Knee Sonography with MRI Correlation

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Pathology:
• Joint space
• Bursae and cysts
• Tendon
• Ligament
• Cartilage
• Miscellaneous

Joint Effusion
• Suprapatellar recess
  – Superior
    • Prefemoral & quadriceps fat pad separation
    • Distends with partial knee flexion
  – Medial and lateral to patella
    • Distends with knee extension
    • Transducer pressure displaces joint effusion

Suprapatellar Recess and Gutters

Joint Effusion: sagittal plane

Joint Effusion: transverse plane

- Patella
- Femur

Patella
Femur

Transverse

Joint Effusion: transverse plane

- Patella
- Femur

Joint Effusion:
Knee extension

- Patella
- Quad
- Femur

Effusion

- Joint recess
- Between anterior horn of lateral meniscus and tibia

Superior Plica

Lipohemarthrosis

- Intracapsular fracture / soft tissue injury
  - Fat from marrow or soft tissues
- Sonography:
  - Fat: hyperechoic
  - Serum: anechoic
  - Blood: hypoechoic

J Ultrasound Med 1995; 14:279

Courtesy of Alex Chien, MD
Intra-articular Body

- Joint recess
- Echogenic
- Possible shadowing
- Adherent versus loose body

Pigmented Villonodular Synovitis

Femur

PCL

Tibia

Sagittal

Sagittal PDw

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Anterior Knee Bursa:

- Prepatellar bursa
- Superficial infrapatellar bursa
- Deep infrapatellar bursa

Prepatellar Bursa: aseptic fluid

Patella

PT

Sagittal

Axial

Superficial Infracapellar Bursa

Case #1

Case #2
Deep Infrapatellar Bursa

Normal

Abnormal

SM-TCL Bursa

Adventitious Bursae:
- Site of friction
- Myxomatous degeneration of fibrous tissue
- Medial epicondyle:
  - Rider’s bursa: horseback riding
  - Limbo-dancing
  - Trinidadian art form of limbo dancing

Baker Cyst:
- Semimembranosus-medial gastrocnemius bursa
- 50% over age of 50 have communication with knee joint
- Cyst communication to posterior knee between SM-MG tendons required

AJR 2001; 176:373

Baker Cyst Evaluation: pitfall

Baker Cyst

Axial Axial T2w
Baker Cyst

Baker Cyst: intra-articular body

Baker Cyst: hemorrhage

Baker Cyst: rupture + hemorrhage

Baker Cyst: rupture

Baker Cyst: rupture
**Pes Anserinus**

- Pes anserinus: “goose foot”
  - Sartorius
  - Gracilis
  - Semitendinosus
- Bursa:
  - Deep to conjoined tendon
  - Adjacent to proximal tibia

**Pes Anerinus: bursal fluid**

**Snapping: sartorius over pes anerinus bursa**

**Ganglion Cyst: aspiration**

**Ganglion Cyst: gastrocnemius origin**

**Peroneal Intraneural Ganglion**

- Joint fluid from proximal tibiofibular joint
  - Enters peroneal nerve via articular nerve branches
  - Shown at MR arthrography after exercise
  - Extends proximal via epineurial sheath
- May also form via tibial nerve

1 Spinner et al. Clin Anatomy 2007; 20:826
2 Spinner et al. Skeletal Radiol 2006; 35:172
Peroneal Intraneural Ganglia

Intraneural Ganglion

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Tendon Abnormalities
- Tendinosis:
  - Swollen, hypoechoic, no inflammation
- Tear:
  - Partial-thickness tear
  - Full-thickness tear: retraction
Quadriceps Tendon: Partial Tears
- Rectus Femoris Tear (1 layer)
- Vasti Tear (2 layers)

Quadriceps Tendon: full-thickness tear
- Long Axis
- Sagittal PDw

Quadriceps Femoris Tear: dynamic imaging
- Long Axis

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

Patellar Tendon: tendinosis
- Long Axis
- Short Axis
- Color Doppler power Doppler

Radiology 1996; 200:821
**Patellar Tendon: full-thickness tear**

- Long Axis
- Sagittal PDw
- Longitudinal

**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
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**MCL: full-thickness tear**

**Lateral Collateral Ligament Injury**

**ACL Tear**

**ACL Tear: anterior approach**

Smith J et al. PMR 2015; 7:736
**Anterolateral Ligament**

- Anterolateral stability
- Important: setting of ACL tear
- Tibia attachment:
  - Between Gerdy and fibula
- Femur: variable
  - Posterior to LCL: common
- Meniscal attachment


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**Meniscus: Accuracy**

- 70 patients with surgical correlation
- Sensitivity / Specificity = 88% / 85%
- PPV / NPV = 85% / 88%
- Most studies:
  - US is markedly limited

*Akatsu Y et al. JBJS 2015; 97:799*
Buckle Handle Tear: medial meniscus

Osteoarthritis: meniscus extrusion

Medial Meniscus

Meniscus: chondrocalcinosis

Parameniscal Cyst:
- Medial more common\(^1\)
- Anechoic or hypoechoic
- Extends to periphery of meniscus\(^2\)
- Look for meniscal tear

\(^1\)AJR 2001; 177:409
\(^2\)AJR 1998; 171:491

Lateral Meniscus: tear and parameniscal cyst

Gout
- Double contour sign:
  - Hyperechoic foci on surface of hyaline cartilage
  - Does not demonstrate anisotropy
    - Unlike normal cartilage interface
    - Disappears with serum urate < 6 ml/dl

Thiele RG, Rheumatol Int 2010; 30:495
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Deep Venous Thrombosis
- Hypoechoic thrombus
- Not compressible
- No flow
Take Home Points

• Common indications:
  – Fluid, cysts, extensor tendon
• Very limited:
  – Meniscus, cartilage, cruciate ligaments
• Suprapatellar recess:
  – Look all around patella
• Baker cyst: look for communicating neck

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