

Musculoskeletal Ultrasound: Dynamic Imaging

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Disclosures

- Consultant: Bioclinica
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- Book Royalties: Elsevier
- Not relevant to this lecture

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Fundamentals of Musculoskeletal Ultrasound
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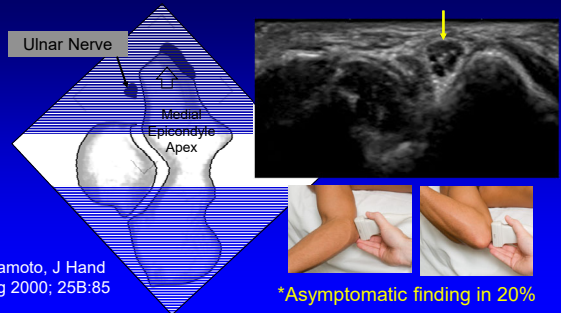
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Objectives:

- To demonstrate musculoskeletal pathologies requiring:
 - Joint movement or positioning
 - Muscle contraction

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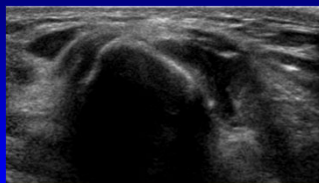
Isolated Ulnar Nerve Dislocation



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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

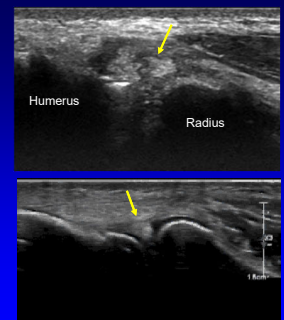
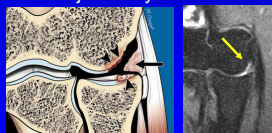


Jacobson JA et al. Radiology
2001; 220:601

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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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Ulnar Collateral Ligament Tear

Long Axis

Normal

T1w Coronal post-gadolinium

T2w Coronal post-gadolinium

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Ulnar Collateral Ligament

- Valgus stress: 30 degrees elbow flexion
 - Unlock the olecranon
 - Stress: UCL anterior bundle
- Gravity stress is adequate, equal to Telos¹
- Ultrasound measurements:
 - Reliable and precise²

¹Harada M et al. J Sho Elb Surg 2014; 23:561
²Bica D et al. J Ultrasound Med 2015; 34:371

Ulnar Collateral Ligament: partial tear

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Ulnar Collateral Ligament: valgus stress

- >1 mm asymmetric gapping = 87% accuracy in diagnosis of UCL tear
 - MR arthrography accuracy = 88%
 - US + MR arthrography: accuracy = 98%
- Asymmetric joint space widening with stress:
 - Normal: 1.3 mm or less
 - Partial tear: 1.2 – 3.0 mm
 - Full thickness tear: 2.8 – 4.8 mm

Roedl JB et al. Radiology 2016

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Ulnar Collateral Ligament: laxity

Symptomatic

Contralateral

With valgus stress

With valgus stress

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Ulnar Collateral Ligament: laxity

With valgus stress

T2w fat sat

MIND THE GAP

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Extensor Carpi Ulnaris

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

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

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Pulley Tear

- A2 and A4 pulleys: most important
- Sagittal image
 - Bowstringing
 - Hypoechoic edema / hemorrhage
- Dynamic evaluation*

*Radiology 2002; 222:755

Radiology 1998; 206:339

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A2 – 4 Pulley Injury

Proximal Phalanx

Middle Phalanx

Normal

Normal

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A4 Pulley Injury: bowstringing

Middle Phalanx

Normal

From: Klausner A et al. Radiology 2002;222:755-761

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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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Iliopsoas Complex

