

Hands On Diagnostics Annual Symposium 2017

September 21-23, 2017

Peripheral Nerve Sonography

Presented by
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www.mskmasters.com

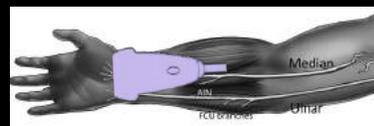
MSK Registry Review
Wrist and Hand

Pearls for Nerve Identification

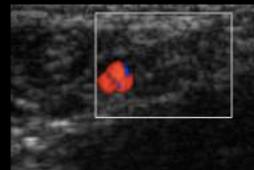
Activation of Adjacent Tendons



“Rapid Scan” Technique



Doppler Exam

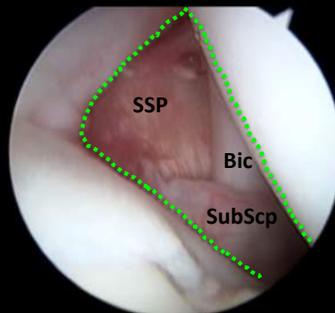


MSK Registry Review

The Rotator Interval

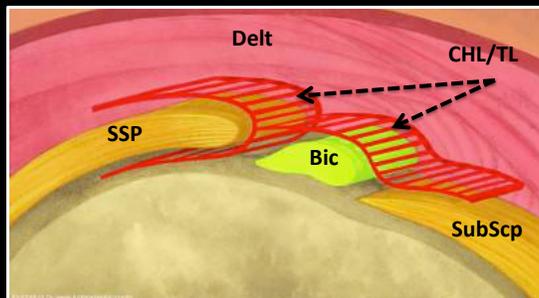
MSK Registry Review

Rotator Interval : Surgical Anatomy



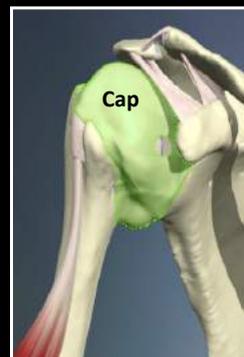
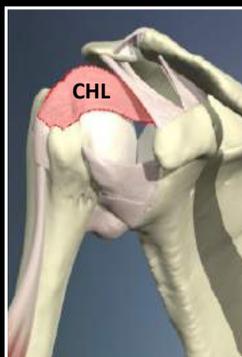
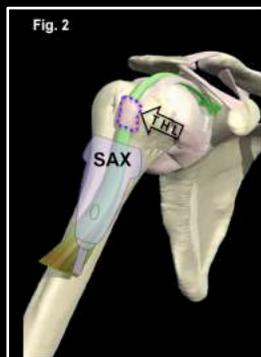
A triangular space between the
Supraspinatus and Subscapularis tendons .

Rotator Interval : Sonographic Anatomy



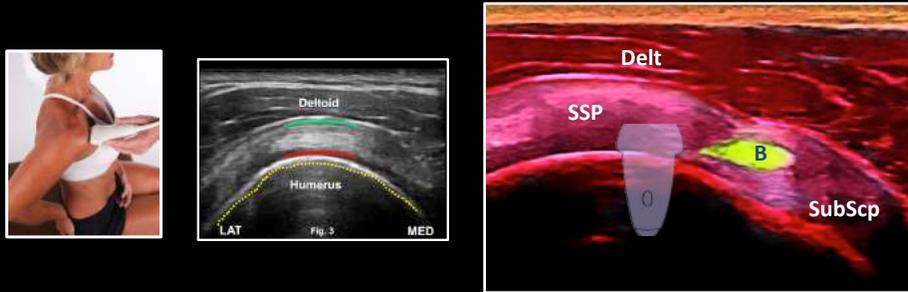
The rotator interval is associated with the GH capsule.
A triangular space between...
Supraspinatus (SSP) and Subscapularis tendons (SubScp) .
Margins are defined by a number of landmarks ,
most notably the Biceps (Bic) tendon, but also Coraco-Humeral
Ligament (CHL), and Transverse Humeral Ligament (TL).
The interval integrity is important to shoulder stability !!

Rotator Interval : Sonographic Anatomy



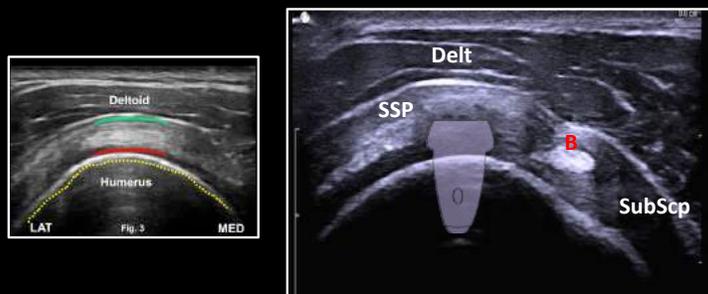
Imaging the Rotator Interval
Evaluating the combined interface of ...
Transverse Humeral Ligament (purple hilite THL)
Coraco-Humeral ligament (red hilite CHL), and
The Gleno-Humeral capsule (green hilite CAP)

MSK Registry Review
Rotator Interval Image: Short Axis



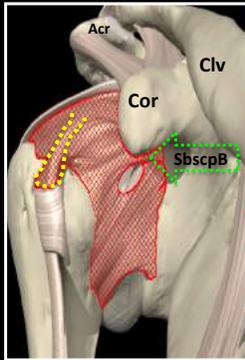
**From the SAX Supraspinatus image (“tire on the rim”)
Translate/Slide the probe medially toward the Coracoid...
but not TO the Coracoid.
Followed by a slight inferior/downward rotation to visualize the Biceps (B)**

MSK Registry Review
Rotator Interval Image: Short Axis

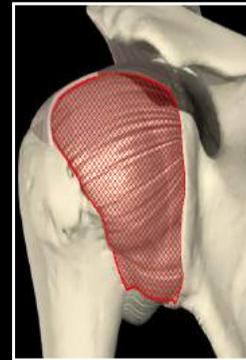


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MSK Registry Review
Gleno-Humeral Capsule



Anterior GH Capsule



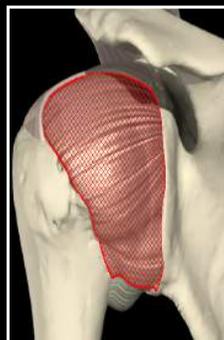
Posterior GH Capsule

The capsule is attached proximally to the *fibro-cartilaginous* Glenoid Labrum, and the *bony* Glenoid Rim.
Two openings exist... One for the Biceps tendon, and one for the Subscap Bursa

MSK Registry Review
Gleno-Humeral Capsulitis



Anterior GH Capsule



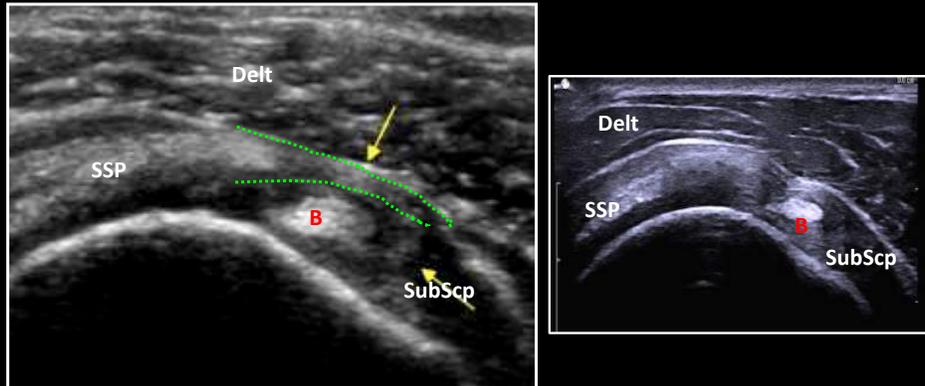
Posterior GH Capsule



Contracted Capsule

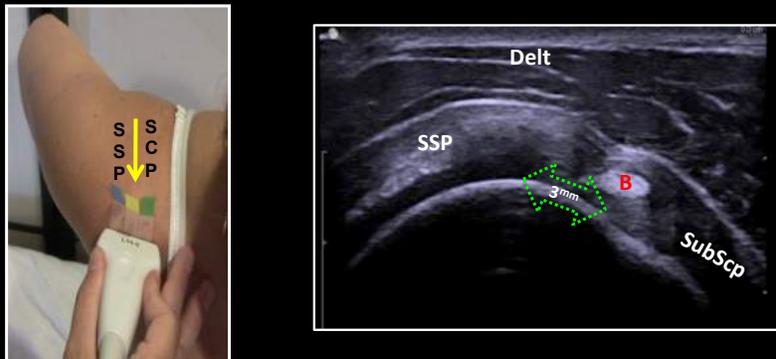
"frozen shoulder," adhesive capsulitis is characterized by a painful, gradual loss of range of motion from inflammation, progressive fibrosis, and ultimate contracture of the gleno-humeral joint capsule and CHL thickening.

