

Imaging of Peripheral Neuropathies

Involvement of the Upper Limb

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Objectives

- Illustrate the peripheral nerve anatomy at common sites of neural entrapment in the upper extremity
- Highlight clinically important sites of peripheral nerve pathology and their associated clinical syndromes
- Identify ultrasound and MR imaging features of upper limb peripheral neuropathies

Objectives

Draw the Brachial Plexus in 10 seconds! - YouTube

http://www.youtube.com/watch?v=gTas7ijp0YE

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Supplemental Figures Pathologic alterations of cutaneo... Draw the Brachial Plexus in 10 se... Cambridge Orthopaedics - UK

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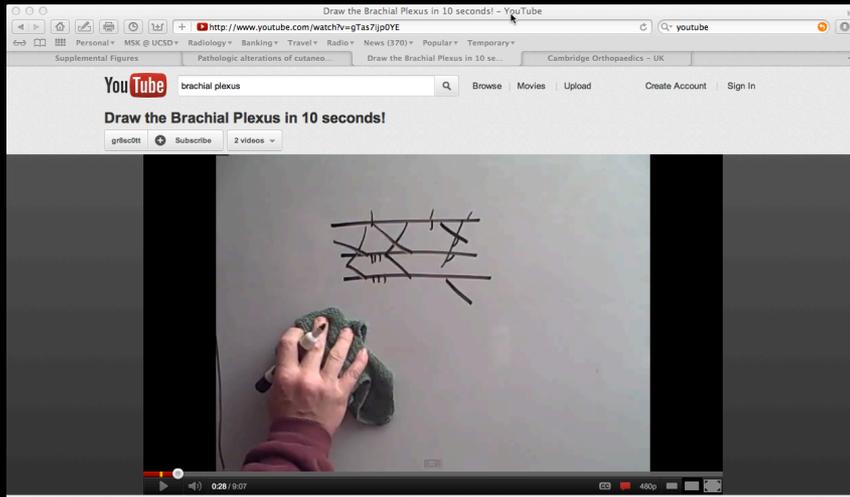
Draw the Brachial Plexus in 10 seconds!

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0:28 / 9:07 480p

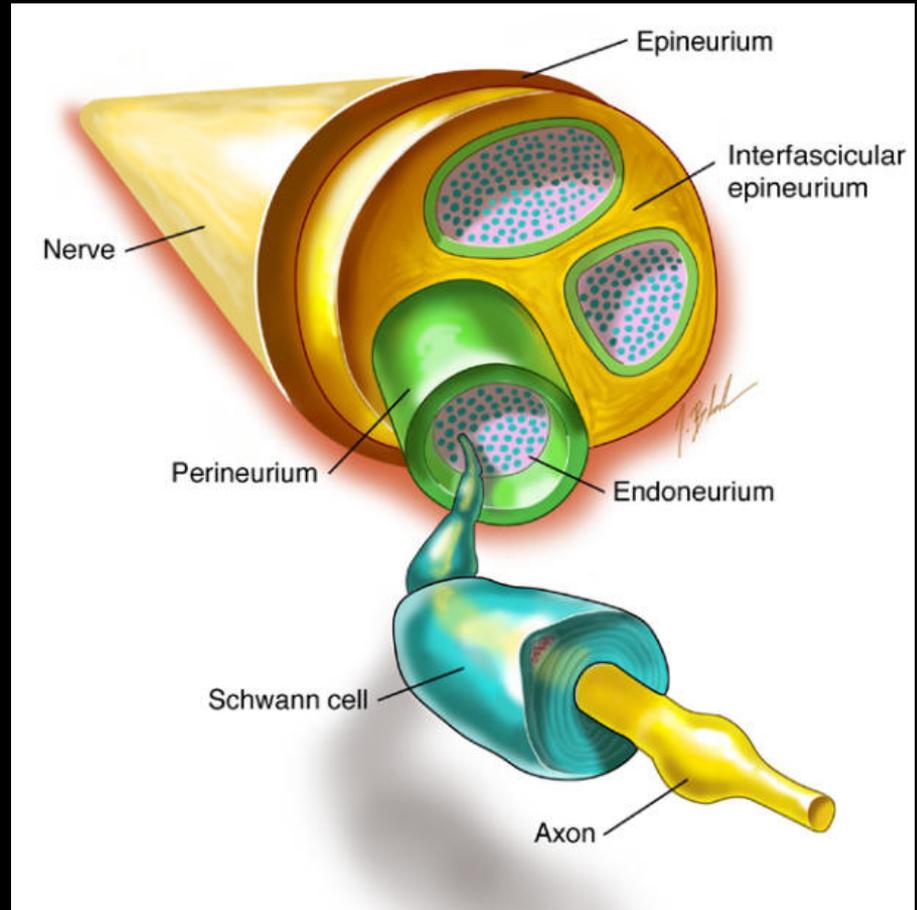
Objectives



- musculocutaneous nerve
- axillary nerve
- suprascapular nerve
- radial nerve
- ulnar nerve
- median nerve

Nerves

- parallel bundles of nerve fibers grouped together in fasciculi
 - endoneurium
 - fibers
 - perineurium
 - fasciculi
 - epineurium
 - nerve trunk