AIIS

Ilium

From: Guillin R. et al. Eur Rad 2009; 19:995

Red: psoas major
Orange: medial iliacus fibers
Purple: lateral iliacus fibers

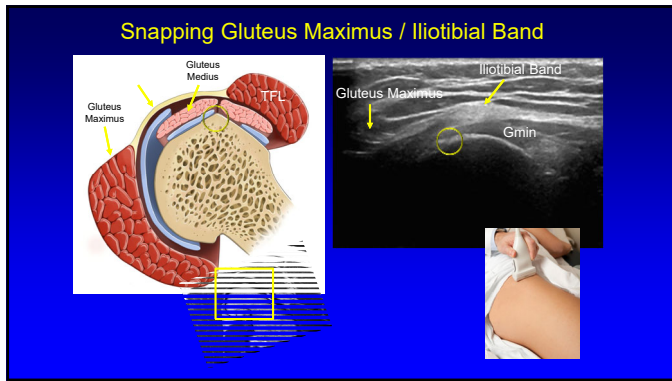
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Snapping Hip Syndrome: iliopsoas

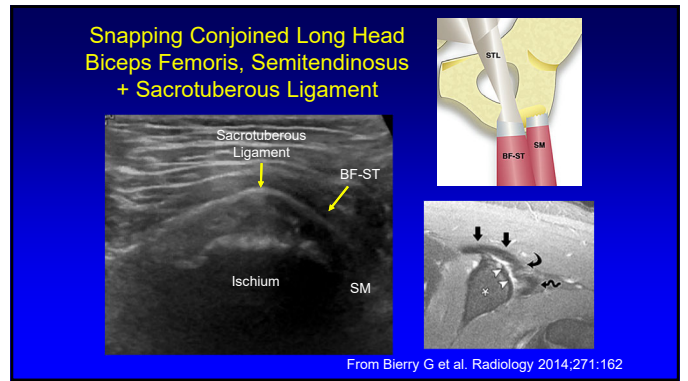
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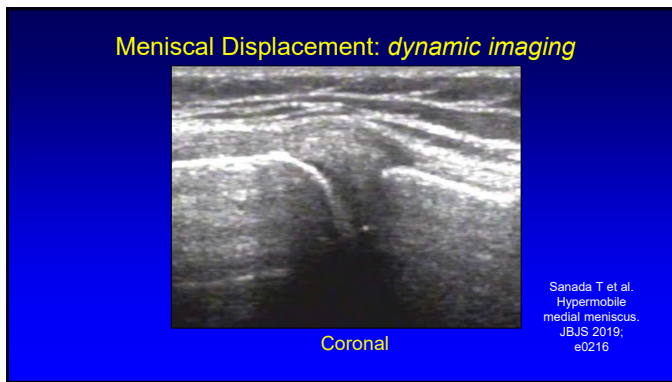
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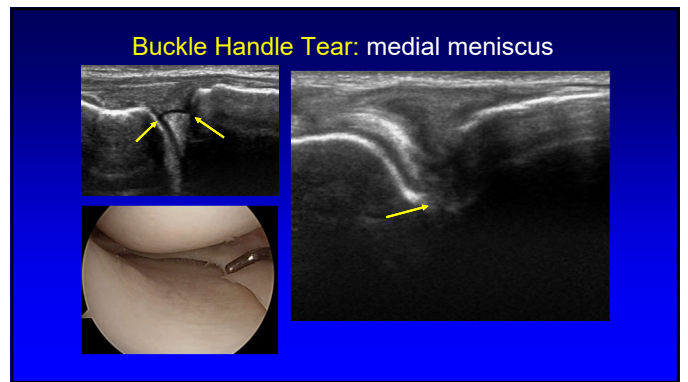
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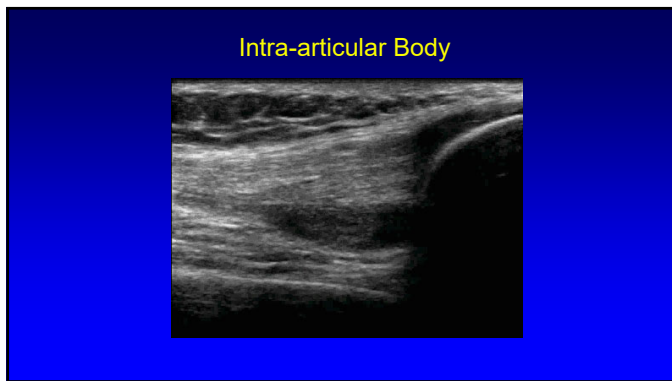
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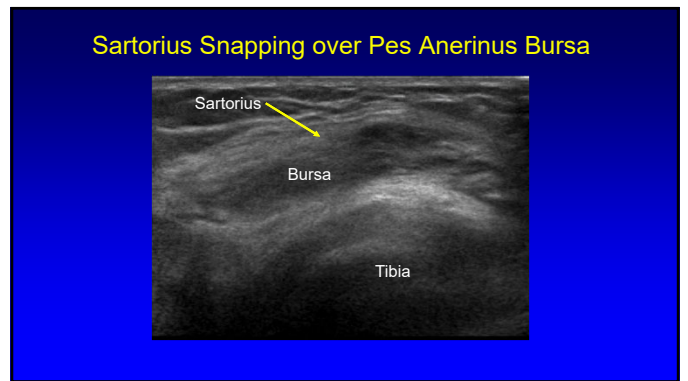
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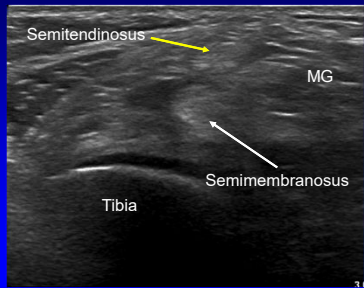