The Rotator Interval: Thickening of the combined Interface (THL...CHL...Capsule)



Evaluating increased echogenicity and thickening of ...
the combined interface of CHL/TL AND the capsule
Measuring contra-lateral interval thickness usually necessary

Rotator Interval: Width/Margin

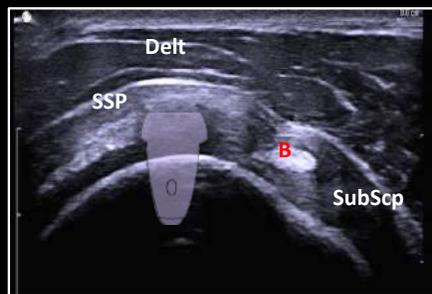


A narrow sonolucent region on either side of short axis biceps tendon
Increase in SSP and/or Subscap margin is suggestive
of interval compromise/instability.
Accepted normal width/margin is 3^{mm} on either side of biceps

MSK Registry Review

Rotator Interval Image: Short Axis

Abnormalities... "tears" are associated with instability
of the long head of the biceps brachii tendon...
THL and CHL ligament compromise allows biceps instability

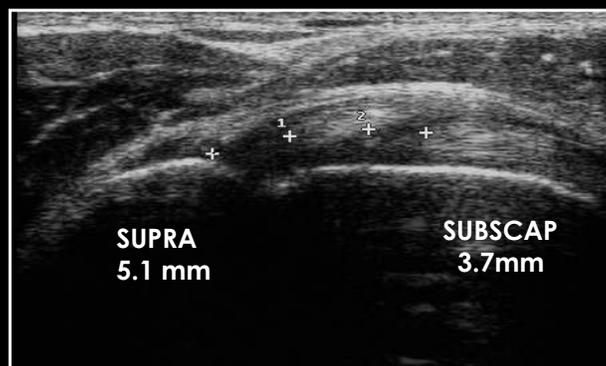


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Rotator Interval Width

3mm/3mm

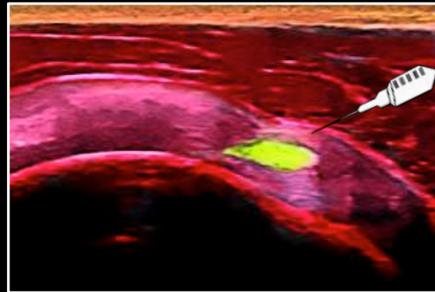
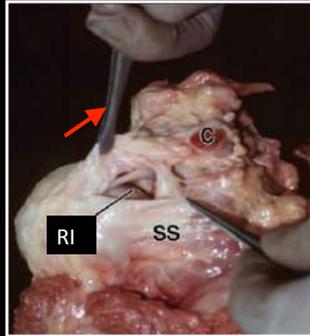
Suggestive of Rotator Interval Instability



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Rotator Interval: Gleno-Humeral Jt. Access

Common access portal in surgery and interventional radiology...
And ultrasound guided procedures !



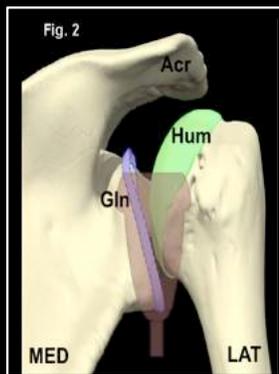
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Gleno-Humeral Joint Imaging Protocol : Posterior



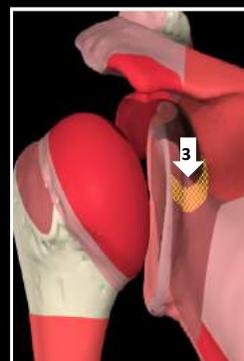
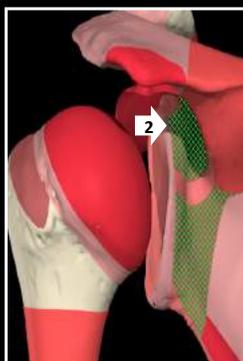
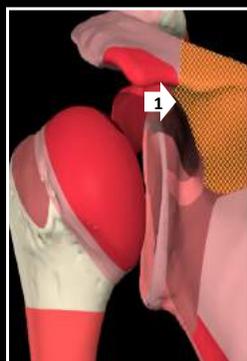
The humeral dome and the apex of the glenoid are visible.
The posterior capsule spans the joint space.
Decubitus patient with adducted arm enhances visibility

MSK Registry Review
Glenoid Labrum Imaging Protocol : Posterior



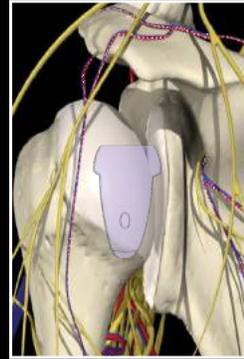
A soft fibro-cartilaginous ring attached to the bony glenoid.
 providing increased depth and ligament attachment.
 Only peripheral labral defects are visible. MRI is more suitable

MSK Registry Review
Spino-Glenoid Notch



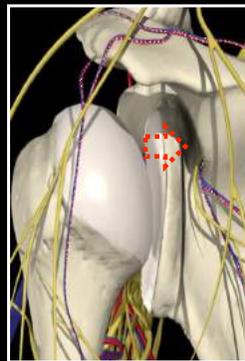
1. Lateral margin of scapular spine merges with...
2. Dorsal aspect of scapular neck forming "notch"
3. Ligament spans notch and...Suprascapular AVN bundle pass thru... from top to bottom

MSK Registry Review
Spino-Glenoid Notch Imaging Protocol : Posterior



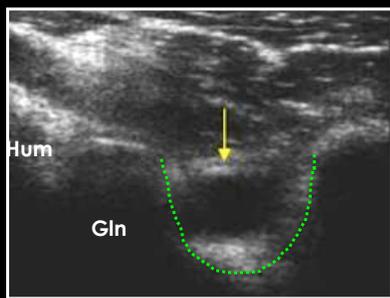
Medial probe translation from Gleno-Humeral image will reveal the notch

MSK Registry Review
Spino-Glenoid Notch Imaging Protocol : Posterior

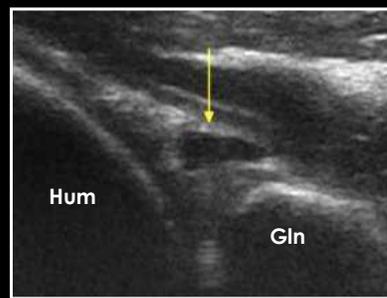


Medial probe translation from Gleno-Humeral image will reveal the notch

Spino-Glenoid Notch: Dorsal Ganglion Cyst



Dorsal Ganglion:
Located in notch
SSN compression
may mimic TOS



Labral Cyst:
Not in notch
Overlying joint space

Suprascapular Nerve Pathology

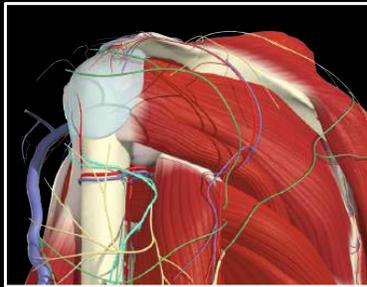
- Clinical : Poorly localized pain in posterior shoulder and/or upper back
 - Weakness raising arm
 - Infraspinatus atrophy

MRI :

- “Denervation edema” in area of Spino-glenoid Notch

Quadrilateral or Quadrangular Space

- *Clinically important anatomic space in the *posterior arm*
- * Provides anterior regions of axilla a passageway to the posterior regions.
- * **Axillary nerve** and **Posterior Circumflex Humeral artery** can be compressed or damaged due to space-occupying lesions or trauma.
- *Symptoms include axillary nerve related weakness of the deltoid muscle



Quadrilateral or Quadrangular Space

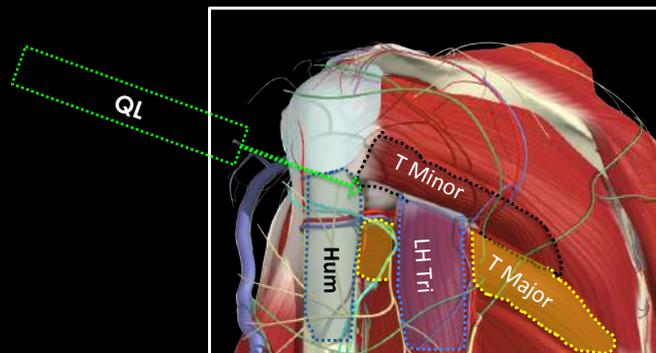
Boundaries of QL Space

Superior Border: Teres Minor

Inferior Border: Teres Major

Medial Border: Long Head of Triceps

Lateral Border: Surgical Neck of Humerus



Tmajor appears as two sections
Bc it is DEEP to LH Tri

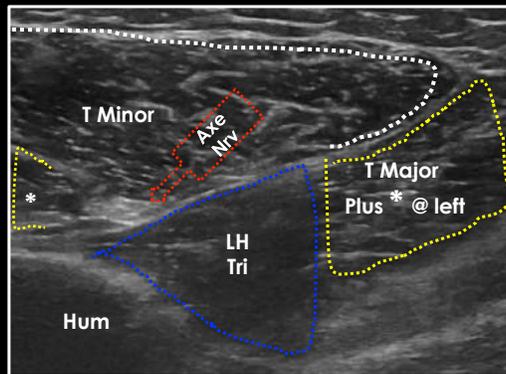
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Bc it is DEEP
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Peripheral Nerves Elbow

