

# Ultrasound versus MR imaging for Musculoskeletal Evaluation

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## Disclosures

- Consultant: Bioclinica
- Contractor: POCUS PRO
- Advisory Board: Philips
- Book Royalties: Elsevier
- Not relevant to this lecture

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Fundamentals of Musculoskeletal Ultrasound are  
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## Objectives

- To review indications for ultrasound versus MR imaging:
  - Musculoskeletal conditions
  - Pediatric and adolescent patient
  - Review of each joint

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## Shoulder

- US:
  - Rotator cuff (if > 40 years of age)
  - Bursitis
  - Joint effusion
- MRI:
  - Rotator cuff (if <40 years of age)
  - Labrum and hyaline cartilage
  - Bone: fracture, tumor

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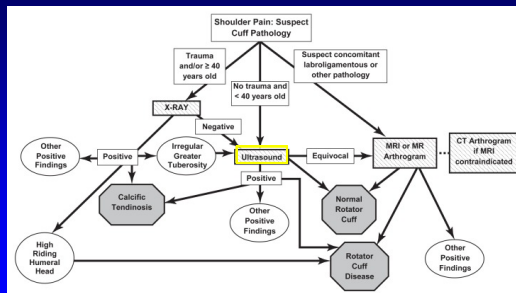
## Rotator Cuff Tear:

- Meta-analysis: 65 articles
- Full-thickness tears:
  - MRA, MRI, US = in sensitivity (92 – 95%)
  - MRA more specific
- Partial-thickness tears:
  - MRA most sensitive (86%) and specific
  - MRI (64%), US (67%)

de Jesus, 2009; 192:1701

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## Native Shoulder: suspect cuff tear



Nazarian LN et al. Radiology 2013; 267:589

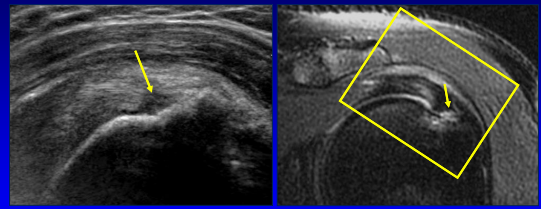
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### Tendon Abnormalities:

- Tendinosis: hypoechoic, increased size
- Partial-thickness tear: hypoechoic with anechoic focus or clefts
- Full-thickness tear: discontinuity
  - Dynamic imaging: retraction

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### Articular Partial-thickness Tear: supraspinatus



Long Axis

Coronal T2w

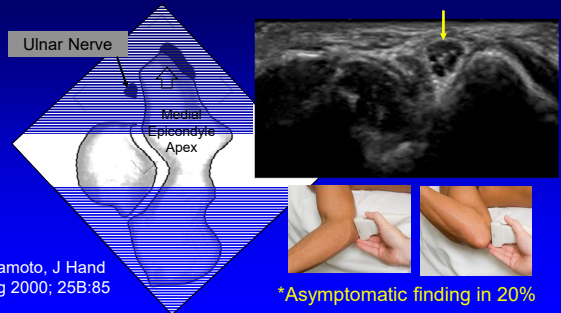
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### Elbow

- US:
  - Joint: effusion, synovitis, bursitis
  - Tendon abnormalities
  - Snapping conditions
  - Peripheral nerves
  - UCL tears (with MR arthrography)
- MRI:
  - Cartilage
  - Bone: fracture, tumor

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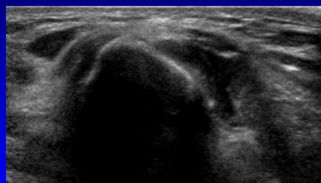
### Isolated Ulnar Nerve Dislocation



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### Snapping Triceps Syndrome

- Ulnar nerve and medial triceps dislocate over apex of medial epicondyle
- Ulnar nerve and medial triceps remain in contact with each other
- Palpable snap felt through transducer

