

Dynamic Musculoskeletal Ultrasound

Jon A. Jacobson, MD

Professor of Radiology
Section Chief, Musculoskeletal Imaging



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Disclosures:

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

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Objectives:

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

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Dynamic Imaging:

- Shoulder
- Elbow
- Wrist and Hand
- Hip and Thigh
- Knee
- Ankle and Foot
- Soft Tissues

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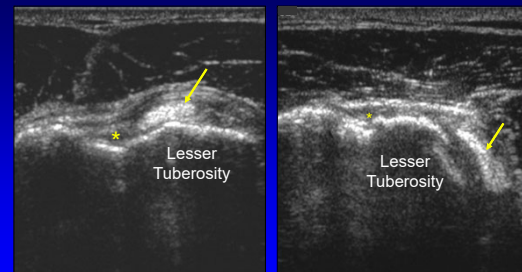
Biceps Brachii Tendon:

- Subluxation:
 - Partially perched on lesser tuberosity
- Dislocation:
 - Empty bicipital groove
 - Simulates biceps tendon tear
 - Associated subscapularis tears

Farin et al. Radiology 1995; 195:845

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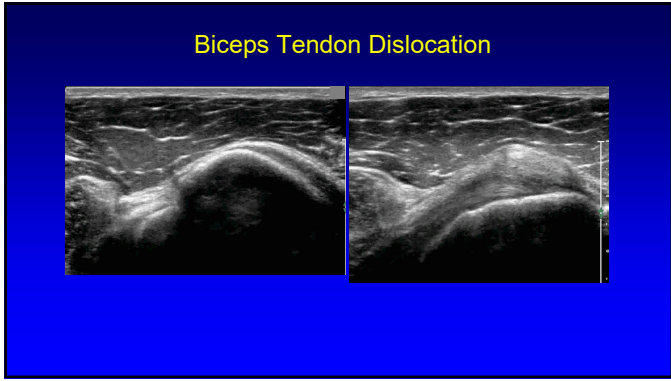
Biceps Tendon



Subluxation

Dislocation

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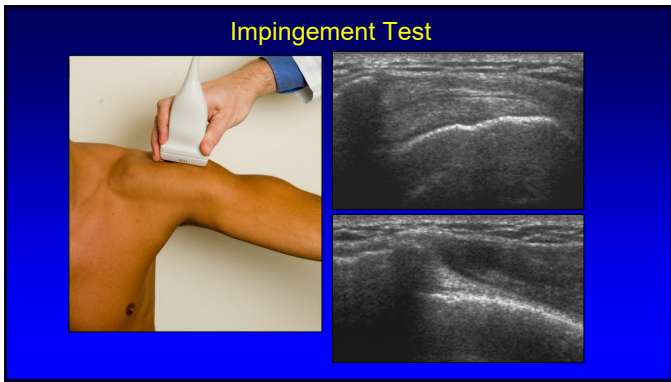
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Impingement: bursal fluid

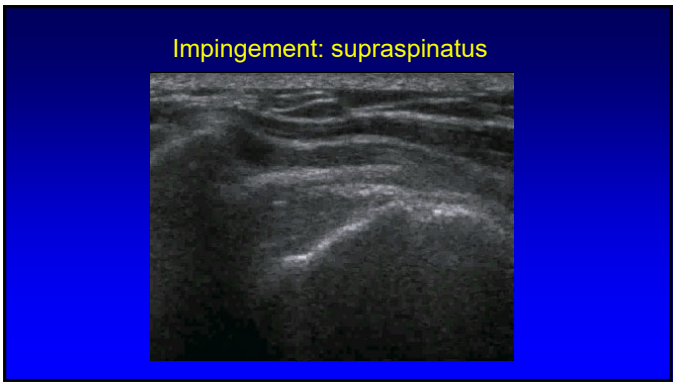
- Abnormal pooling of subacromial-subdeltoid bursal fluid
- Lateral acromion¹:
 - Coronal plane, active arm elevation
 - Not visible in neutral position, no cuff tear
- At coracoid²:
 - Axial plane, active elevation internal rotation