Distal Biceps Tendon

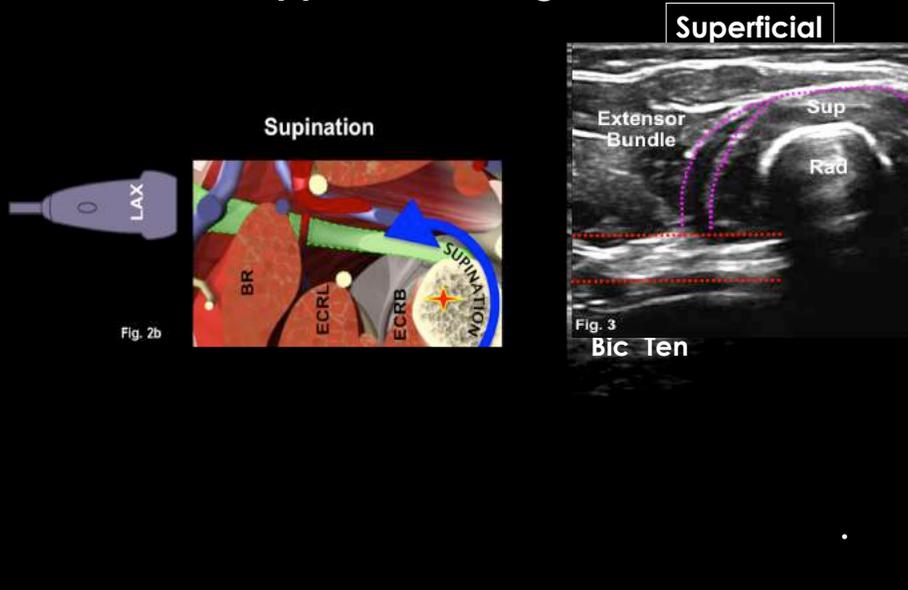
Lateral Approach

Lateral Approach to the Distal Biceps Tendon

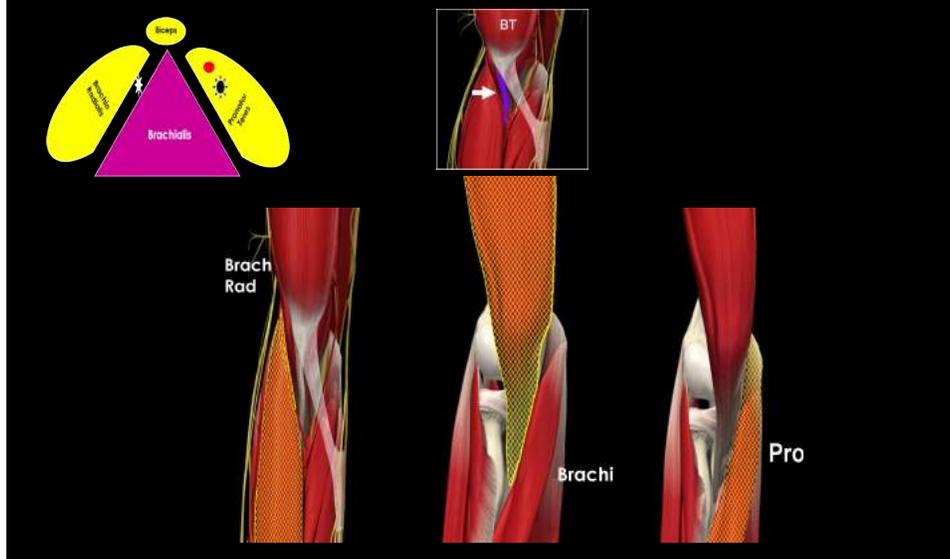


90° elbow flexion
Sufficient hand supination to expose tendon
Longitudinal/Coronal
Probe slightly distal from Radial Head

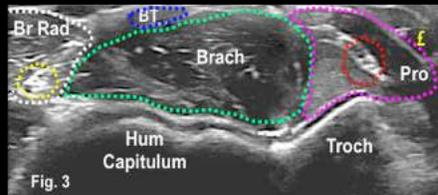
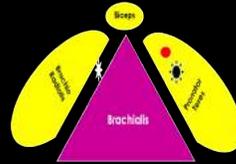
Lateral Approach : Image Orientation



Anterior Elbow "Pyramid" The Surrounding Musculature

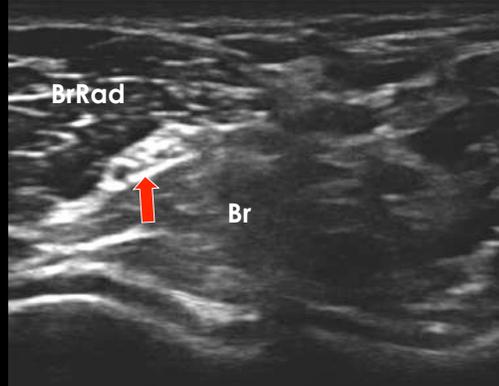
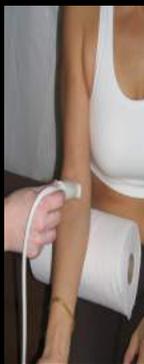


Anterior Elbow "Pyramid"



- Brach = Brachialis
- Br Rad = Brachio-radialis
- Pro = Pronator
- BT = Biceps Tendon
- Radial Nerve = Yellow dotted outline
- Brachial Nerve = Red dotted outline
- ⚡ = Brachial Artery

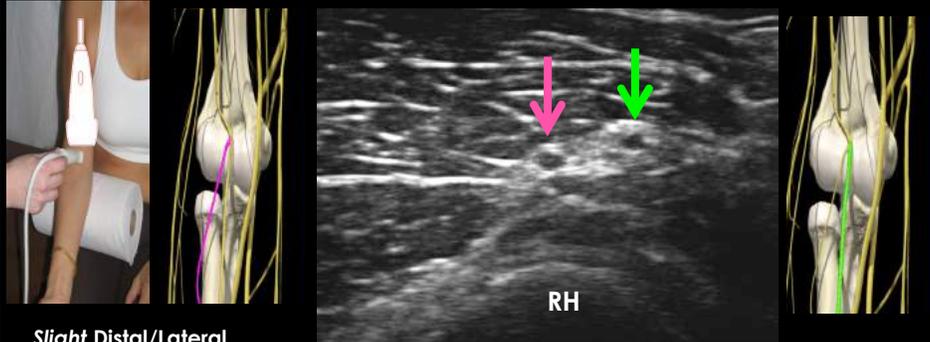
Radial Nerve...Cutaneous Sensory ...and Posterior Inter-osseous branches



SAX Probe
At the
joint space

The hyperechoic RADIAL NERVE is identified
between the Brachioradialis and the Brachialis

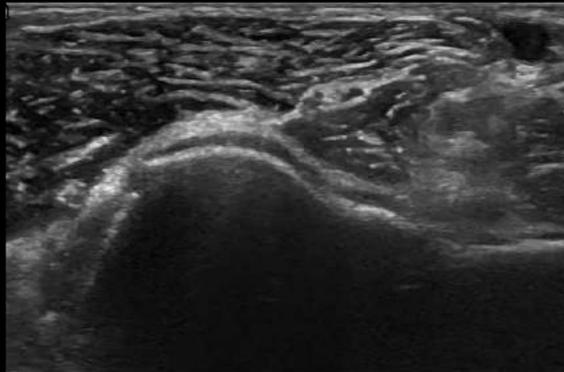
The Cutaneous Sensory ...and Posterior Interosseous (PIN)



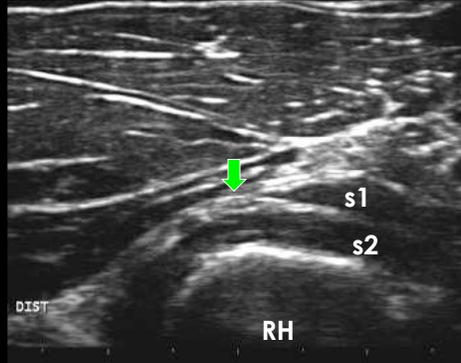
Slight Distal/Lateral
Probe translation
from RN

Radial Head becomes the only bony landmark.
The PIN splits laterally
The Cutaneous Sensory nerve splits medially
Both are HYPOECHOIC due to anisotropy

Radial Nerve Splitting Moving probe distally across joint space

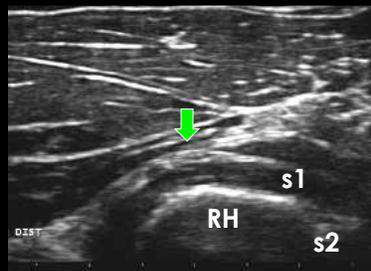


Posterior Interosseous (PIN)



Radius remains the only bony landmark.
The PIN is quite small and found between
the superficial (s1) and deep (s2)
heads of the Supinator muscle

Posterior Interosseous (PIN)

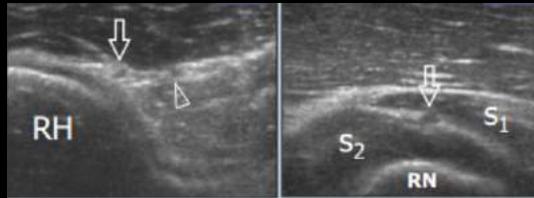


Common Site of PIN Entrapment

Arcade of Frohse, sometimes called the
“supinator arch”, is the most superior part of the
superficial layer of the supinator muscle, and is a
fibrous arch over the *posterior inter-osseous nerve*.