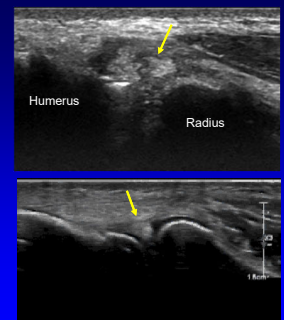


Jacobson JA et al. Radiology 2001; 220:601

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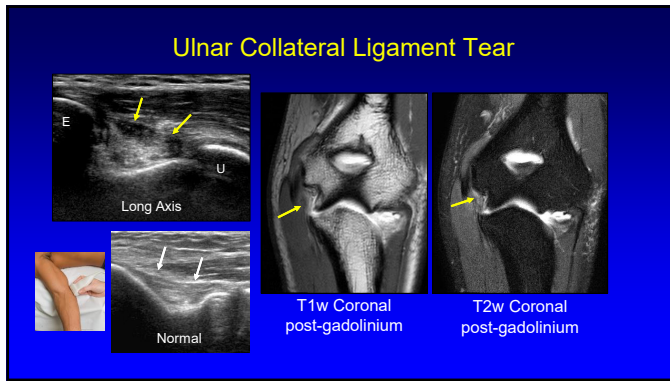
### Synovial Fold Syndrome

- Normal capsular tissue
  - Hyperechoic, triangular
- Abnormal:
  - Thickened > 3 mm
  - Heterogeneous
  - Adjacent synovitis