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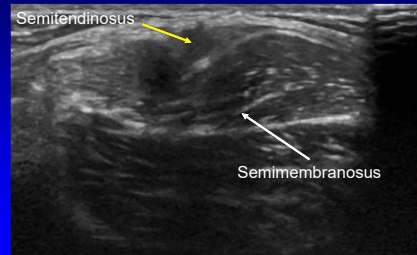
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Semitendinosus Snapping over Semimembranosus



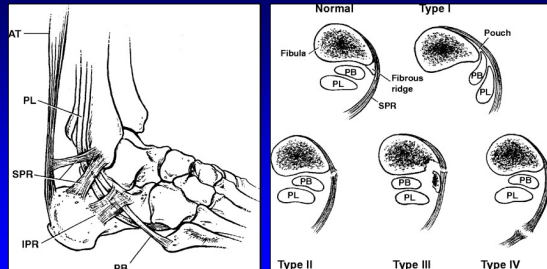
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Semitendinosus Snapping over Semimembranosus



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Peroneal Retinaculum



Rosenberg et al. AJR 2003; 181:1551

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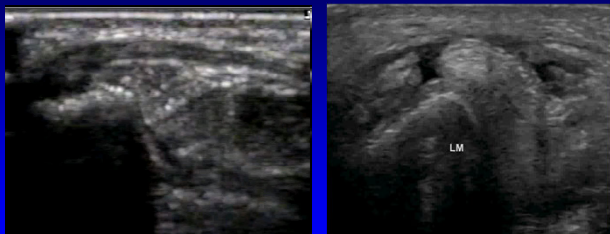
Peroneal Tendon Subluxation:

- Abnormal movement may only occur dynamically
- Predisposes to peroneal tendon tears
 - Longitudinal split of peroneus brevis
- US: examine with dorsiflexion / eversion
 - 100% accurate diagnosis with US

Neustadter et al. AJR 2004; 183:985

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Peroneal Tendon: dynamic imaging



Subluxation: Type 1 pouch

Dislocation and tendon tear

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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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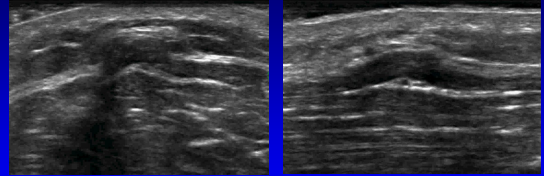
Muscle Hernia

- 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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Muscle Hernia: *anterior tibialis*



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Muscle Hernia: *anterior tibialis*



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Dynamic Imaging: summary

- Dynamic pathologic conditions
 - Limited number
 - Involve specific structures
- Consider ultrasound for any snapping or painful dynamic situation

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Syllabus on line and other educational material:
www.jacobsonmskus.com

Twitter handle: @jjacobsn

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