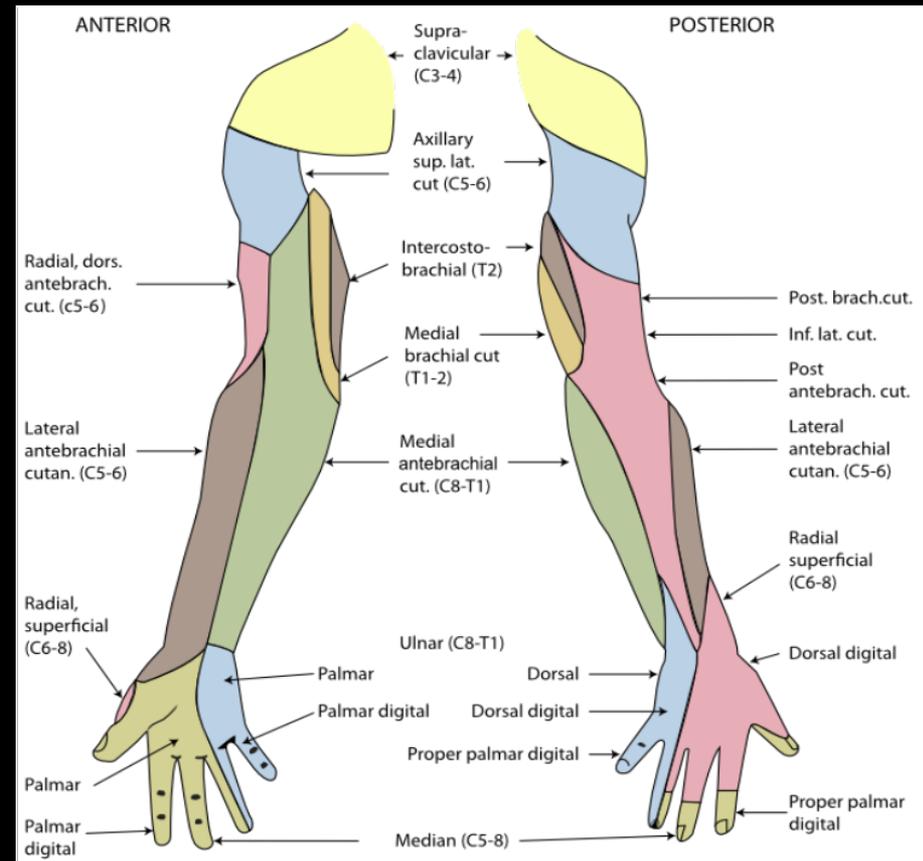


Entrapment Neuropathies

- compression of a short segment of a single nerve at a specific site
 - fibro-osseous tunnel
 - opening in fibrous tissue or muscle
- injured structures
 - nerve fibers
 - Schwann cells
 - endoneurium
 - perineurium
 - epineurium
 - intraneural microvessels

Peripheral Neuropathies

- traditional diagnosis
 - clinical history
 - physical examination
 - electrophysiologic studies
 - able to determine location & severity of underlying nerve injury
 - mildly invasive
 - operator dependent
- limitations
 - inability to determine structural causes
 - inability to assess spatial information



Peripheral Neuropathies

- imaging

- US

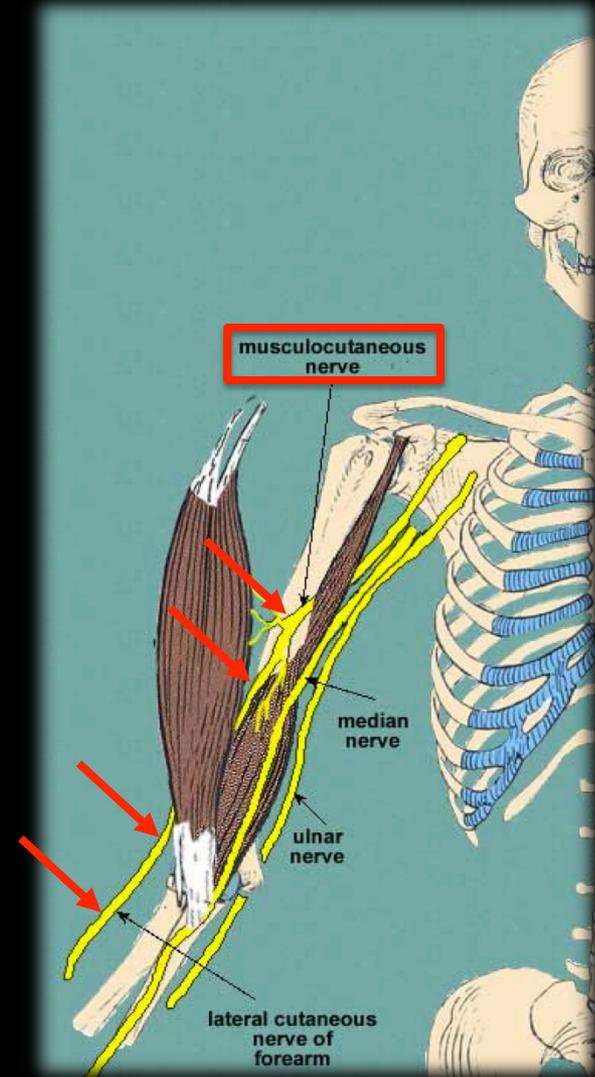
- quick, low-cost, noninvasive
 - dynamic evaluation
 - high spatial resolution
 - capacity to explore long nerve segments
 - limitations: operator dependence, confined use for assessment of superficial nerves

- MRI

- depiction of deeper nerves
 - high contrast resolution
 - identify specific muscle denervation patterns
 - muscle edema within 24-48 hours
 - fatty atrophy within several months