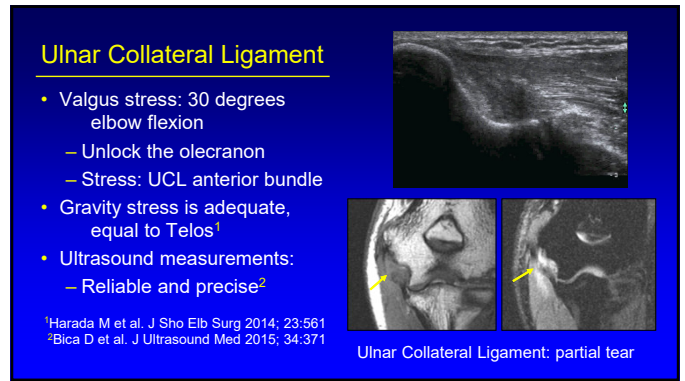


Cerezal et al. AJR 2013; 201:W88

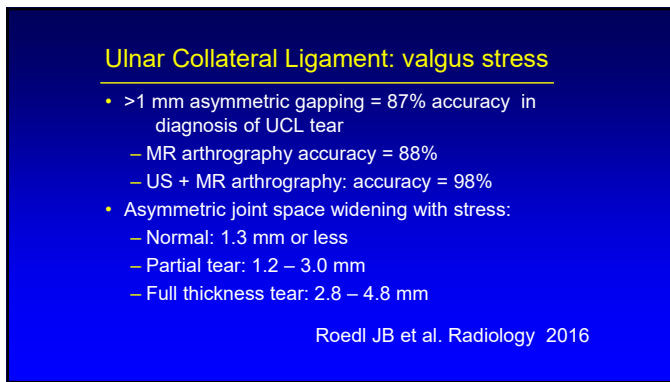
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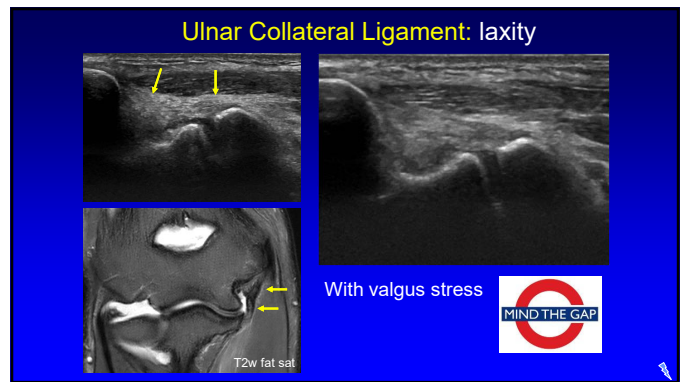
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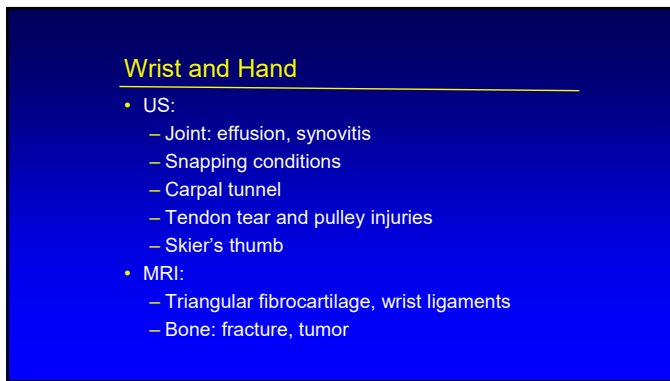
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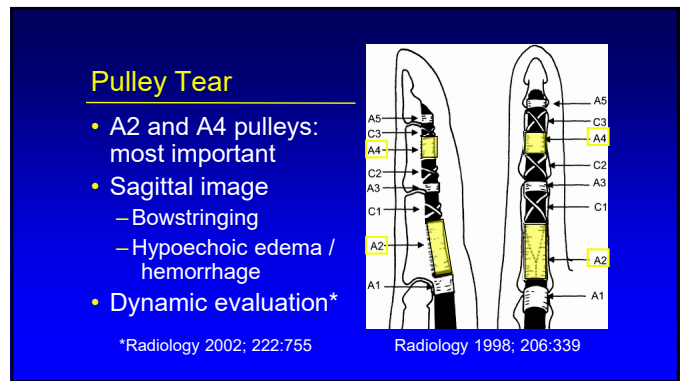
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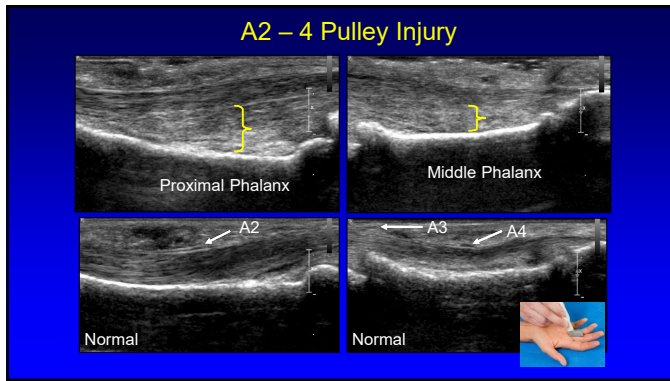
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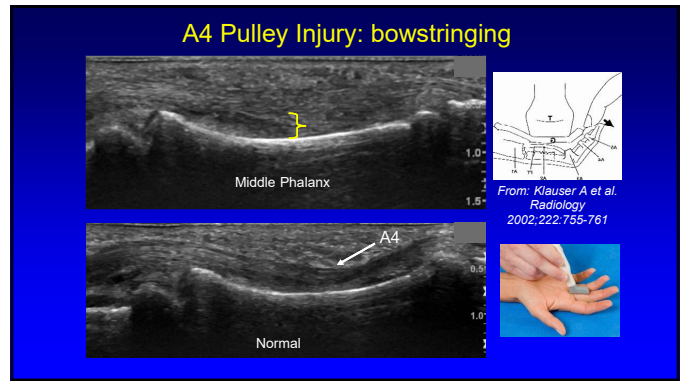
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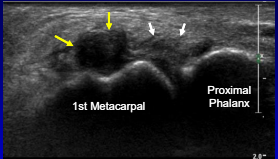
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### Stener Lesion

- Displaced proximal stump of UCL
  - Hypochoic & round
  - Proximal to MCP joint
  - At proximal edge of adductor pollicis aponeurosis
- No tissue spanning MCP joint
- “Yo-yo on a string” sign
- Ultrasound: 100% accuracy\*



Yellow arrows: Stener  
 White arrows: aponeurosis

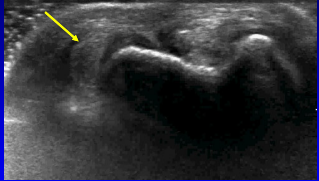


\*Melville D. et al. Skeletal Radiology 2013; 42:667

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### Extensor Carpi Ulnaris

- 6<sup>th</sup> extensor wrist compartment
- Dislocation:
  - Dynamic
  - Supination/pronation
  - Subsheath tear or dysfunction
- Predisposes to tendon tear and tenosynovitis



Campbell D et al. Br J Sports Med 2013; 47:1105

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### Hip

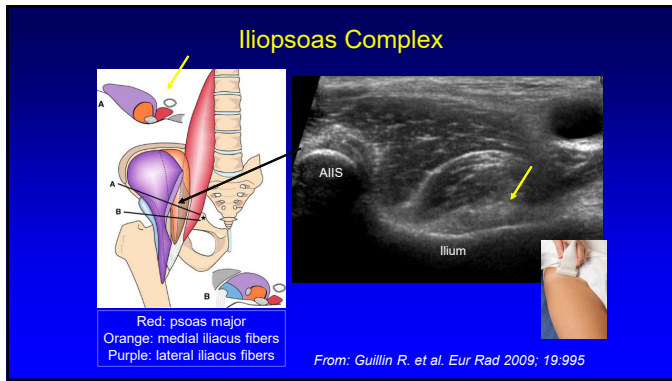
- US:
  - Joint: effusion, synovitis
  - Snapping conditions
  - Greater trochanter: tendons and bursa
- MRI:
  - Labrum and articular cartilage
  - Bone: fracture, tumor, osteonecrosis