MSK Registry Review

**Posterior Interosseous Nerve (PIN)
Compression at Radial Head
"Radial Tunnel" Syndrome
Anterior Forearm Pain**



**PIN passing between two bellies of the
Supinator..."Radial Tunnel"**

MSK Registry Review

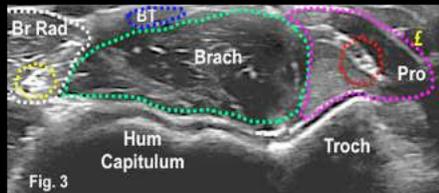
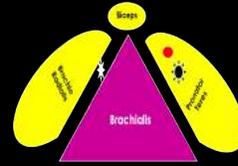
Nerves Located at the Elbow

Median Nerve



MSK Registry Review
Nerves Located at the Elbow

Median Nerve



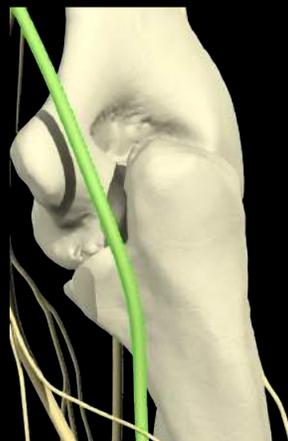
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MSK Registry Review
Nerves Located at the Elbow

Ulnar Nerve

Med

Lat



P to A view of Right Elbow

Ulnar Nerve Short Axis



Probe position is SAX
Bridging
the Ulnar groove.
Black Star = Olecranon process
Red Star = Medial Epicondyle

Ulnar Nerve Short Axis

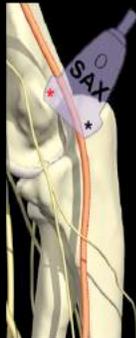


Fig. 2

Probe position is SAX
Bridging the Ulnar groove.

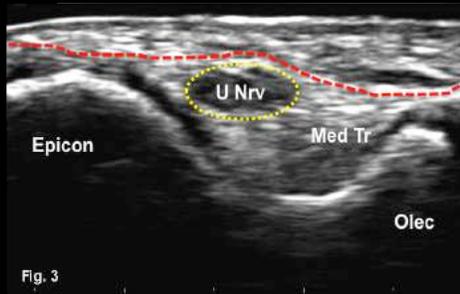


Fig. 3

The Sub-Q nerve is typically
a hypoechoic oval ...
“starry night” internal echoes
adjacent to medial epicondyle

Adjacent Muscle: Medial Triceps (MT)

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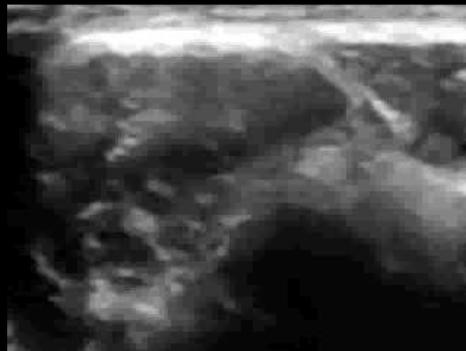
Ulnar Nerve Dynamic Imaging Subluxing Nerve



**Note! In severe cases the Medial Triceps can also
sublux/dislocate out of the groove
"Snapping Triceps"**

MSK Registry Review

Ulnar Nerve Dynamic Imaging Subluxing Ulnar Nerve with Medial Triceps



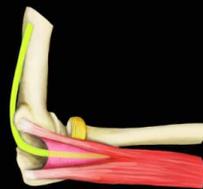
MSK Registry Review
Nerves Located at the Elbow

Ulnar Nerve Entrapment “Cubital Tunnel Syndrome”
Most common site of Ulnar Nerve Compression...

3cm distal from Ulnar Groove ...
as the nerve passes **UNDER** the roof of the cubital tunnel.

The “roof” is a membrane/aponeurosis called...
Osborne’s Fascia or Osborne’s Ligament.

The membrane is located between the two heads
of the Flexor Carpi Ulnaris muscle



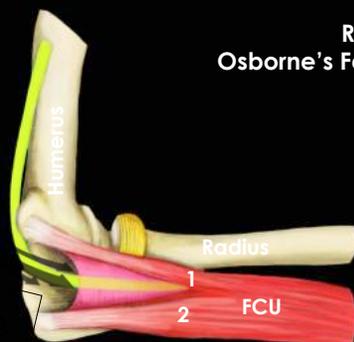
Nerves Located at the Elbow

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As the nerve passes **UNDER** the roof of the cubital tunnel.

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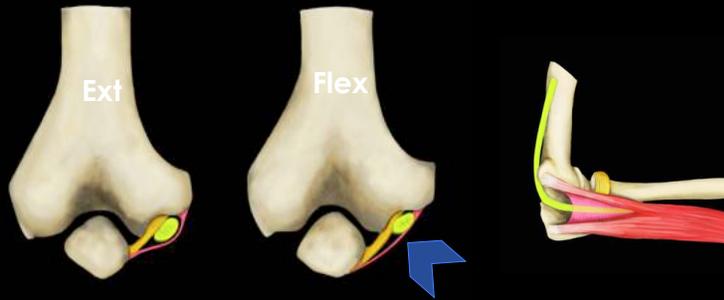
Osborne’s Fascia or Osborne’s Ligament

The membrane is located between the two heads
of the Flexor Carpi Ulnaris muscle



Remember !!
Osborne’s Fascia aka... Osborne’s
Ligament

**Mechanism of Ulnar Nerve entrapment/compression
under Osborne's Fascia/Ligament...Flexion !**



Right Elbow P to A View
Yellow =UCL the "floor"
of Cubital Tunnel
Pink = Osborne's Fascia "the roof"
Green = Ulnar Nerve

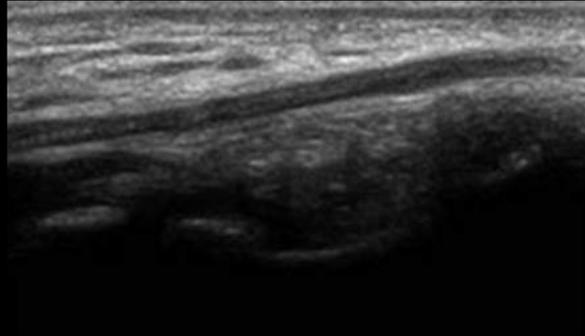
MSK Registry Review

Evaluating Ulnar Nerve Proximal to Ulnar Groove

MSK Registry Review

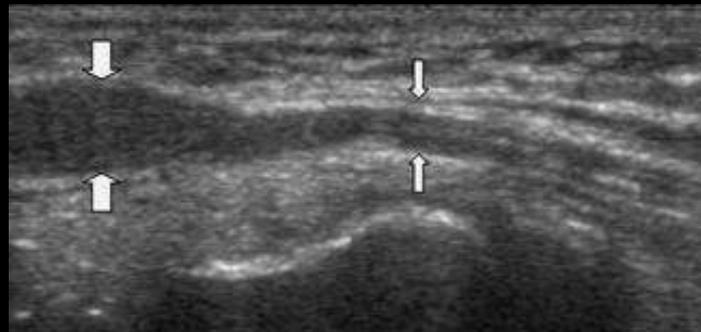
Evaluating Ulnar Nerve Proximal to Ulnar Groove

**Longitudinal Normal Ulnar Nerve
Uniform thickness... "ribbon-like"**



MSK Registry Review

**Pre-cubital tunnel entry... stenotic dilation
of Ulnar Nerve**



Proximal

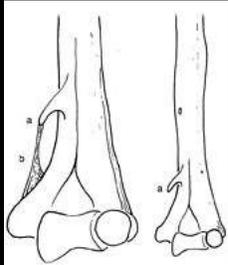
Distal

MSK Registry Review

Pre-cubital tunnel entry... Ulnar Nerve Entrapment

Struther's Ligament

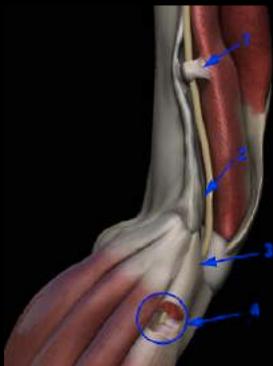
- An anatomic rarity... 13.5 % of population
- Located +/- 8cm proximal to Ulnar Groove
- A Bony "supra-condylar" spur may form...above medial epicondyle



Proximal

MSK Registry Review

Review of Possible Ulnar Nerve Entrapment Sites

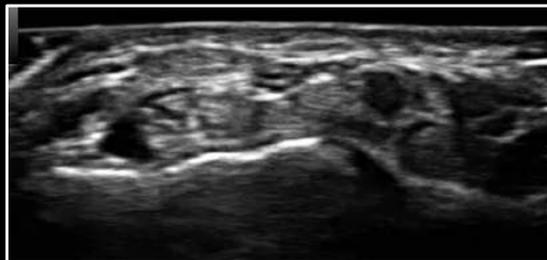


1. 1. Ligament of Struther's
2. 2. Posterior to medial epicondyle
3. 3. Entrance to cubital tunnel
4. "Osborne's Fascia/Ligament"
5. 4. Flexor/Pronator Aponeurosis
- 6.