¹Farin et al. Radiology 1990; 176:845
²Stallenberg et al. AJR 2006; 187:894

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Isolated Ulnar Nerve Dislocation

Ulnar Nerve
 Medial Epicondyle
 Apex

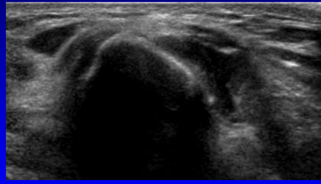
Okamoto, J Hand Surg 2000; 25B:85

*Asymptomatic finding in 20%

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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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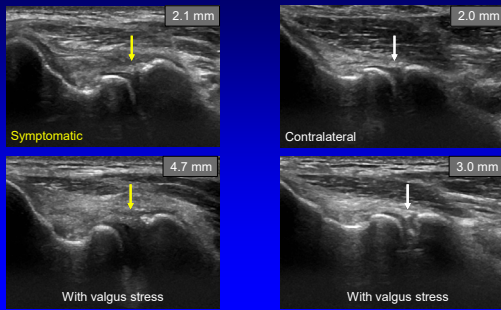
Ulnar Collateral Ligament: valgus stress

- >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

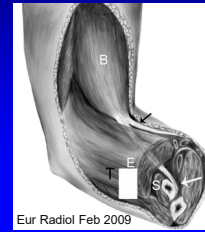


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Biceps Brachii Tendon: normal



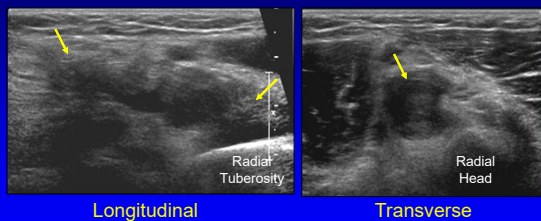
Longitudinal: dynamic imaging



Eur Radiol Feb 2009

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Biceps Brachii Tendon: complete tear

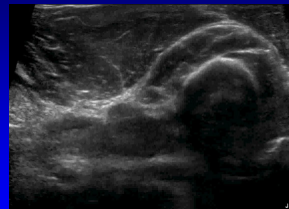


Longitudinal

Transverse

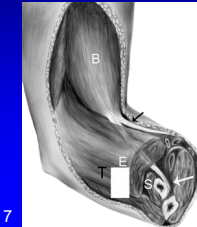
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Biceps Brachii Tendon: complete tear non-retracted



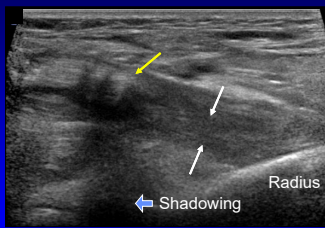
Longitudinal: dynamic imaging

Kalume Brigido M. Eur Radiol 2009 ; 19:1817



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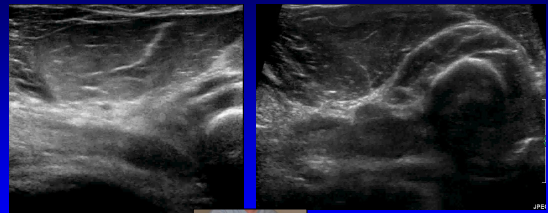
Biceps Brachii Tendon: partial tear (short head)



Longitudinal:
Retracted superficial short head (yellow arrows)
Hypoechoic but intact deep long head (white arrows)

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Biceps Tendon Tears: dynamic imaging



Partial Tear

Complete Tear



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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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Dynamic Imaging:

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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

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

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

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Snapping Hip Syndrome: iliopsoas

- 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

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Snapping Hip Syndrome: iliopsoas

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Snapping Hip: lateral

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

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Snapping Gluteus Maximus / Iliotibial Band