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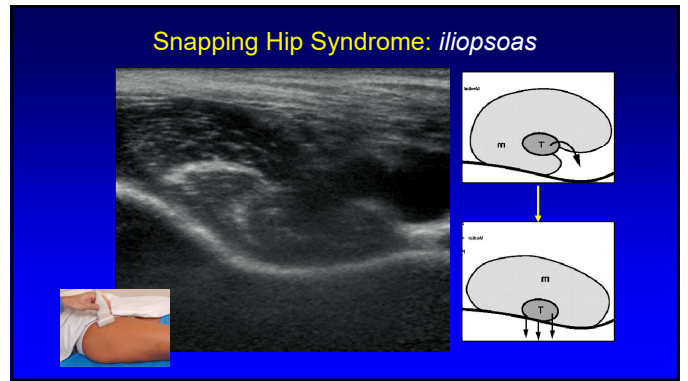
### Snapping Hip Syndrome

- Painful snap with hip motion
- Intraarticular
- Extraarticular:
  - Anterior: iliopsoas tendon
  - Lateral: iliotibial tract or gluteus maximus

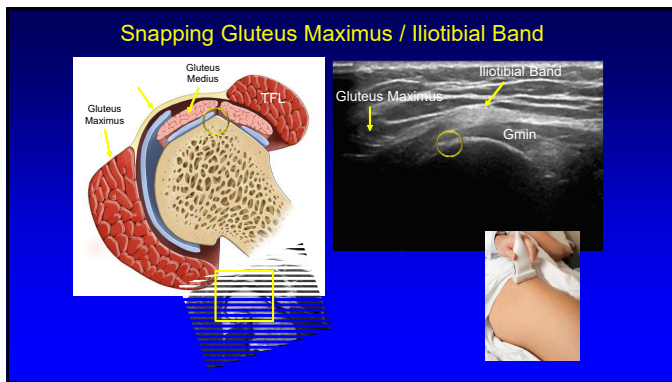
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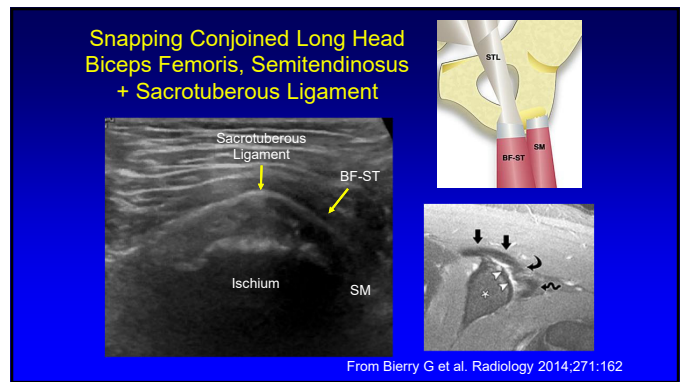
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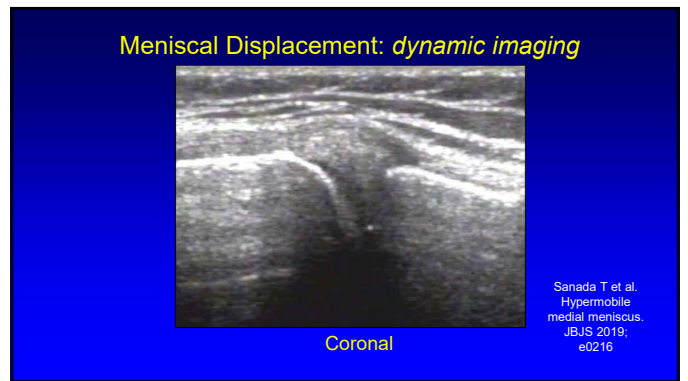
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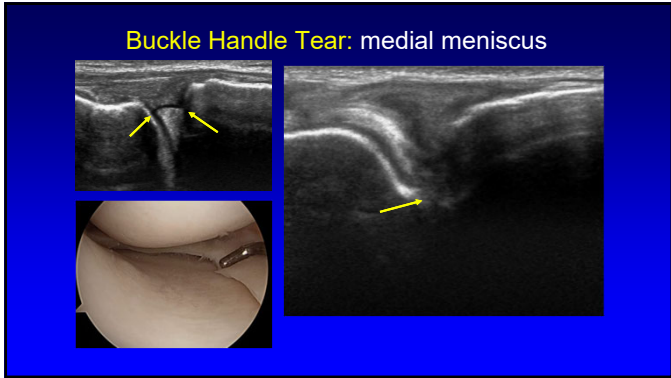
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- ### Knee
- US:
    - Joint: effusion, synovitis
    - Snapping conditions
    - Bursitis, Baker cyst
  - MRI:
    - Meniscus and articular cartilage
    - Ligaments
    - Bone: fracture, tumor, osteonecrosis