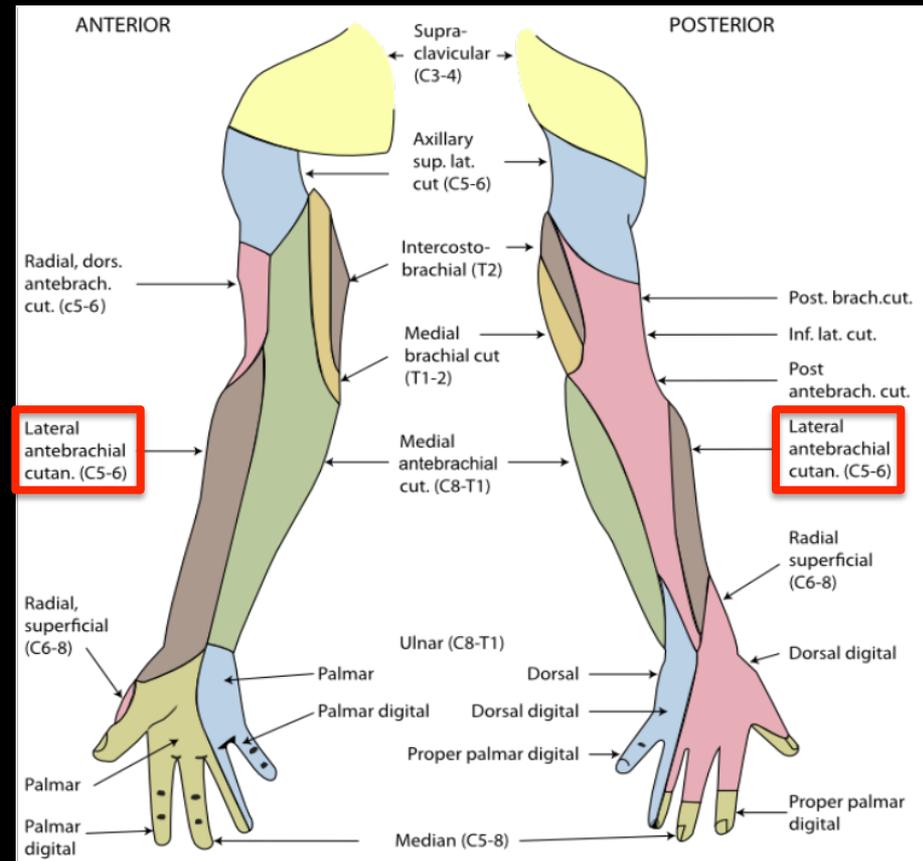
Musculocutaneous Nerve

- lateral cord of brachial plexus
 - between brachialis & biceps brachii muscles
 - lateral to biceps brachii tendon
 - through antebrachial fascia



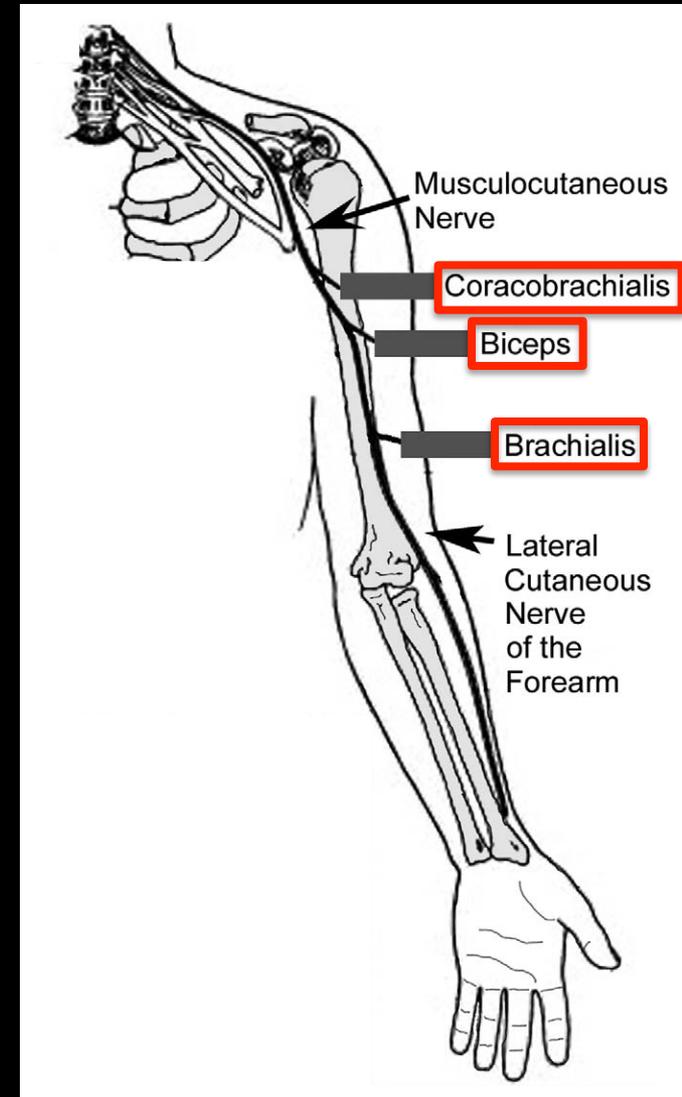
Musculocutaneous Nerve

- lateral cord of brachial plexus
 - between brachialis & biceps brachii muscles
 - lateral to biceps brachii tendon
 - through antebrachial fascia
- lateral antebrachial cutaneous nerve
 - lateral forearm