Peripheral Nerves Wrist and Hand

MSK Registry Review
Wrist and Hand

Palmar Transverse: Median Nerve Localization



Ask the patient to slowly flex and extend the thumb to activate the FPL (Flexor Pollicis Longus)

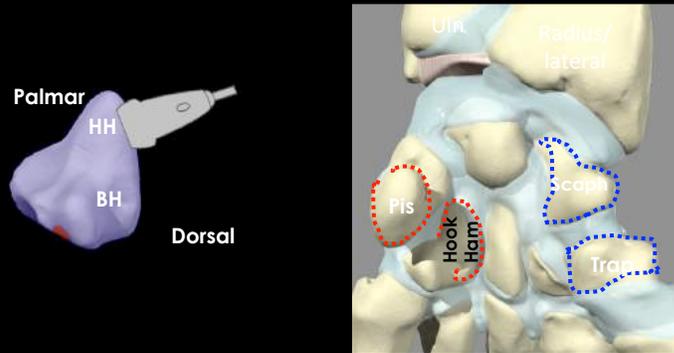
The hyper-echoic FPL tendon is seen pushing the hypo-echoic, ovoid nerve superficially and right.

Medial and Lateral Boundaries of the Carpal Tunnel

Transverse Carpal Ligament forming the base and sides

Laterally: by the **Scaphoid and Trapezium tubercles**

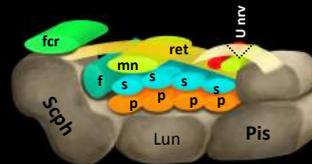
Medially: by the **Hook of the Hamate and the Pisiform**



Proximal and Distal Borders of Carpal Tunnel

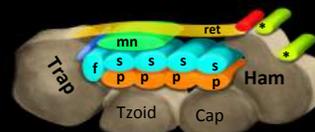
Proximal/Entry

Scaphoid and Pisiform



Distal/Exit

Hook of Hamate and Trapezium



Carpal Tunnel: The Occupants

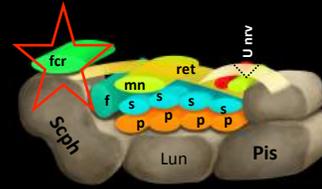
9 Tendons...1 Nerve

Flexor Digitorum Superficialis , Flexor Digitorum Profundus, Flexor Pollicis Longus

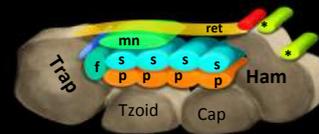
FDS-4
FDP-4
FPL-1 =9 Tendons
Median Nerve

Flexor Carpi Radialis (FCR)
NOT !!
in the Carpal Tunnel

It is superficial to retinaculum



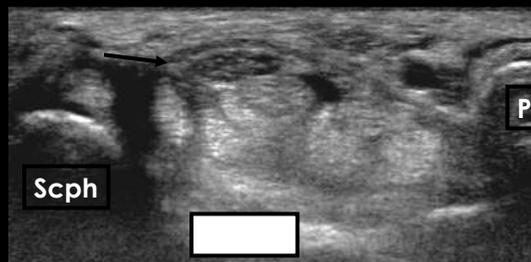
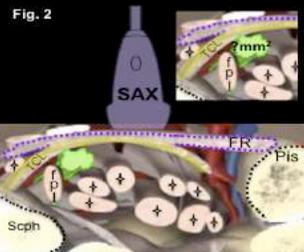
Proximal entry carpal tunnel



Distal exit carpal tunnel

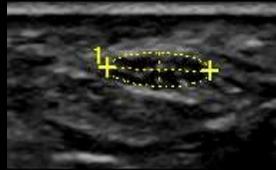
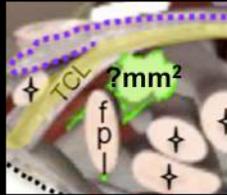
MSK Registry Review
Wrist and Hand

Median Nerve Cross- Sectional Area Wrist to Forearm Ratio : Step One



Identify the hypoechoic nerve.
at the Carpal Tunnel entry....
Scaphoid and Pisiform
are bony landmarks

Median Nerve Cross- Sectional Area Wrist to Forearm Ratio : Step One



Elliptical measurement
yields x-sectional value

Do not compress nerve !
Reduce probe pressure

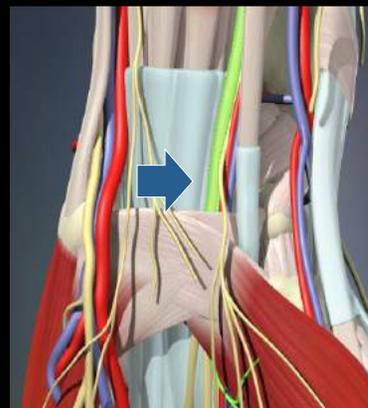
Irregular contours can
be traced manually

Median Nerve Cross- Sectional Area Wrist to Forearm Ratio : Step Two



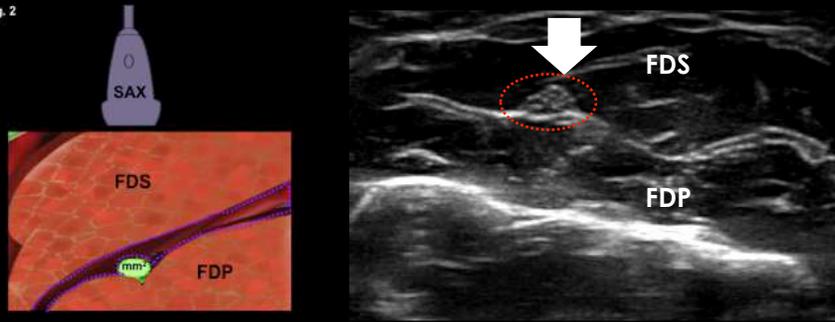
From distal image
Trace MN proximally

12cm ...4.7 inches



Median Nerve Cross- Sectional Area Wrist to Forearm Ratio : Step Two

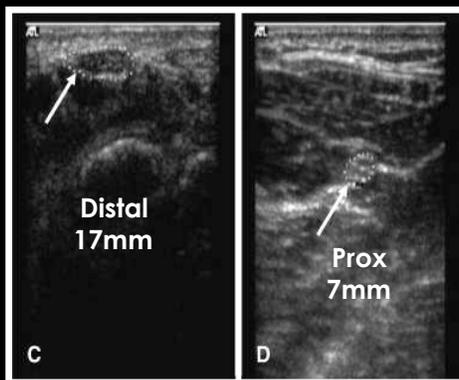
Fig. 2



Trace MN proximally
12cm or 4.7 inches

The MN is seen between
the FDS and the FDP
Flexor Digitorum Superficialis & Profundus

Median Nerve Cross- Sectional Area Wrist to Forearm Ratio Calculation



Ratio = 2.4

7mm 17mm

> 1.4 positive
for
Carpal Tunnel

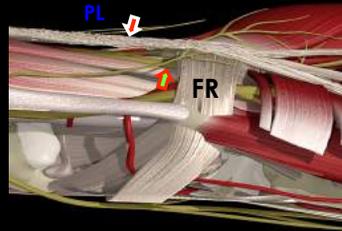
Source: [Clinical Neurophysiology 2008; 119:1353-1357](https://doi.org/10.1016/j.clinph.2008.01.101) (DOI:
10.1016/j.clinph.2008.01.101)

Median Nerve Longitudinal

Slightly off midline toward radial margin

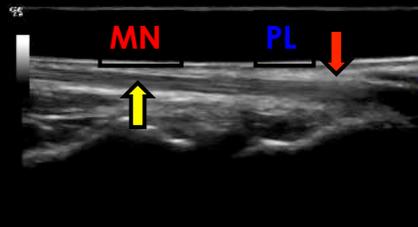


Med
to th



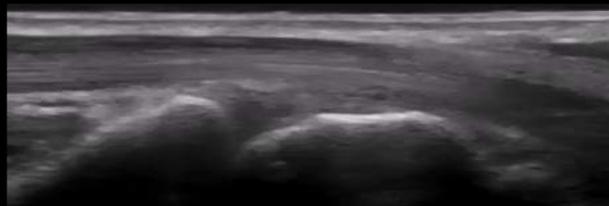
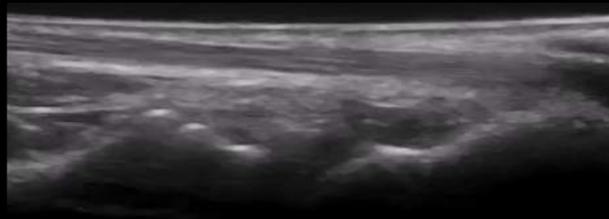
Palmaris Longus (PL) passes superficial to the Flexor Retinaculum (FR).

The most superficial structure of the volar wrist.
Absent in 20 % of population

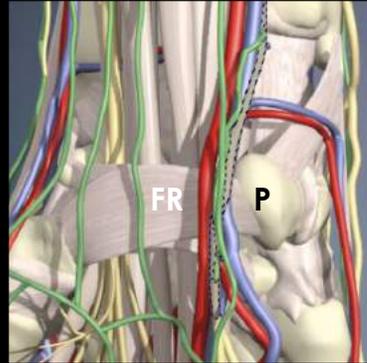


MSK Registry Review
Wrist and Hand

Median Nerve Has little or NO EXCURSION with finger flexion !