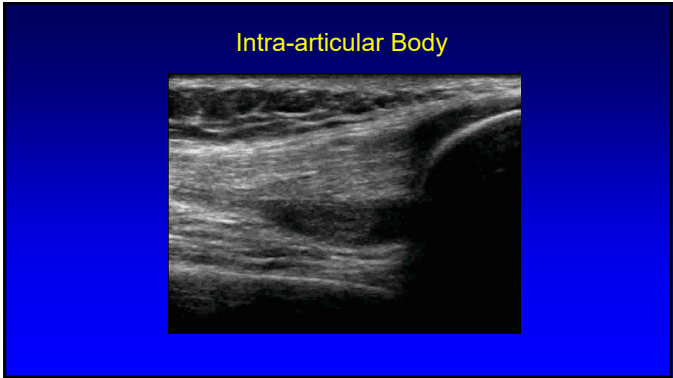
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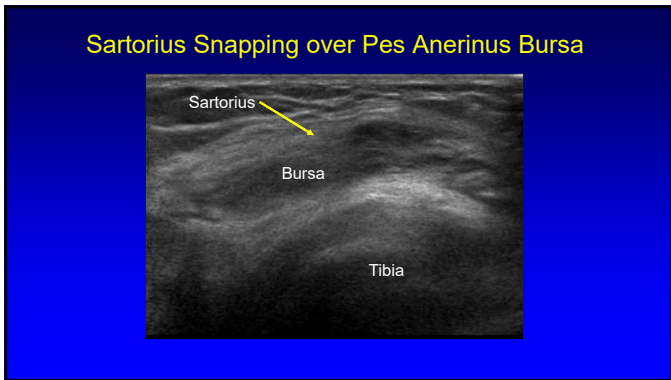
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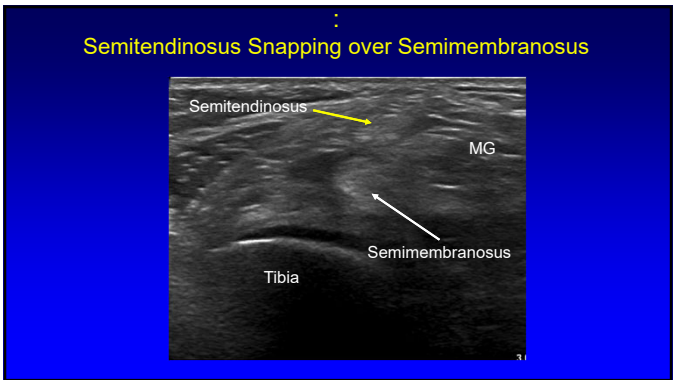
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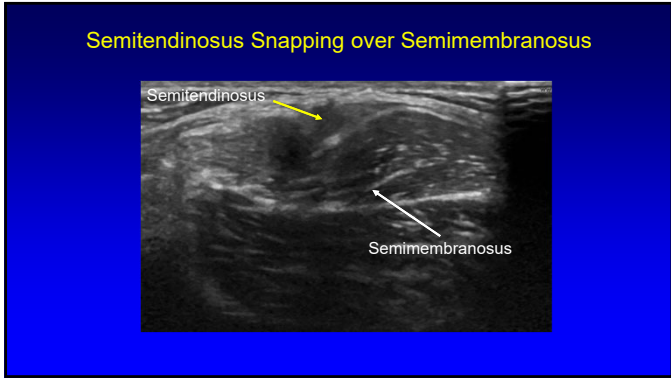
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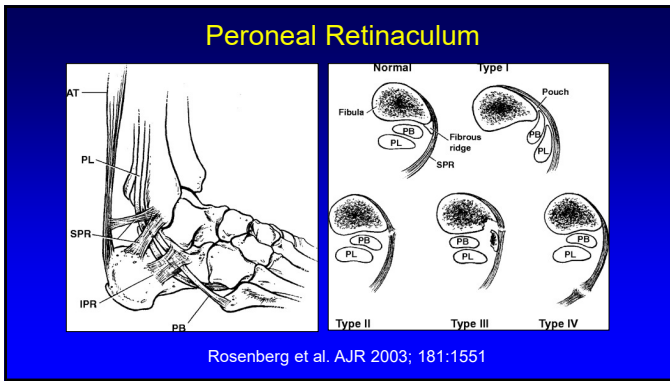
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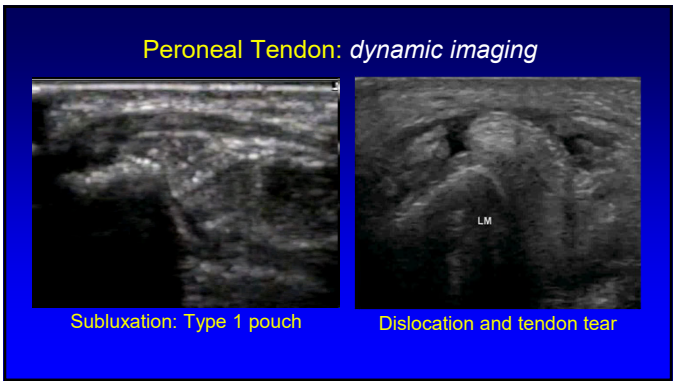
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- Ankle and Foot**
- US:
    - Joint: effusion, synovitis
    - Tendons & plantar fascia
    - Peripheral nerves
    - Ankle ligaments
    - Snapping conditions
  - MRI:
    - Articular cartilage
    - Bone: fracture, tumor