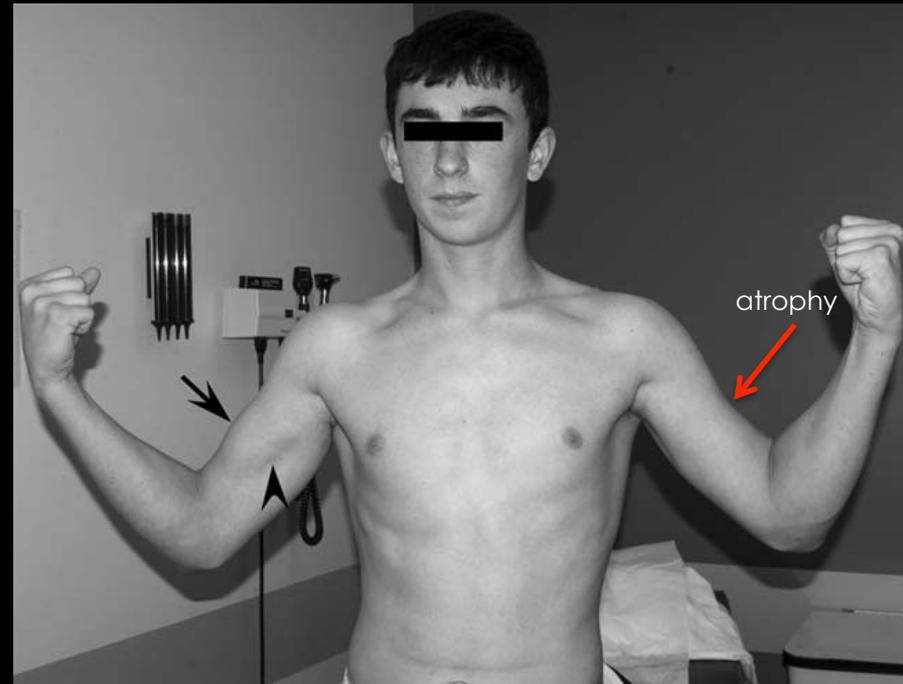
Musculocutaneous Nerve

- muscle supply
 - coracobrachialis
 - brachialis
 - biceps brachii



Musculocutaneous Nerve

- entrapment is uncommon; posttraumatic
- sites of entrapment
 - coracobrachialis muscle
 - antebrachial fascia in cubital fossa
 - external compression against biceps tendon
 - repetitive & vigorous arm exercise
- clinical features
 - muscle weakness
 - at/distal to coracobrachialis muscle
 - brachialis & biceps branchii muscles
 - sensory abnormalities mimicking lateral epicondylitis



Musculocutaneous Nerve

- MR imaging
 - nerve may not be well visualized
 - muscle edema
 - coracobrachialis muscle
 - brachialis muscle
 - biceps brachii muscle
- US
 - point of emergence of lateral antebrachial cutaneous nerve

