

Peripheral Nerves & Adjacent Structures:

Normal Anatomy and Ultrasound Features

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● Peripheral Nerves and Adjacent Structures

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- Artifact
- Nerve
- Tendon
- Fasciae
- Muscle

● ARTIFACT: Anisotropy of Ultrasound

- First described by Dussik et al in 1958
- Tendons appear **echogenic** when the US beam insonates at 90° to the long axis of the tendon fibers
- The more the angle deviates from 90°, the fewer reflected sound waves will be detected
- Tendons become **isoechoic to muscle** at angles of 2°–7° and **hypoechoic** at greater angles

[Matthieu J. C. M. Rutten et al. 2006 RadioGraphics, 26:589-604]

● ARTIFACT: Anisotropy of Ultrasound

TENDON

● ARTIFACT: Anisotropy of Ultrasound

MUSCLE

● ARTIFACT: Anisotropy of Ultrasound

MUSCLE

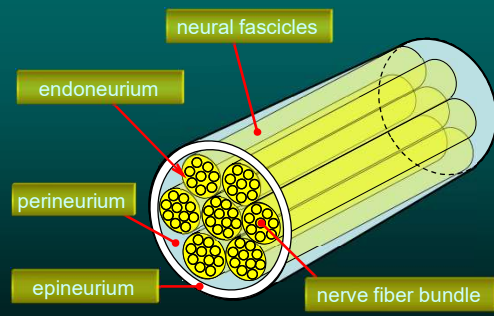
● Peripheral Nerves and Adjacent Structures

AGENDA

ULTRASOUND NERVE

- Artifact
- Nerve
- Tendon
- Fasciae
- Muscle

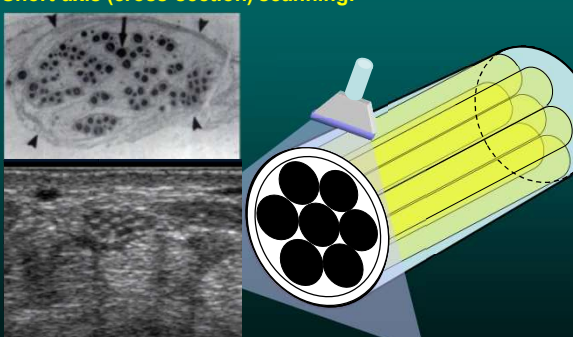
● Basic Structures of Peripheral Nerves



A diagram of the basic structures of a peripheral nerve

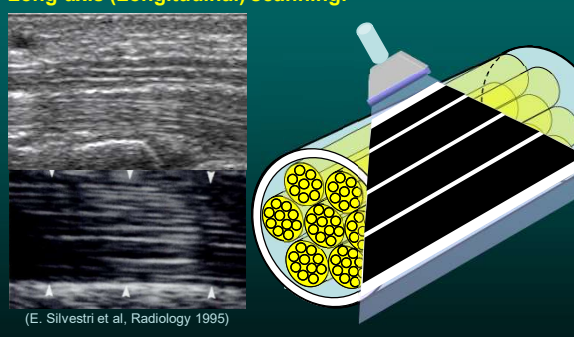
● Normal US Features of Peripheral Nerve

Short-axis (cross-section) scanning:



● Normal US Features of Peripheral Nerve

Long-axis (Longitudinal) scanning:



(E. Silvestri et al, Radiology 1995)

● Unusual US Features of Peripheral Nerve

UNUSUAL


Hypoechoic nerve:

Causes:

- Thin nerves.
 - The perineurium or even epineurium is too thin to reflex enough echoes.
- Nerve is not perpendicular to the sound beam
 - US anisotropy

Problems:
Difficulties in differentiating from the companion vessels.

Solutions:
Color-Doppler Ultrasound.
Compression.



● Unusual US Features of Peripheral Nerve

UNUSUAL

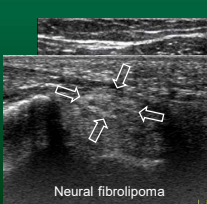
Hyperechoic nerve:

Causes:

- Thick epineurium, perineurium, or even endoneurium
- Thin neural fascicles
- Artifacts

Problems:
Difficulties in differentiating nerves from tendons.

Solutions:
Trace the nerve.
Sagittal scan.

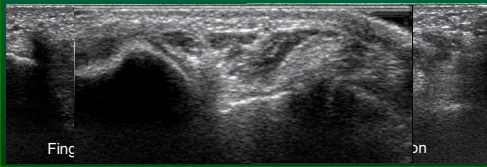


Neural fibrolipoma

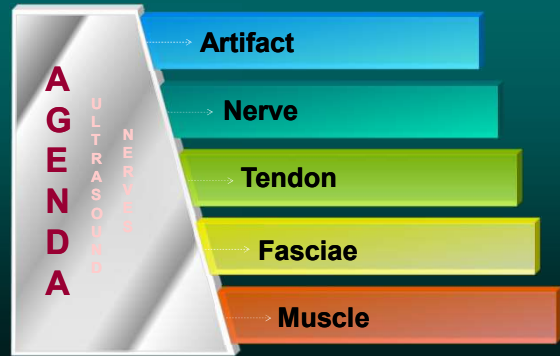
● **Dynamic Scanning**

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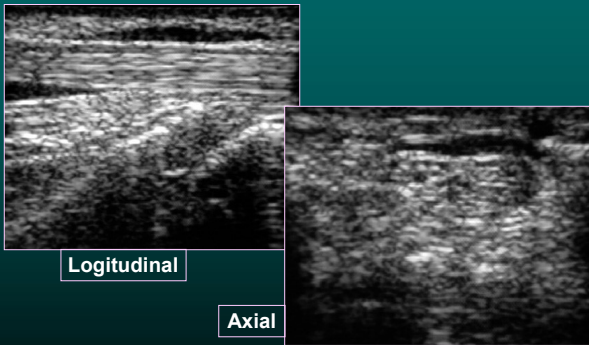
Dynamic scan is necessary in certain locations
 — Abnormal movement of a nerve associated with the motions of extremities may be the source of symptoms.
 ✓ A decreased mediolateral motion of the median nerve in carpal tunnel → carpal tunnel syndrome.
 ✓ Ulnar nerve may subluxate or dislocate out of the groove with the elbow flexion and extension.



● **Peripheral Nerves and Adjacent Structures**



● **Normal Tendon**



● **Common Tendon Pathologies**

- Chronic and acute rupture
- Tendinitis
- Tenosynovitis
- Tendon dislocation
- Entheses and enthesopathies
- Related masses and cysts

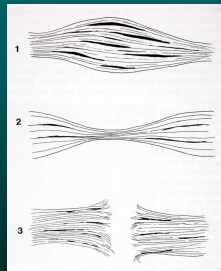
● **US Features of Tendon Rupture and Tendinitis**

Tendinitis and Partial tendon tear:

- Focal or diffuse hypoechogenicity.
- Diffuse or focal thickening or thinning.
- Tendon fiber splitting, delamination
- Tendon sheath effusion.

Complete tendon tear:

- Full-thickness discontinuity.
- Flowing fluid in the gap.
- Absence of tendon.



● **Tendinitis: Tennis Elbow**