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### Intrasheath Peroneal Subluxation

- Abnormal snapping: peroneal tendons
- No lateral displacement, intact retinaculum
- Type A: no tear; B: tendon tear
- Associations:
  - Convex posterior fibula in 92%
  - Tendon tear in 86%
  - Low lying peroneus brevis muscle in 71%

J Bone Joint Surg Am 2008; 90:992  
J Foot Ankle Surg 2009; 48:323

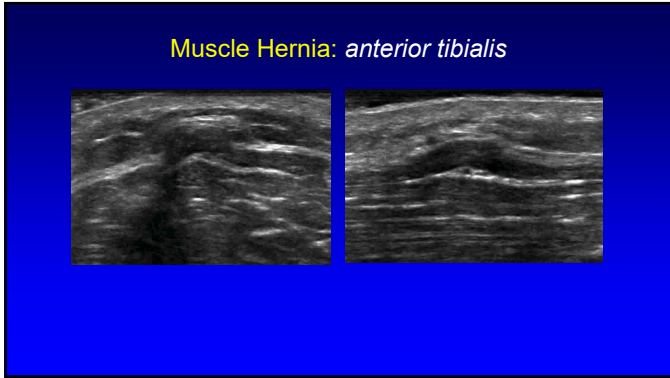
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### Muscle Hernia

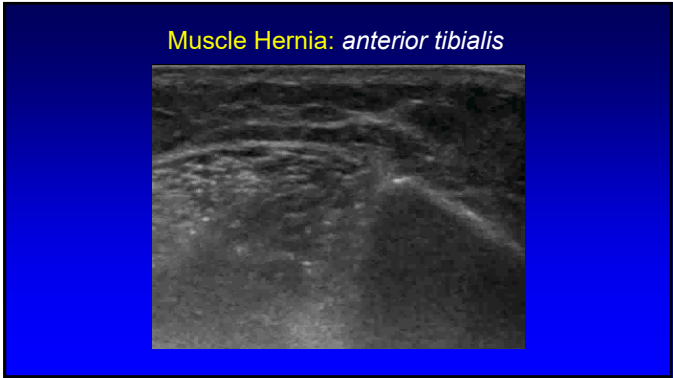
- Cause: trauma, activities, weak fascia
- Lower leg: especially anterior tibialis
- Swelling with muscle contraction
- US: muscle bulge, possible fascial defect
  - Site of perforating vessel

Beggs, AJR 2003; 180:395

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### Take Home Points

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- Ultrasound equal to MRI for many applications
  - Especially superficial pathology
- Important role imaging dynamically
  - Snapping conditions
  - Muscle contraction / position needed

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Thank you!

Syllabus on line and other educational material:  
[www.jacobsonmskus.com](http://www.jacobsonmskus.com)

Twitter handle: @jjacobsn

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