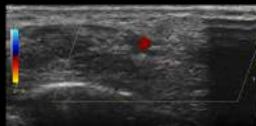
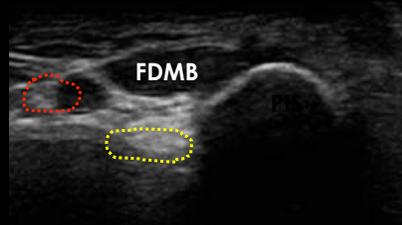


Ulnar Nerve Transverse In Guyon's Canal



Ulnar Nerve is adjacent to the Ulnar Artery and superficial to Flexor Retinaculum FR
Probe is moved in short axis plane to medial/ulnar side of palmar wrist.

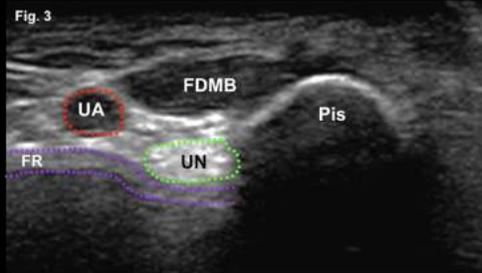
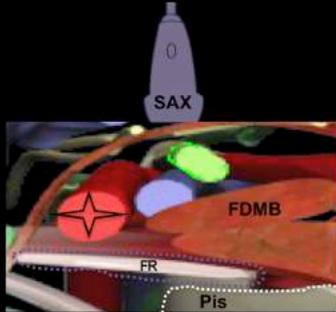
Ulnar Nerve SAX In Guyon's Canal



Ulnar Nerve can be identified using color flow or doppler

Pis : Pisiform
Red Hilite : Ulnar Artery (pulsatile, non-compressible)
Yellow Hilite : Ulnar Nerve
FDMB = Flexor Digiti Minimi Brevis

Ulnar Nerve Transverse In Guyon's Canal



Ulnar Nerve is adjacent the artery and superficial to Flexor Retinaculum
Bony landmark is the Pisiform

Ulnar Nerve Branches Distal to Guyon's Canal

The canal/tunnel extends from Pisiform to distal margin of Hamate



Ulnar Nerve



Digital (motor)



Cutaneous (sensory)

The Ulnar Nerve divides into 2 terminal branches.
The "proper" digital nerve (motor)
The cutaneous branch (sensory)

Ulnar Nerve Branches Distal to Guyon's Canal

The canal/tunnel extends from Pisiform to distal margin of Hamate

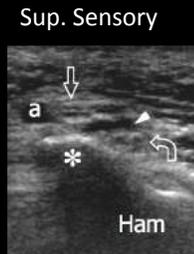
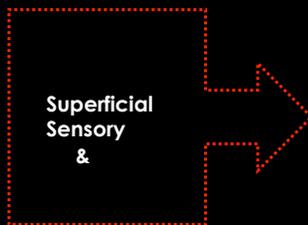
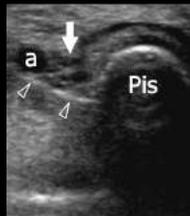
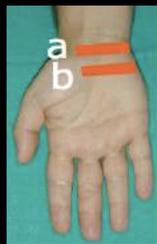
Ulnar Nerve

Digital (motor)

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The "proper" digital nerve (motor)
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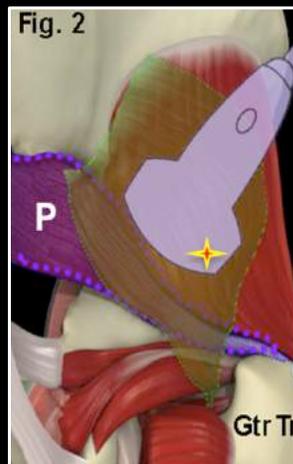
Guyon's Canal Ulnar Nerve Branches



Peripheral Nerves Hip

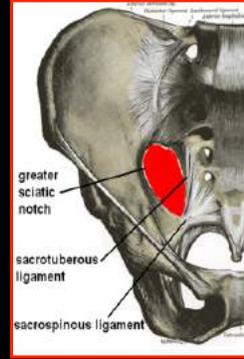
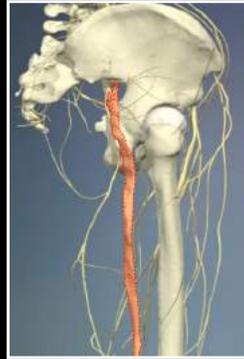
MSK Registry Review

Piriformis/Sciatic Nerve



MSK Registry Review

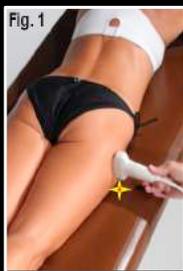
Sciatic Nerve



Largest nerve in the body. Exits the pelvis via the Greater Sciatic Foramen/Notch, whose borders are defined by bone laterally... and ligament medially
Piriformis occupies most of the opening

MSK Registry Review

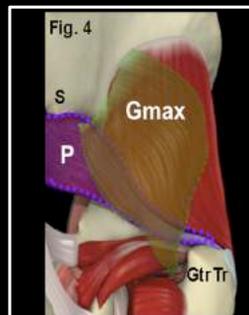
Piriformis Imaging



Probe Position #1
at Grtr. Troch
SAX to Femur



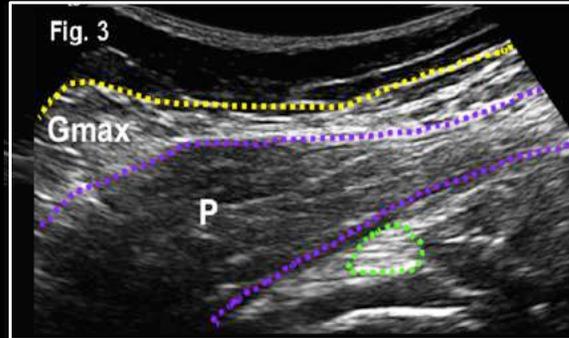
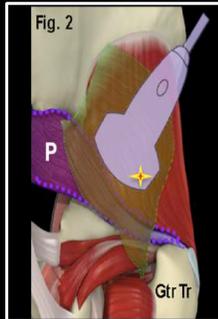
Probe Position #2
Medial into Gmax
Rotate, align w/ Piriformis



Piriformis deep to Gmax

Probe Position #1
The "reference" end of the probe on the posterior aspect of the Greater Trochanter.

Piriformis Imaging



Sciatic Nerve immediately deep to Piriformis
Usually... but may pierce the muscle



Dynamic Maneuver : Internally/Externally rotate
the hip/foot. Piriformis contracts/slides.
Overlying Gmax stationary.

Lateral Femoral Cutaneous Nerve Sonography

Meralgia Paresthetica...

“thigh pain with anomolous/irregular perception”

*Chronic neurologic disorder due to entrapment/
compression at the level of the ASIS and Inguinal
ligament*

Seen with...

*weight gain
diabetes
“seat belt” injury
repetitive motion*

Lateral Femoral Cutaneous Nerve Anatomy

*Has an oblique path thru inguinal region
medial to lateral toward the ASIS.*

Distal to ASIS....

- LFCN passes under the Inguinal ligament
- and is “sandwiched” between two layers of fascia
... superficial to the Sartorius muscle



ASIS



Inguinal
Ligament



LFCN



Sartorius

Lateral Femoral Cutaneous Nerve Sonography

Interface Identification

LFCN is visualized between 2 hyperechoic fascial layers

- Fascia Lata : Superficial “sheath” of thigh
- Fascia Iliaca : Covering Iliacus and Psoas

Lateral Femoral Cutaneous Nerve Sonography

Interface Identification

LFCN is visualized between 2 hyperechoic fascial layers

- ***Fascia Lata*** : Superficial “sheath” of thigh
- ***Fascia Iliaca*** : Covering Iliacus and Psoas



MSK Registry Review

Lateral Femoral Cutaneous Nerve Sonography

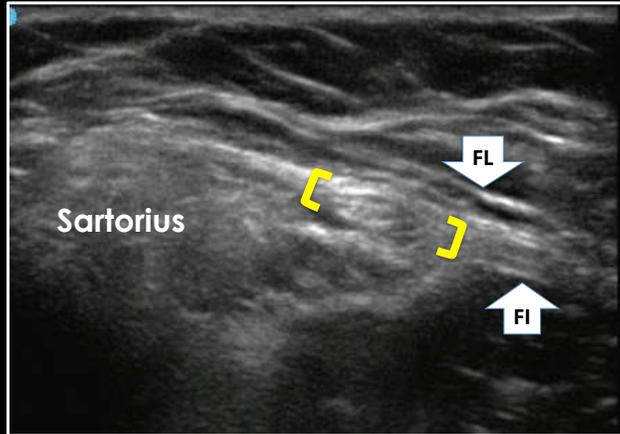
Supine Patient

SAX oblique probe at the ASIS parallel w Inguinal ligament
Translate probe distal (viz fascia NOT ligament !)