Musculocutaneous Nerve

43-year-old patient with laceration to the upper arm and biceps weakness

biceps muscle



AX T2 FS

brachialis muscle

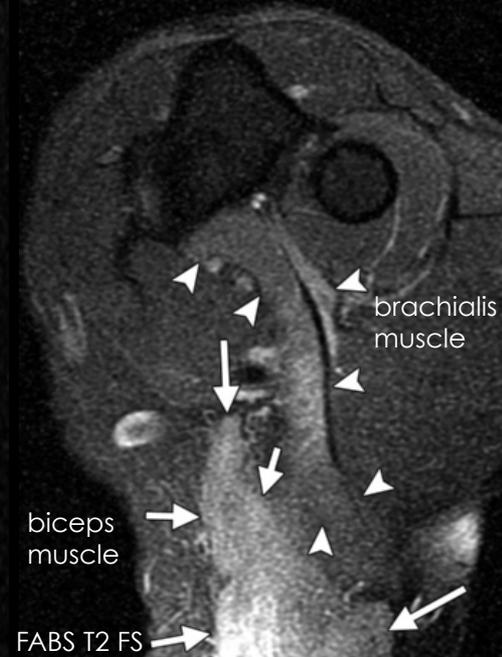


AX T2 FS

brachialis muscle

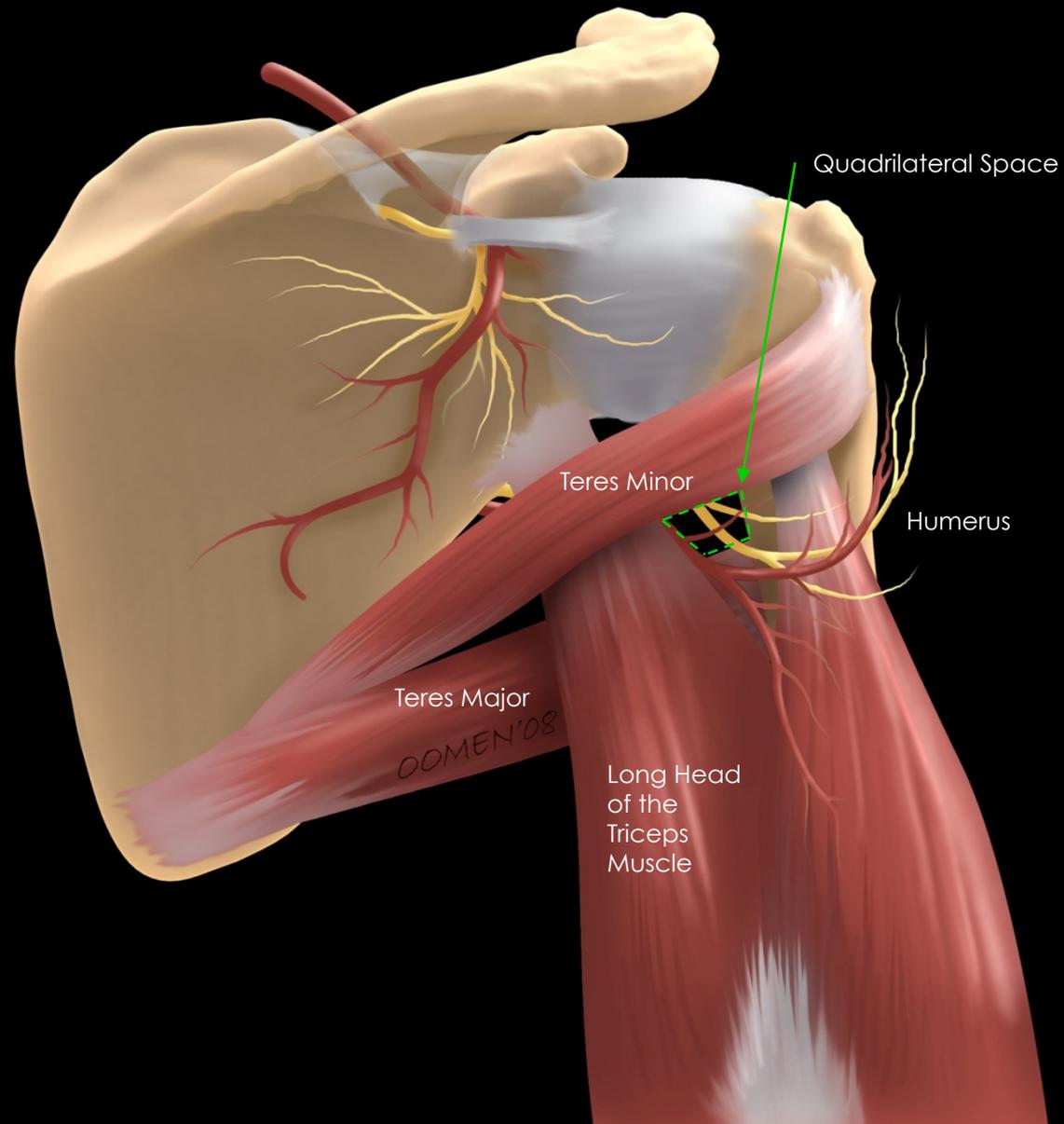
biceps muscle

FABS T2 FS



Axillary Nerve

- quadrilateral space
 - teres minor muscle
 - teres major muscle
 - long head of the triceps muscle
 - humerus

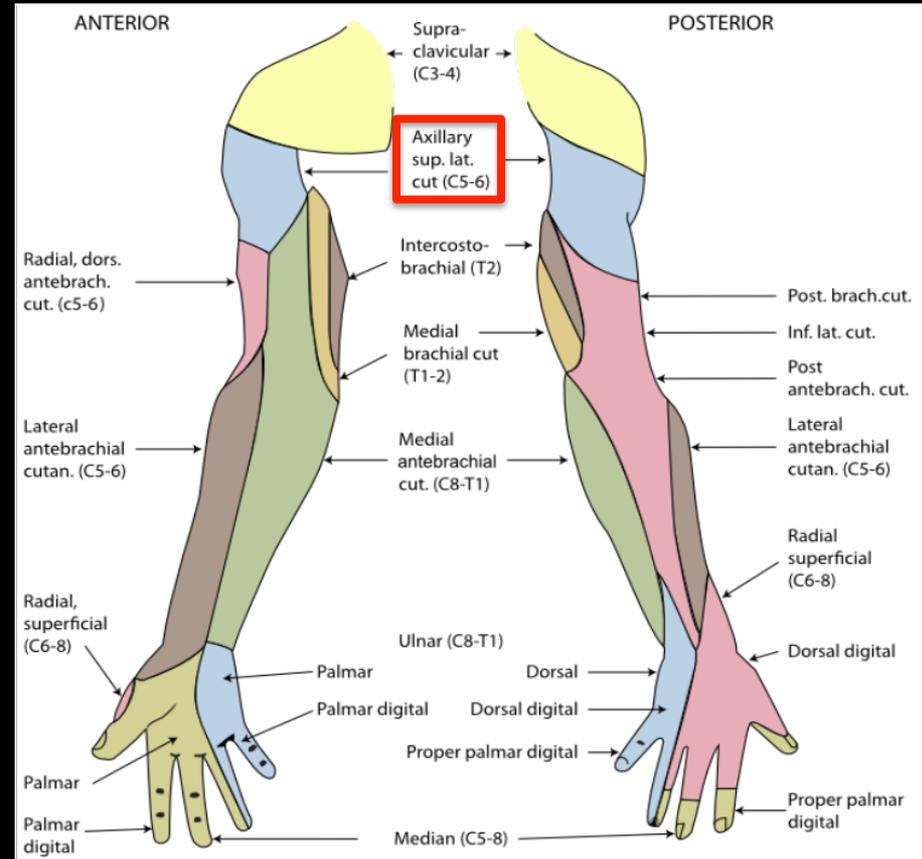


Axillary Nerve

- sites of entrapment
 - quadrilateral space
 - anteroinferior to glenohumeral joint
- CAUSES
 - usually secondary to brachial plexus impairment
 - open surgical intervention
 - posttraumatic in up to 45% of shoulder dislocations
 - quadrilateral space syndrome
 - fibrous bands (most common)
 - tumors
 - paralabral cysts
 - osteophytes

Axillary Nerve

- clinical features
 - vague
 - poorly localized pain over anterior shoulder with potential radiation to arm & forearm
 - paresthesias
 - weakness of deltoid
 - fatigue in athletes
 - atrophy of teres minor & deltoid muscles

