Pathology:
- Joint abnormalities
- Bursal pathology
- Muscle and tendon injury
- Snapping hip syndrome
- Miscellaneous pathology

Hip Effusion:
- Separation of anterior and posterior layers\(^1\)
- Capsule distention at femoral neck > 7 mm or difference of 1 mm from opposite side\(^2\)
- Extension & abduction improves visualization\(^3\)
- Do not internally rotate hip: capsule thickens

\(^1\)Radiology 1999; 210:449
\(^2\)Scand J Rheumatology 1989; 18:113
\(^3\)Acta Radiologica 1997; 38:867

Hip Joint: septic effusion

- It is incorrect to assume that joint fluid may not be seen anterior due to gravity
- Native hip: joint fluid distributes around femoral neck
- In no cases was fluid only seen posterior
- Exception: after hip surgery

Moss et al. Radiology 1998; 208:43
Hip Joint: aseptic effusion

Hip Effusion:
- Cannot predict infection by ultrasound
- Negative power color Doppler does not exclude infection*
- Guided aspiration

* AJR 1998; 206:731

Pigmented Villonodular Synovitis

Synovial Hypertrophy: Infection

Juvenile Rheumatoid Arthritis
**Hip Labrum**

- Normal: Hyperechoic, triangular
- Degeneration: hypoechoic
- Tear: anterior
  - Anechoic cleft
  - Sensitivity 82%, specificity 60%, accuracy 80%*


**Femoroacetabular Impingement**

- Pincer-type: deep acetabulum
- Cam-type
  - Broad irregular femoral neck
  - Possible cortical irregularity at US
- Associated with anterior labrum tear
- Consider dynamic evaluation

Radiology 2005; 226:588

**FAI: Ultrasound**

- Ultrasound can demonstrate a bony protuberance and non-spherical head associated with CAM FAI
- Alpha angle measurements
  - Buck et al.: unreliable
  - Lerch et al.: strong correlation with MRI


**Labral Tear and Paralabral Cyst**

- Associated with labral tear
  - Full-thickness or detachment
- Anechoic to hypoechoic
- Multilocular

**Cam Impingement**

Note: labral tear (yellow arrow) and osseous bump (white arrow)

Courtesy of M. van Holsbeeck, Detroit, MI

**Femoroacetabular Impingement**

Sagittal-oblique
**Total Hip Arthroplasty:**
- Metal components demonstrate posterior reverberation.
- Artifact occurs deep to prosthesis away from fluid collection (unlike MRI, CT).

**Hip Arthroplasty:**
- Ultrasound cannot differentiate small effusion from post-op change\(^1\)
- Suspect infection:
  - Pseudocapsule > 3.2 mm: suspect infection\(^2\)
  - Extra-articular fluid collection
  - Not visualized with arthrography if non-communication

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**Pathology:**
- Joint abnormalities
- Bursal pathology
- Muscle and tendon injury
- Snapping hip syndrome
- Miscellaneous pathology

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\(^1\)Weybright PN et al. AJR 2003; 181:215
\(^2\)AJR 1994; 163:381
Trochanteric Pain Syndrome:

- Most commonly caused by gluteus minimus and medius tendon abnormalities
  
- Trochanteric bursitis: uncommon
  - 20% of symptomatic patients
  - Not actually inflamed
  - Not associated with pain

2. Long SS et al. AJR 2013; 201:1083
Iliopsoas Bursal Fluid

Axial T1w post-gadolinium

Ischial or ischiogluteal Bursa

- Uncommon
- "Weaver’s Bottom"
- Between ischial tuberosity and gluteus maximus

Pathology:
- Joint abnormalities
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Muscle and Tendon Injury

- Tear:
  - Anechoic or hypoechoic defect
  - Partial-thickness tear
  - Full-thickness tear: retraction
- Tendinosis:
  - Hypoechoic, enlarged
  - No inflammation (not tendinitis)

Tendinosis: tensor fascia lata

Long Axis

Asymptomatic Side

Tendinosis: Gluteus Medius

AF LF LFSPF SPF LF
Tendinosis: Gluteus Minimus

Tear: Gluteus Minimus

>2 mm cortical irregularity depth (x-ray) = 90% positive predictive value for gluteus tendon tear

Steinert et al. Radiology 2010; 257:754

Tear: Gluteus Medius after THA

Tear: Gluteus Medius

>2 mm cortical irregularity depth (x-ray) = 90% positive predictive value for gluteus tendon tear

Steinert et al. Radiology 2010; 257:754

Post-operative: Gluteus Medius

Calcific Tendinosis: Gluteus Medius

Long Axis Short Axis
Sports Hernia?:

- A non-anatomic, non-diagnostic term attributed to many causes of groin pain
  - Tears or attenuation of inguinal structures
  - Bulge posterior wall of inguinal canal
  - Obturator nerve entrapment
  - Common aponeurosis abnormality:
    - Rectus abdominis and adductors tendons
  - Associated: pubic symphysis instability, FAI

Omar IM et al. Radiographics 2008; 28:1415
Garvey JW et al. Hernia 2010; 14:17
Hopkins DN et al. JHS Reviews 2017; Ed

Rectus Abdominis + Adductor: “Sports Hernia”

