Knee Ligament Injury in Athletes

Laura W. Bancroft, M.D.
Objectives

• To review the imaging appearance of knee ligament injury in athletes:
  – Anterior cruciate ligament (ACL)
  – Posterior cruciate ligament (PCL)
  – Medial collateral ligament (MCL)
  – Lateral collateral ligament (LCL)
  – Patellofemoral ligament
  – Iliotibial band
## Knee Injuries

<table>
<thead>
<tr>
<th>FORCE</th>
<th>RESISTANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior Translation</td>
<td>ACL</td>
</tr>
<tr>
<td>Posterior Translation</td>
<td>PCL</td>
</tr>
<tr>
<td>Varus (medial to lateral)</td>
<td>LCL</td>
</tr>
<tr>
<td>Valgus (lateral to medial)</td>
<td>MCL</td>
</tr>
<tr>
<td>Internal Rotation (femur fixed)</td>
<td>LCL</td>
</tr>
<tr>
<td>External Rotation (femur fixed)</td>
<td>MCL</td>
</tr>
<tr>
<td>Hyperextension</td>
<td>PCL</td>
</tr>
</tbody>
</table>

ANTERIOR CRUCIATE LIGAMENT
Normal 2 bands – posterolateral and anteromedial
Normal 2 bands – posterolateral and anteromedial
Mucinous degeneration of ACL + ACL ganglion
Mucinous degeneration of ACL + ACL ganglion
ACL ganglion
Partial tear

Posterolateral bundle
Torn near femoral origin
Torn near tibial attachment
Chronic ACL tear
Buckled PCL
Anterior drawer sign
ACL

• Contusions
  – Posterior lateral tibial plateau
    • “7” sign
  – Lateral femoral condyle (coup)
    • Deep lateral sulcus
  – Medial femoral condyle (contrecoup)
ACL tear

Coup and contrecoup contusions
Coup contusions
Contrecoup contusions
ACL

- Adolescents may have same contusion pattern as adults, but may preserve ACL
- Increased ligamentous laxity
Tibial avulsion fracture at ACL attachment
ACL Sprain with marrow edema
Segond fracture

- Cortical avulsion of the tibia at the insertion of the middle 1/3 of the lateral capsular ligament
- Internal rotation and varus stress
- High association with:
  - ACL injuries (75-100%)
  - Meniscal tears (66-75%)
  - Posterolateral corner of knee
Segond fracture
Segond fracture + ACL tear
ACL torn and fibrosoed to PCL
Posterior Cruciate Ligament
PCL sprain
PCL sprain
PCL sprain – high grade
PCL ganglion
PCL rupture
PCL rupture
PCL rupture
Medial Collateral Ligament
MCL sprain
MCL sprain
MCL sprain
MCL partial thickness tear
MCL distal rupture
MCL high grade partial tear and femoral epicondylar spurring
MCL grade 2 sprain
MCL – avulsive marrow changes deep fiber rupture
MCL rupture deep fibers and near complete rupture of superficial fibers
MCL mid rupture

MCL distal rupture
Pellegrini-Stieda calcifications
Pelligrini-Stieda calcifications
MCL bursitis
Edema-like signal about the MCL:
- MCL sprain
- osteoarthrosis
- extruded meniscus
Lateral Collateral Ligament
Fibular collateral ligament sprain
Fibular collateral ligament rupture
Patellofemoral Ligament
Patellofemoral ligament avulsion
Patellofemoral ligament avulsion
Patellofemoral ligament avulsion
Patellofemoral ligament avulsion
Patellofemoral ligament avulsion
Iliotibial Band Friction Syndrome

- Repetitive flexion and extension
- Friction against lateral femoral condyle
- Runners

Iliotibial Band Friction Syndrome

- Repetitive flexion and extension
- Friction against lateral femoral condyle
- Runners

Iliotibial band friction syndrome
Iliotibial band friction syndrome
Conclusion

• The integrity of the anterior cruciate ligament can be assessed by primary and multiple secondary signs, and can be associated with multiple other injuries involving the MCL, menisci and medial tibial rim
Conclusion

• Posterior cruciate ligament sprains are more common than full thickness tears

• Medial collateral ligament tears are associated with valgus forces and can be part of O’Donoghue’s triad
Conclusion

• Lateral collateral ligaments tears are due to varus force and often involve the conjoined tendon

• Patellofemoral ligament strains and tears should be sought in patients with PDRS

• Iliotibial band syndrome occurs in runners, with thickening and fluid deep to the iliotibial band