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Patellar Clunk Syndrome

- After total knee arthroplasty
- 1% to 7.5% incidence
- Fibrous nodule: intercondylar notch
- Pain with flexion - extension



Okamoto T. et al. J Orthop Sci 2002; 7:590

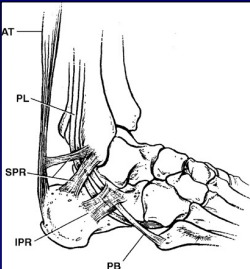
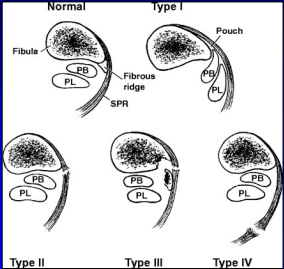
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Peroneal Retinaculum






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 US diagnosis

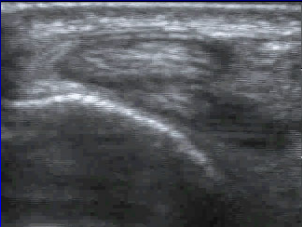



Neustadter et al. AJR 2004; 183:985

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Intrasheath Subluxation

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



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

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Achilles Tendon: Dynamic Imaging

- Increase accuracy for full-thickness tear:
 - Widening of gap with passive dorsiflexion
 - Lack of tendon movement across tear
- Determine if ends approximate
 - Conservative versus surgical treatment

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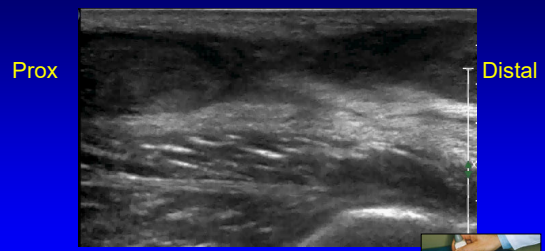
Achilles Tendon: dynamic imaging



Long Axis

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Achilles Tendon: healing tear



Prox

Distal

Longitudinal



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Morton Neuroma:

- Interdigital nerve entrapment
- Edema, fibrosis, necrosis
- 3rd intermetatarsal space > 2nd
- Sharp, burning pain from metatarsal head to toes
- Females: pliable foot, high-heeled narrow-toed shoes

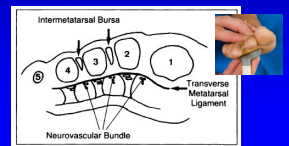
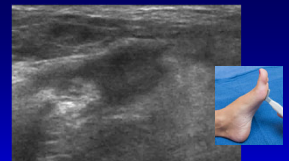


From: Martinoli, RadioGraphics 2000; 20:S199

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Dynamic Evaluation

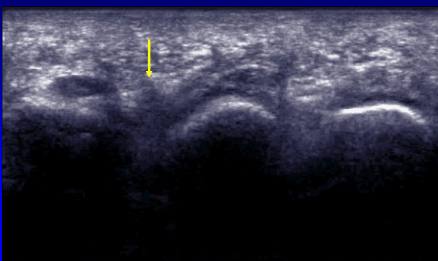
- Compression
 - Between transducer and palpation
 - Bursae (dorsal) compress, neuromas (plantar) do not
- Sonographic Mulder Sign
 - Scan plantar: coronal plane
 - Neuroma displaces: plantar
 - Palpable click



Torriani M et al. AJR 2003; 180:1121
Zanetti M et al. Radiology 1997; 203:516

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Dynamic imaging: Mulder's Maneuver



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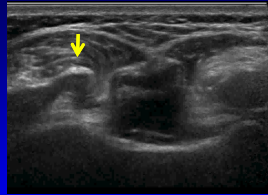
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Slipping Rib Syndrome

- Abnormal mobility of cartilaginous rib
- Slips over adjacent rib with muscle contraction or activity
- Visible with dynamic ultrasound



J Ultrasound Med 2002; 21:339

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

Twitter handle: @jjacobsn

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