Slide 1

Basic Ultrasound Concepts

Jon A. Jacobson, MD
FACR, FSRU, FAIUM, RMSK

Musculoskeletal Radiologist
Lenox Hill Radiology, NYC
University of California, San Diego

Syllabus PDF

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Slide 2

Disclosures

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

Note: all images from the textbook Fundamentals of Musculoskeletal Ultrasound are copyrighted by Elsevier Inc.

See www.jacobsonmskus.com for syllabus other educational material

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Slide 3

Equipment: probe selection

- Frequency determines resolution
  - High frequency = high resolution
  - Poor depth penetration
- Superficial structures: 10 – 17 MHz
  - Distal extremities and peripheral nerves
- Deep: 5 – 7 MHz linear or curvilinear
  - Thigh or hip

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Slide 4

Scanning: basics

- Holding transducer:
  - Anchor hand/transducer
  - 5th finger or hand on patient
- Coupling gel
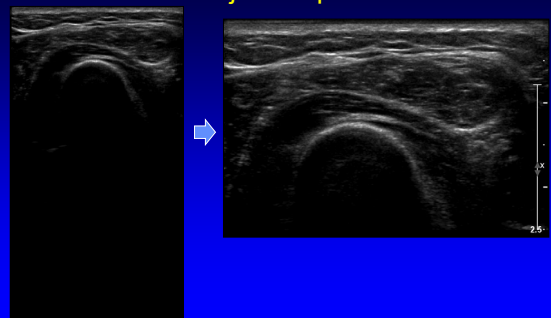- Imaging plane:
  - Long axis of transducer

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Slide 5

Scanning: basics

- Beam is focused
  - Narrower than transducer width
  - < 2 mm
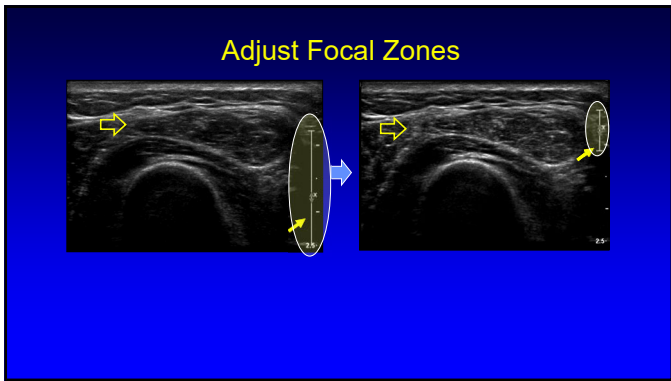- Sweep transducer slowly
  - Only millimeters at a time

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Slide 6

Adjust Depth

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Adjust Focal Zones

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Adjust Gray Scale

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Long Head of Biceps Brachii Tendon