Note: common aponeurosis

From: RadioGraphics 2008; 28:1415

Rectus Abdominis / Adductor Injury: “Sports Hernia”

Complete Tear: adductor longus

Proximal

Distal

Long Axis
Aponeurosis Tear (Indirect Head): Rectus Femoris

- Short Axis
- Long Axis

Calcific Tendinosis: rectus femoris

- AIIS
- Long Axis

Calcific Tendinosis

- Ultrasound-guided lavage and aspiration
- 20 gauge spinal needle

Rectus Femoris Injury

- Complete Tear
- Partial Avulsion

Rectus Femoris Tear: full tear, pseudomass

- Short Axis
- Axial T1w post-gado
Rectus Femoris Tear: full tear, pseudomass

Semimembranosus Tear

Semimembranosus: tendinosis

Conjoined Biceps Femoris-Semitendinosus: tendinosis

Conjoined BF-ST Tendon: partial tear

Hamstring: complete tear with retraction

From: Barry et al. Radiology 2014; 271:162
Hamstring Tear:
FTT: Conjoint
PTT: semimembranosus

Biceps Femoris: remote tear

Semimembranosus: remote tear

Seroma

Heterotopic Ossification:
- Hyperechoic
- Posterior acoustic shadowing and reverberation
- No surrounding soft tissue mass

J Ultrasound Med 1989; 8:463
Pathology:
- Joint abnormalities
- Bursal pathology
- Muscle and tendon injury
- Snapping hip syndrome
- Miscellaneous pathology

Snapping Hip Syndrome
- Painful snap with hip motion
- Intraarticular
- Extraarticular:
  - Anterior: iliopsoas tendon
  - Lateral: iliobibial tract or gluteus maximus

Snapping Hip Syndrome: iliopsoas
- Image long axis to inguinal ligament superior to femoral head
- Extension of flexed abducted and externally rotated hip
- Abrupt movement of iliopsoas as iliacus muscle interposed between tendon and bone moves


Deslandes et al. AJR 2008; 190:576
Snapping Hip Syndrome: iliopsoas

- Transverse over greater trochanter
- Hip external rotation / flexion
- Abrupt motion of iliotibial tract or gluteus maximus over greater trochanter

Snapping Hip: lateral

Pathology:
- Joint abnormalities
- Bursal pathology
- Muscle and tendon injury
- Snapping hip syndrome
- Miscellaneous pathology

Soft Tissue Abscess:
- Anechoic or hypoechoic
- Less likely hyperechoic
- Posterior acoustic enhancement
- Swirling of contents with transducer pressure
- Hyperemia

AJR 1996; 166:149

Gluteus Muscle: abscess

- Axial
- T1w post-gadolinium
Osteomyelitis:
- Soft tissue fluid collection adjacent to bone (adults)
- Subperiosteal fluid collection (children)
- Disruption of normal smooth bone cortex

Radiographics 1999; 19:585

Inflammatory Myositis
- Acute: variable echogenicity, swollen
- Late:
  - Hyperechoic: fatty infiltration
  - Decreased size
- Possible hyperemia
- Infection, dermatomyositis, polymyositis

Polymyositis: sartorius

Diabetic Muscle Infarction:
- Thigh and calf: long standing diabetes
- Hypoechoic, swollen, subfascial fluid
- Unlike abscess:
  - Muscle fibers and septa within
  - No anechoic or swirling fluid component

AJR 2000; 174:165
Diabetic Muscle Infarction: quadriceps

Posterior Thigh: Peripheral Nerves

Transection Neuroma:
- Neuroma formation:
  - Disorganized and tangled nerve end
  - Normal response to nerve transection
  - US important to determine if symptomatic

J Clin Ultrasound 1997; 25:85

Transection Neuroma: sciatic

Meralgia Paresthetica
- Sensory: anterolateral thigh
- Hypoechoic enlargement
- Ultrasound-guided steroid injection

Lymph Node:
- Normal: echogenic hilum
  - Interfaces with fluid-filled sinuses
  - Not due to fat
- Abnormal: enlarged, short axis >1.5 cm

Radiology 1992; 183:215
Lymph Node: hyperplastic

Lymph Node: malignant
- Gray scale:
  - Absent echogenic hilum
  - Narrow hilum with thick cortex
  - Round shape (not oval)
- Power Doppler:
  - Dense vascularity
  - Spotted, mixed, or peripheral (not hilar)
  - High resistance

Radiology 1992; 183:215

Lymph Node: reactive

Lymph Node: reactive

Lymph Node: B cell lymphoma

Lymph Node: Non-Hodgkins lymphoma
Lymph Node: angiosarcoma metastasis

Soft Tissue Sarcoma:
- Hypoechoic to mixed echogenicity
- US performs equal to MRI in detection of sarcoma recurrence
- US can detect non-palpable superficial recurrence

1AJR 1991; 157:353
2AJR 1997; 169:1449

Recurrent Sarcoma

Soft Tissue Metastasis: lung

Take-home points
- Joint effusion: anterior recess
- Bursae: know locations
- Tendons: bone landmarks and footprints
- Snapping hip: dynamic evaluation
Syllabus on line and other educational material:
www.jacobsonmskus.com

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