Knee: Tendon Pathology
Jon A. Jacobson, M.D.
Professor of Radiology
Director, Division of Musculoskeletal Radiology
University of Michigan

Disclosures
• Consultant: Bioclinica
• Advisory Board: Philips
• Book Royalties: Elsevier
• Not relevant to this talk

Note: all images from the textbook
Fundamentals of Musculoskeletal Ultrasound are copyrighted by Elsevier Inc.

Tendon Abnormalities
• Tendinosis:
  – Swollen, hypoechoic, no inflammation
• Tear:
  – Partial-thickness tear
  – Full-thickness tear: retraction

Quadriceps Tendon
• Partial-thickness tear and tendinosis
  – Focal hypoechoogenicity
  – Bridging tendon fibers identified
  – No complete tendon retraction

AJR 1994; 162:1137

Quadriceps Tendon: tendinosis

Quadriceps Tendon: tear
• Partial tear:
  – One to two of three tendon layers torn
• Full-thickness tear
  – Complete tendon disruption
  – Tendon retraction: dynamic imaging
  – Joint fluid extending through tear
• 100% accuracy for diagnosis of high-grade and full-thickness tears requiring surgery

Foley R et al. J Ultrasound Med 2015; 34:805
Quadriceps Tendon: Partial Tears

Rectus Femoris Tear (1 layer)

Vastus Tear (2 layers)

Quadriceps Tendon: full-thickness tear

Long Axis

Sagittal PDw

Rectus Femoris Tendon: avulsion

Quadriceps Femoris Tear: dynamic imaging

Long Axis

Patellar Tendinosis:

- Jumper’s knee
- Hypoechoic swelling
- Mucoid degeneration, possible interstitial tearing
- Hyperemia: neovascularity
- No inflammatory cells

Radiology 1996; 200:821

Patellar Tendon: tendinosis

Long Axis
**Patellar Tendon: tendinosis**

- **Long Axis**
- **Short Axis**

**Patella**

**Color Doppler**

**Patellar Tendon Tear**

- Full-thickness tear
  - Hypoechoic
  - Posterior shadowing at ends of torn tendon
  - Tendon retraction
  - Patellar alta

AJR 2001; 176:1535

**Patellar Tendon: full-thickness tear**

- **Long Axis**
- **Sagittal PDw**

**Patella**

**Patellar Tendon: full-thickness tears**

- **Patella**

*3 Different Patients*
**Patellar Tendon:** full-thickness tears

**Patellar Tendon:** full thickness tear

**Osgood-Schlatter Disease:**
- Painful condition affecting the distal patellar tendon insertion on tibia
- Young male athletes
- Radiography: swelling and tibial tuberosity irregularity

**Osgood-Schlatter Disease:**
- Cartilage swelling + bone changes: 54%
- Cartilage swelling alone: 20%
- Tendon abnormality: 15%
- Bursitis: 11%

Skeletal Radiology 1998; 18:193
### Bipartite Patella
- Normal variant
- Upper outer quadrant
- Well-defined cleft
- May become symptomatic

### Semimembranosus
- Tendinosis
- Tendinosis + Partial Tear

### Snapping Semitendinosus Tendon over Semimembranosus Muscle

### Bifurcating Distal Biceps Femoris:
- Long axis of fibular collateral ligament
- Biceps separates: superficial, deep layers
- Surrounds fibular collateral ligament
- May be mistaken as tendinosis or ligament abnormality

Smith, J Ultrasound Med 2011; 30:1156
Iliotibial Band Friction Syndrome:
- Pain: repetitive friction of ITB over lateral femoral condyle
- Sonography:
  - Secondary bursa formation
  - ITB: hypoechoic and swollen
  - Adjacent soft tissue hypoechoic edema

J Ultrasound Med 1998; 17:257

Inflammatory Arthritis: gout
- Erosions: cortical irregularity
- Joint effusion
- Double contour sign:
  - Echogenic crystal layer over hyaline cartilage
- Tendon involvement:
  - Popliteus > patellar

Mallinson PI et al. Skeletal Radiol 2014; 43:277

Gouty Tophus: popliteus

Gout: popliteus

Coronal Color Doppler
Take Home Points:

- Tendinosis: not tendinitis
- Full-thickness tendon tear:
  - Retraction
  - Dynamic evaluation
- Gout:
  - Popliteus tendon
  - Patellar tendon

See www.jacobsonmskus.com for syllabus and other educational material
Twitter: @jacoban