Ellipsoidal LFCN between hyperechoic FL and FI

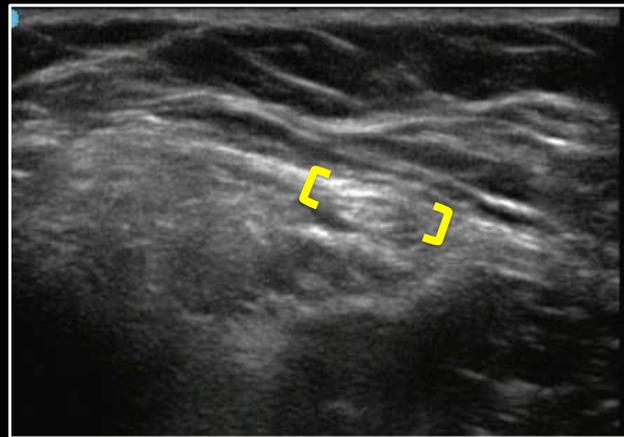


Lateral Femoral Cutaneous Nerve Sonography



**The lateral femoral cutaneous nerve lying between the connective tissues of the fascia lata and fascia iliaca
Medial to the sartorius muscle.**

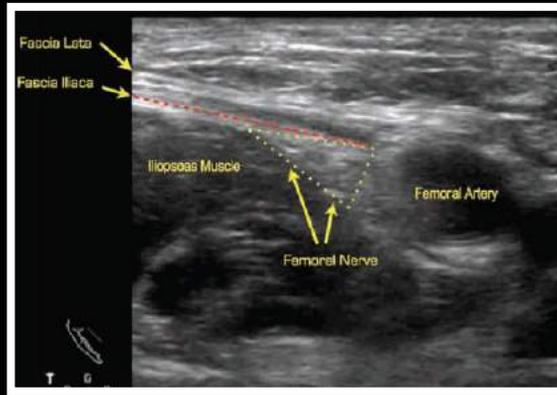
Lateral Femoral Cutaneous Nerve Sonography



**The lateral femoral cutaneous nerve lying between the connective tissues of the fascia lata and fascia iliaca
Medial to the sartorius muscle.**

MSK Registry Review

Lateral Femoral Cutaneous Nerve Sonography



The LFCN can be traced medial to lateral by identifying the femoral neurovascular bundle

Peripheral Nerves Knee

Tibio-Fibular Joint...the forgotten joint

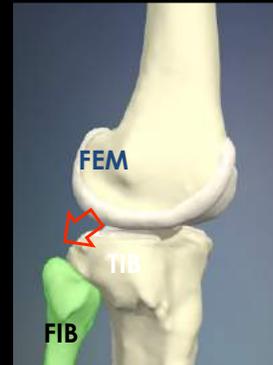
aka...Proximal tibio-fibular articulation
A true cartilage lined joint
Has it's own articular capsule
Communicates w/ knee joint: 10%

Function:

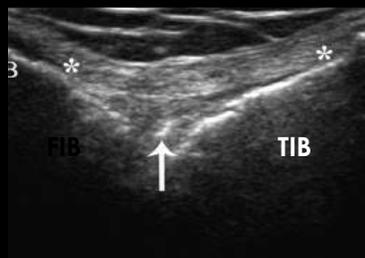
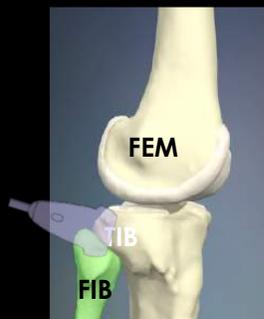
Alleviate torsion stress

Mechanism of Injury

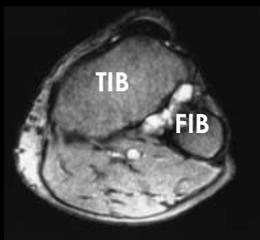
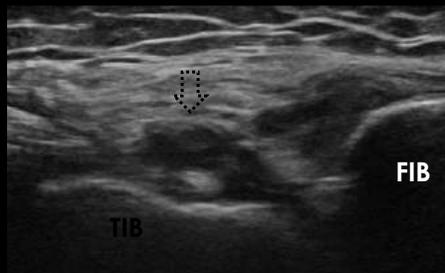
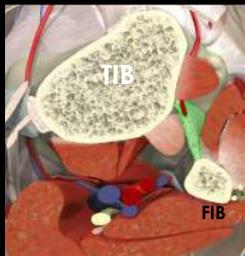
Susceptible to indirect trauma
resulting from severe ankle stress.
Direct trauma is an impact to lateral knee
while weight-bearing and flexed.



Tibio-Fibular Joint Image



Tibio-fibular Ganglion Cyst



MSK Registry Review Knee Lateral Compartment Peroneal Nerve

Aka... Common Fibular Nerve

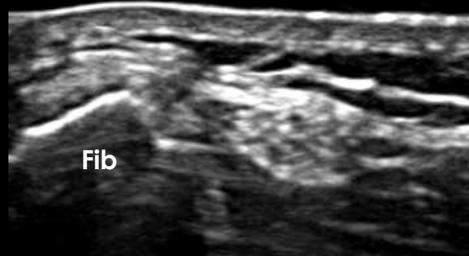
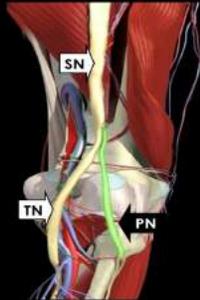


SAX probe at postero-lateral Fibula demonstrates PN
Smaller of the two terminal branches of the Sciatic nerve.

SN= Sciatic Nrv TN= Tibial Nrv PN= Peroneal Nrv

MSK Registry Review
Knee
Lateral Compartment
Peroneal Nerve

Aka... Common Fibular Nerve

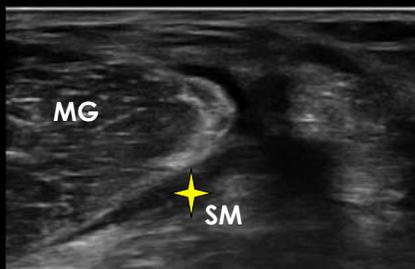


SAX probe at postero-lateral Fibula demonstrates PN
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SN= Sciatic Nrv TN= Tibial Nrv PN= Peroneal Nrv

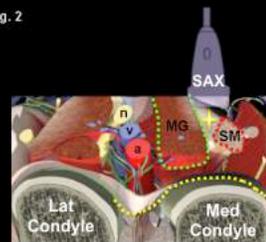
MSK Registry Review
Knee
Posterior Compartment

Popliteal Fossa



Medial Gastroc/Semimembranosus Bursa

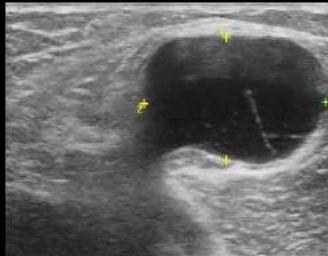
Fig. 2



Baker's cysts have a "tell-tale"
conformation by displaying
a unique neck of origin.
As effusion
enlarges between the
Medial Gastrocnemius
and Semi-Membranosus tendonn

Popliteal Fossa

Medial Gastroc/Semimembranosus Bursa



- True Baker's cyst ...
- * is INTER-MUSCULAR
 - * originates on medial side
 - * has a distinct neck of origin

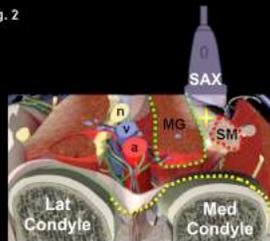


What is this lump! ...on my knee?

Popliteal Fossa

Medial Gastroc/Semimembranosus Bursa

Fig. 2



- True Baker's cyst ...
- * originates on medial side
 - * has a distinct neck of origin

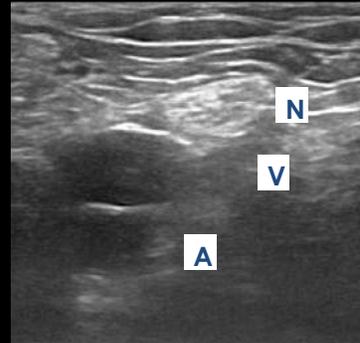


MSK Registry Review
Knee
Posterior Compartment

Popliteal Neuro-Vascular Bundle



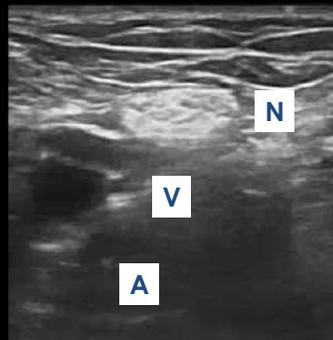
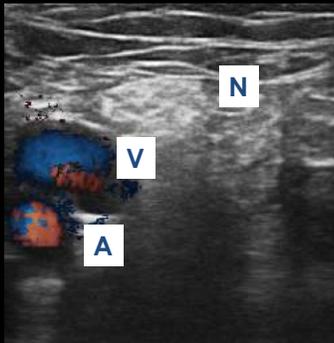
Prone patient position
SAX probe @ crease
scanning thru
the joint space.



The Nerve...Vein... Artery
in a "Stack" formation

Popliteal Neuro-Vascular Bundle

The Nerve - Vein - Artery "Stack"

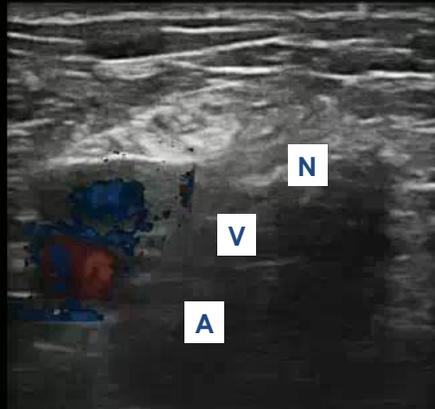


Sonopalpation allows localization of the...
HYPER-echoic Tibial nerve
Compressible Popliteal vein
Non-compressible ... Pulsatile Popliteal artery

Deep Vein Thrombosis (DVT)

Formation of
a clot in a
deep vein.