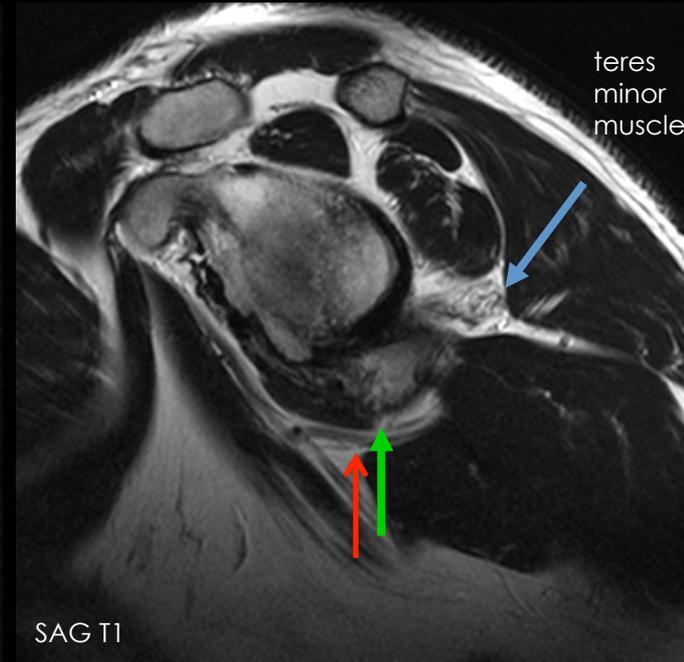
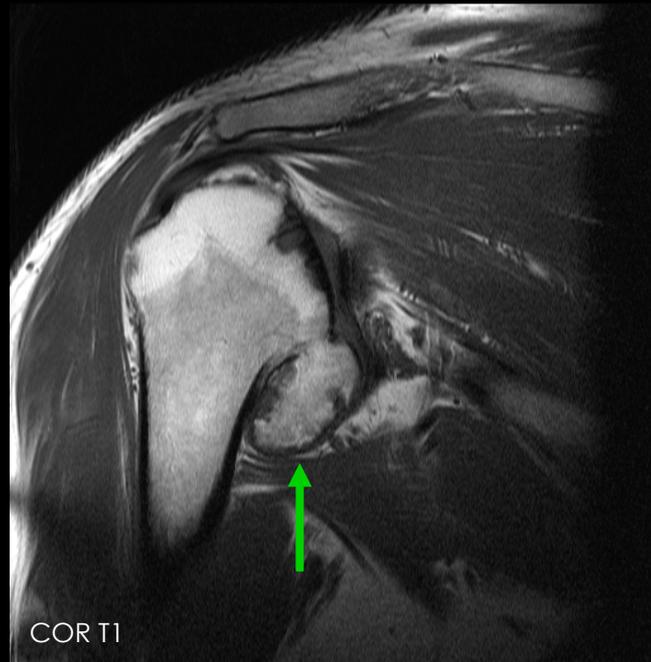
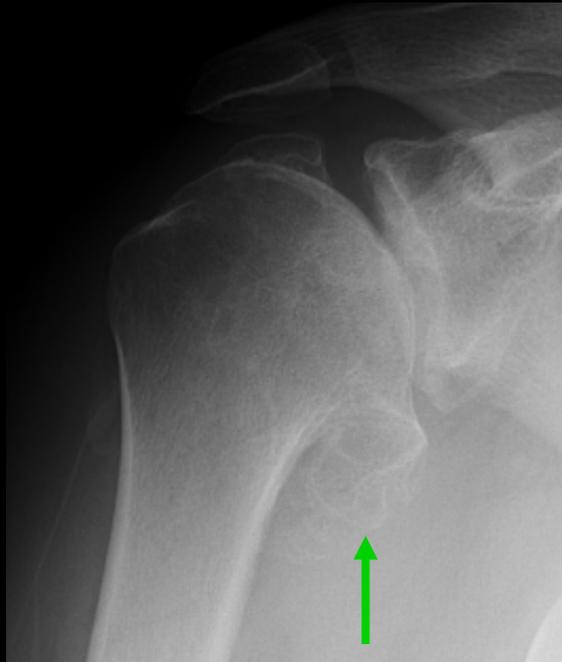


Axillary Nerve

- radiography
 - proximal humeral fracture
 - severe osteoarthritis
 - adequacy of shoulder reduction
- MR imaging
 - masses
 - edema involving teres minor & deltoid muscles

Quadrilateral Space Syndrome

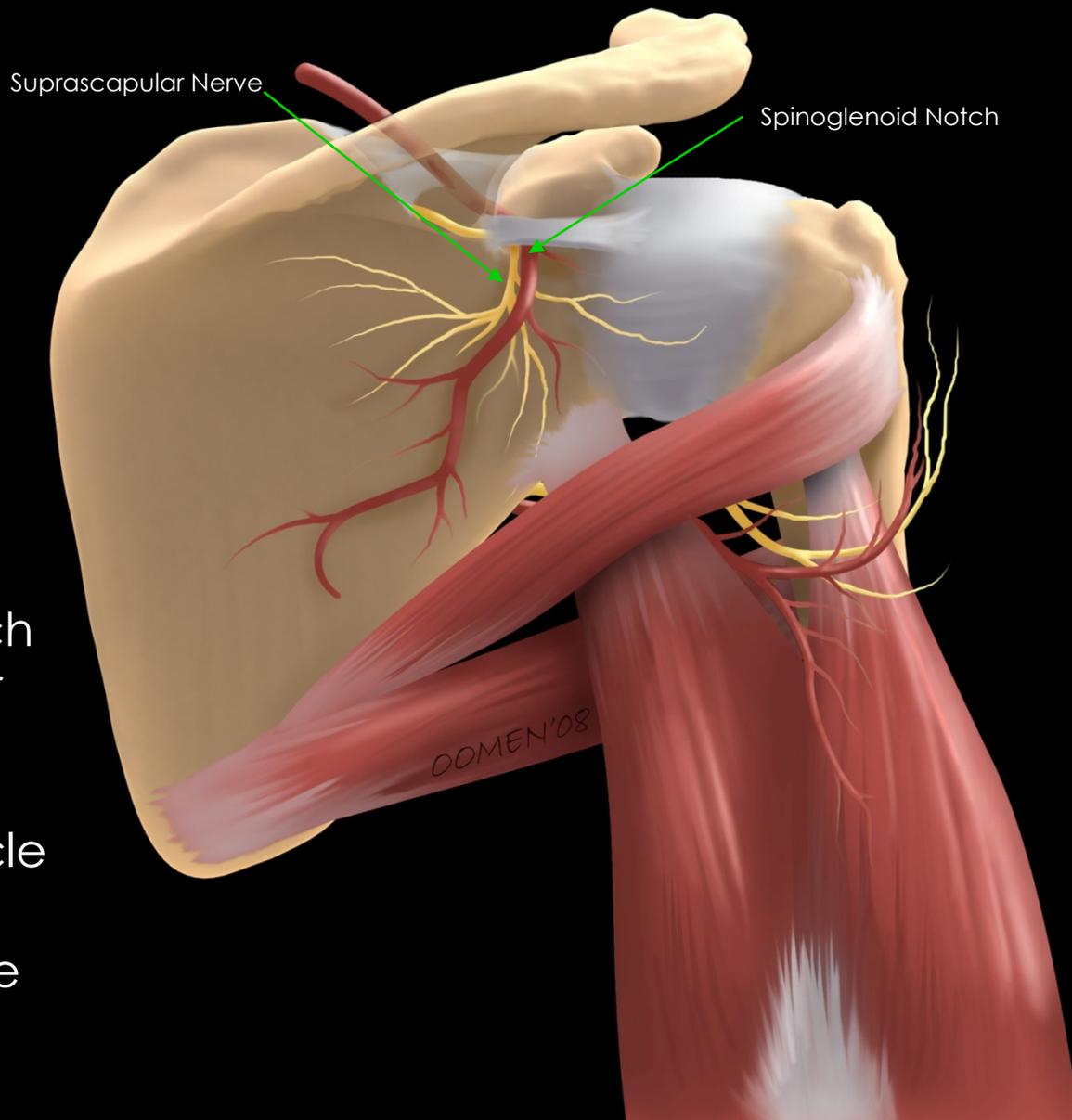
60-year-old patient with shoulder pain and weakness