Short Axis

Long Axis

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Anisotropy: supraspinatus

Long Axis

Short Axis
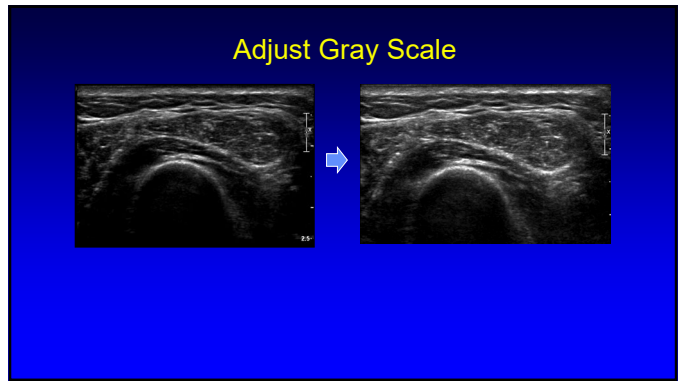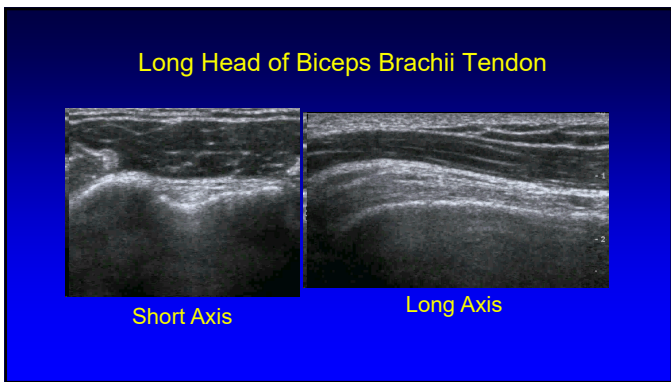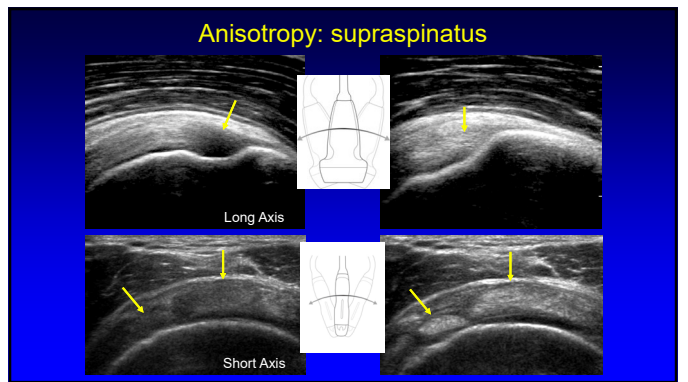
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Shadowing

- Occurs at interface with high impedance differences
- Surface of object is irregular
- Sound beam is absorbed
- Bone, calcification, gas
- Foreign bodies

Achilles ossification

Wood Foreign Body

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Attenuation

- Occurs where soft tissues are dense or many interfaces
- Sound beam is partially absorbed
- Fibrous tissue
- Fatty infiltration of muscle
- Consider low frequency transducer

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Scapula

Infraspinatus: atrophy

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Reverberation

- Occurs when sound beam hits smooth surface
- Sound beam reflected back and forth between object and transducer
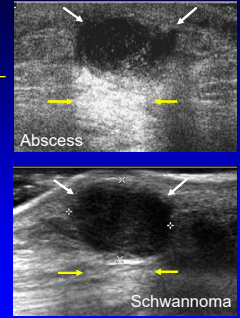- Ring down linear echoes
- Metal, glass, bone cortex
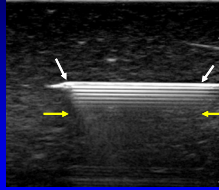
20 ga. needle
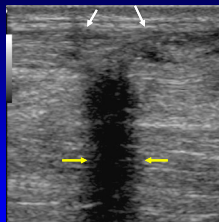
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Increase Through Transmission

- Occurs when sound beam passes through fluid or homogeneous mass
- Sound beam brighter deep to object
- Fluid
- Solid mass: nerve sheath tumor, metastasis, etc.

Abscess

Schwannoma

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Refraction

- Occurs when sound beam hits edge of tendon at site of tear
- Oblique shadow
- Patellar and Achilles tendon tears
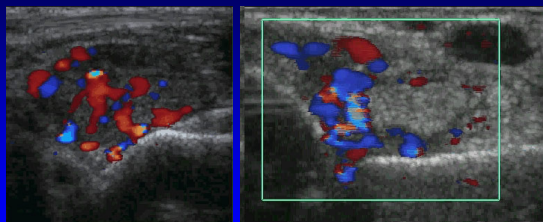

Achilles full-thickness tear

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Color and Power Doppler

- Increased blood flow or hyperemia
  - Neovascularity: tumor, tendinosis
  - Inflammation
- Not seen in normal tendon, ligament, or peripheral nerve
- Pitfall:
  - Avoid too much transducer pressure
  - Obscure flow

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Color Doppler Imaging

Vascular Tumor   Synovitis

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Take Home Points

- Optimize image
- Scanning technique:
  - Stabilize transducer on patient with hand
  - Move transducer small amount at a time
  - Beware: anisotropy

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Thank you!

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

Twitter handle: @jjacobsn

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