poor tracking or excessive compression of the knee cap against the femur can damage the cartilage on the undersurface of the patella and lead to anterior knee pain.
## Diagnostic Accuracy of Best Combinations (Clusters) of Functional Tests and Situational Phenomena

<table>
<thead>
<tr>
<th>Condition Description</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>PPV (95% CI)</th>
<th>NPV (95% CI)</th>
<th>LR+ (95% CI)</th>
<th>LR− (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive findings of muscle contraction and pain during squatting (2 of 2)</td>
<td>35</td>
<td>89</td>
<td>0.87 (0.71−0.95)</td>
<td>0.40 (0.34−0.43)</td>
<td>3.3 (1.2−9.2)</td>
<td>0.73 (0.6−0.94)</td>
</tr>
<tr>
<td>Positive findings of muscle contraction and/or pain during squatting and/or pain during palpation (2 of 3)</td>
<td>60</td>
<td>85</td>
<td>0.89 (0.79−0.95)</td>
<td>0.5 (0.46)</td>
<td>4.0 (1.8−10.3)</td>
<td>0.5 (0.38−0.68)</td>
</tr>
<tr>
<td>Positive findings of muscle contraction, pain during squatting, and pain during kneeling (3 of 3)</td>
<td>33</td>
<td>89</td>
<td>0.86 (0.69−0.95)</td>
<td>0.39 (0.34−0.43)</td>
<td>3.1 (1.1−9.5)</td>
<td>0.7 (0.6−0.9)</td>
</tr>
</tbody>
</table>

PPV=positive predictive value; NPV=negative predictive value; LR+=positive likelihood ratio; LR−=negative likelihood ratio
Bursitis

All characterized by local swelling with or without fluctuance, s/o inflammation
Osteoarthritis

- Palpable bony enlargement (LR 11.8)
- Genu varum deformity (LR = 3.4)
- Stiffness > 30 minutes (LR= 3)

Exam findings:
- Quadriceps wasting
- Joint effusion
- Crepitus on ROM
- Pain worse with movement
Stress fractures

Risk factors?

- Pain with ambulation
- Focal tenderness of affected bone (MOST sensitive finding)

Diagnostic tests (poor sensitivity/specificity):

1. Fulcrum test
   - a. Create fulcrum at affected bone

2. Hop test
   - a. Pain with hopping
   - b. Femoral neck fracture

3. Tuning fork test
   - Pain at fracture
Stress Fx Cont.
Quiz

Remember the cases?

Case 1: ACL tear

Case 2: Meniscal tear