Suprascapular Nerve

- upper trunk of brachial plexus

- obliquely across posterior triangle of neck toward coracoid process
- through suprascapular foramen
 - suprascapular notch
 - transverse scapular ligament
- supraspinatus fossa
 - supraspinatus muscle
- spinoglenoid notch
 - infraspinatus muscle

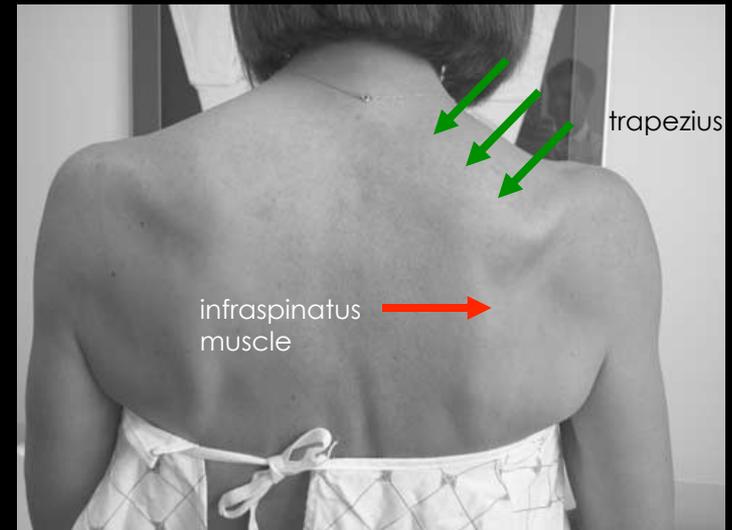


Suprascapular Nerve

- sites of entrapment
 - suprascapular notch
 - spinoglenoid notch
- causes
 - thickened transverse scapular ligament
 - repetitive strain on abducted externally rotated shoulder
 - paralabral cysts
 - tumors
 - iatrogenic surgical injury
 - enlarged varicosities

Suprascapular Nerve

- clinical features
 - insidious onset of deep, generalized, dull posterior shoulder pain
 - minimal functional motor loss
 - atrophy of supraspinatus &/or infraspinatus muscles

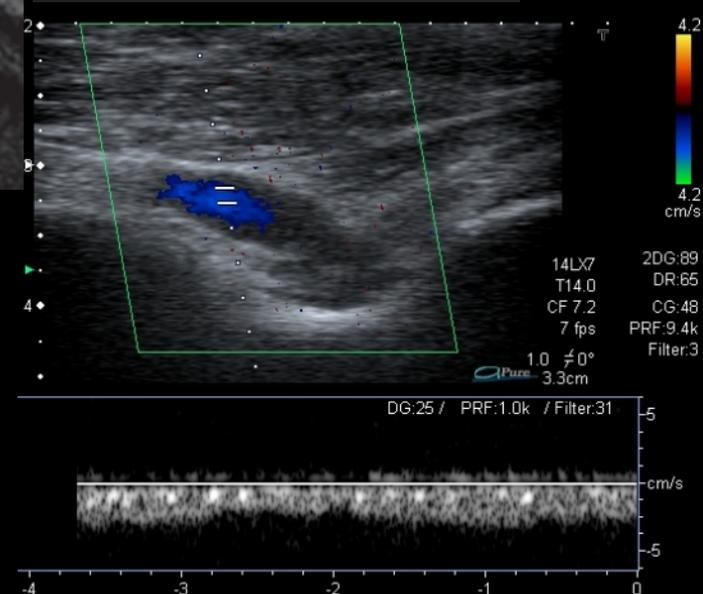
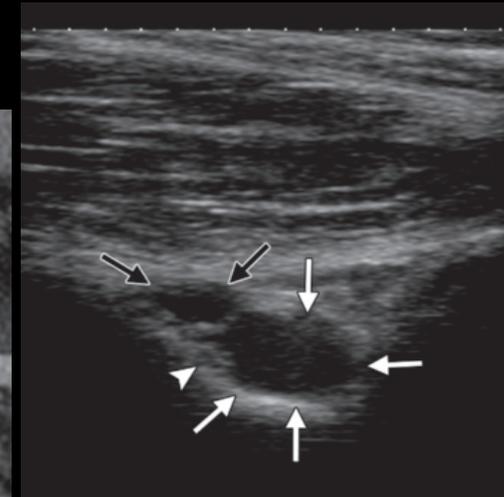
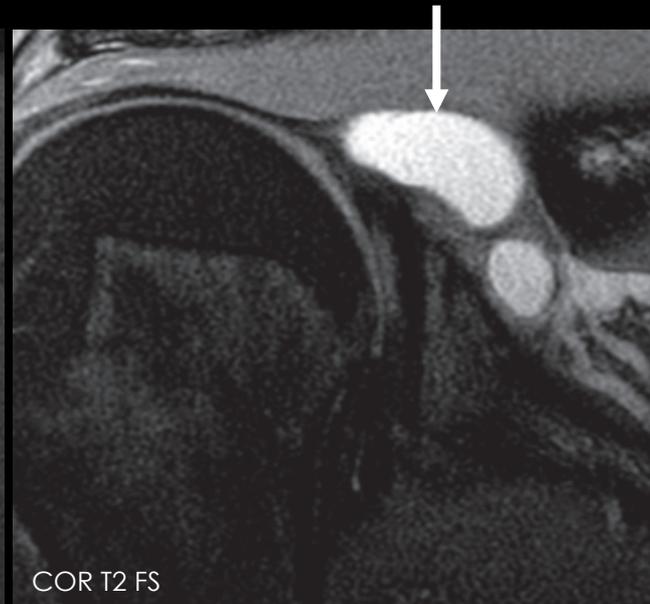
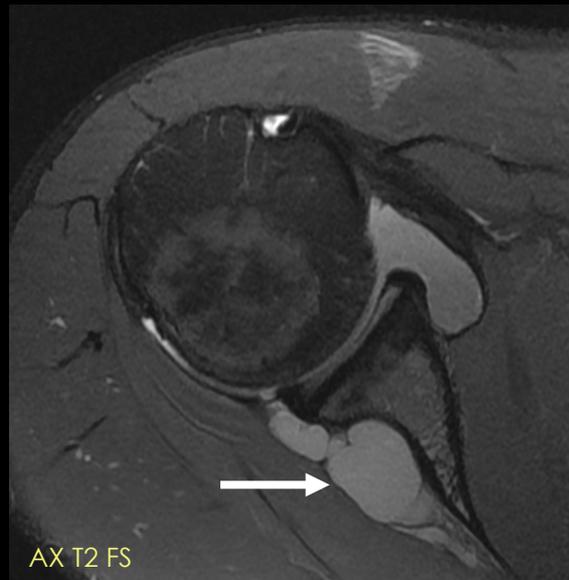