US Findings:
Non-
compressible...
Popliteal Vein



Tibial Nerve Neuro-fibromatosis and Thrombosis



Neurofibromatosis is a genetic disorder that causes tumors to form on nerve tissue.
Neurofibromatosis is usually diagnosed in childhood or
early adulthood.

The tumors are usually noncancerous (benign), but sometimes can become cancerous
(malignant).

Peripheral Nerves Foot and Ankle

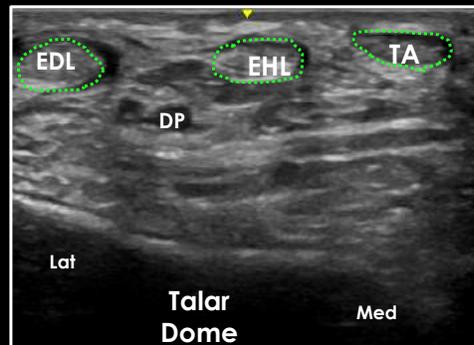


MSK Registry Review: Ankle and Foot
Anterior Ankle Tendon Anatomy

Imaging the Extensor Tendons



Supine patient
SAX probe

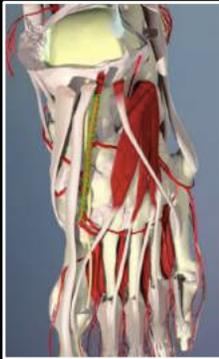


Visualize scalloping contour
of Talar Dome

EDL and EHL often display
hypoechoic low-lying muscle

Deep Peroneal Nerve

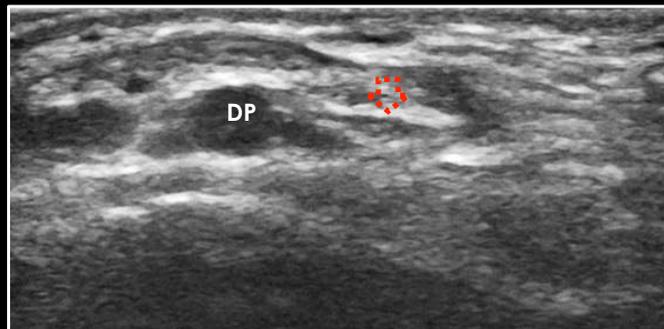
The Deep Peroneal nerve deep and medial to EHL
and, adjacent to the non-compressible... pulsatile Dorsalis Pedis



Anterior Tarsal Tunnel Syndrome
Dorsal osteophytes over
fibio-talar or talo-navicular joints

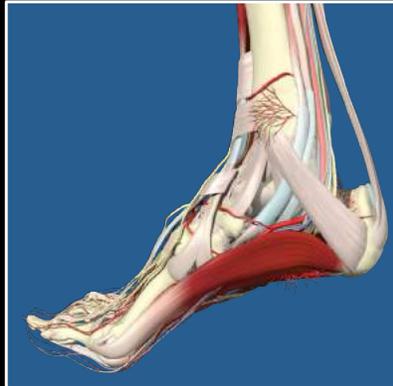


Deep Peroneal Nerve



The fascicular pattern of the small nerve is medial to
Dorsalis Pedis (DP) and deep to EHL

The Medial Ankle



PQ

The Tarsal Tunnel

Time to meet...

Tom: *Tibialis Posterior Tendon*

Dick: *Flexor Digitorum Longus Tendon*
and ...

Very: Tibial veins and artery

Nervous Harry: Tibial Nerve and
Flexor Hallucis Longus Tendon

The Tarsal Tunnel Boundaries

- **Roof:** flexor retinaculum
- **Floor:** medial surfaces of the tibia, talus, and calcaneus

Tarsal Tunnel Syndrome

The most common symptoms are pain and paresthesia in the toes, sole, or heel and the main finding at physical examination is the positive Tinel Sign (distal paresthesias produced by percussion over the affected portion of nerve).



Tarsal Tunnel Syndrome Tibial Nerve Branches

Tibial Nerve

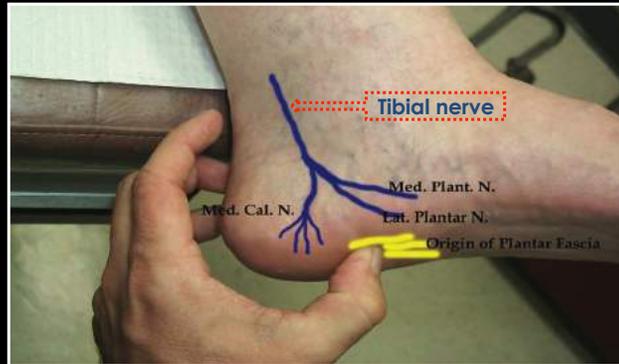
Medial Calcaneal nerve

Medial plantar nerve

Lateral plantar nerve

Baxter's Nerve
One of the more elusive diagnostic considerations in heel pain is entrapment of first branch of the lateral plantar nerve

Tarsal Tunnel Syndrome
Tibial Nerve Branches

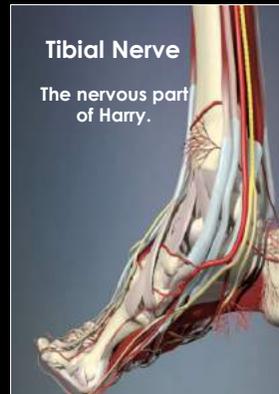
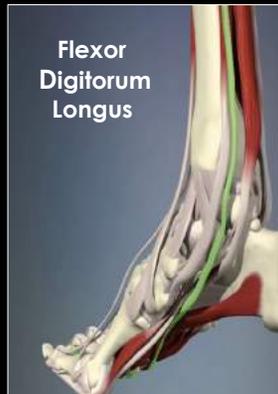
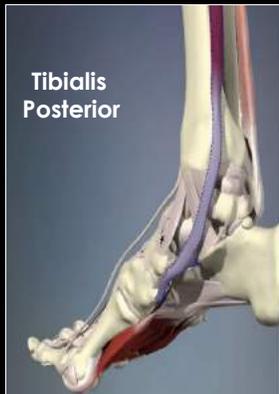


Tarsal Tunnel Syndrome
Pattern of sensory loss

“If a patient presents with numbness of the heel...what do you image?”

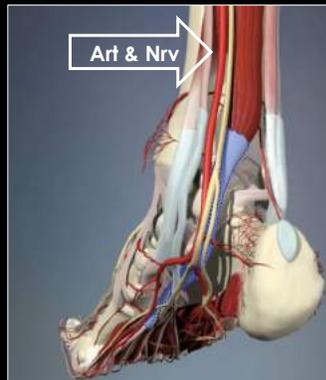


The Tarsal Tunnel



Moving posteriorly from the bony Medial Malleolus, cross-sectional display of the Tarsal Tunnel structures is seen

The Tarsal Tunnel: Flexor Hallucis Longus Tendon



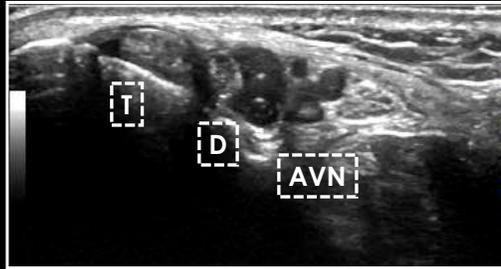
Flexor Hallucis Longus (FHL blue hilite) is often poorly visualized due to its position deep to Tibial artery and Tibial nerve.

Imaging the Tarsal Tunnel

SAX at Posterior-Superior Medial Malleolus

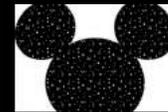
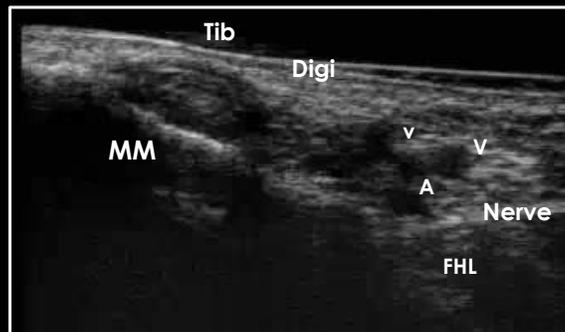


Supine patient
External rotation of foot.
Probe in SAX
at or slightly proximal on MM.



The Flexor Hallucis
(not visible)
is deep to the
artery-vein-nerve bundle

Medial Ankle/Tarsal Tunnel SAX Dynamic with FHL



Reading left to right... Tib Posterior is next to malleolus. FDL is adjacent to PT. There may be two veins with the artery. Tibial nerve is posterior to vascular bundle.

Note! As the poorly visualized (due to anisotropy) Flexor Hallucis is activated the "starry night" appearance of the nerve is better demonstrated.

Medial Ankle/Tarsal Tunnel SAX
Ganglion Cyst Compressing Tibial Nerve