Suprascapular Nerve

- MR imaging
 - muscle edema & atrophy
 - suprascapular notch syndrome
 - supraspinatus & infraspinatus muscles
 - spinoglenoid notch syndrome
 - infraspinatus muscle only
- US
 - distinguishing paralabral cysts from a varix
 - guiding aspiration of large paralabral cysts at spinoglenoid notch

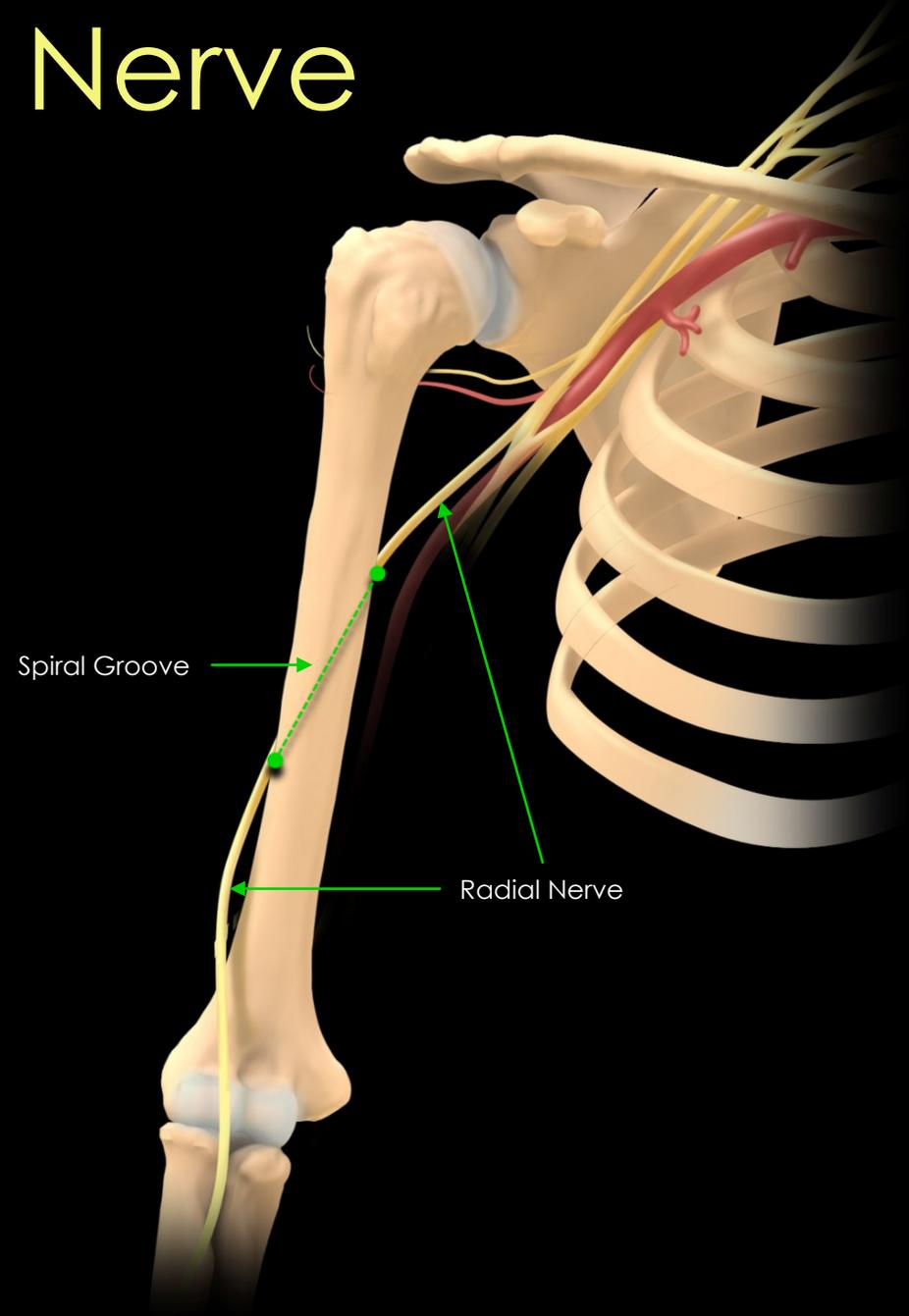
Suprascapular Nerve

22-year-old patient with muscle pain about the shoulder and EMG findings suggesting mild suprascapular nerve compression likely at the spinoglenoid notch



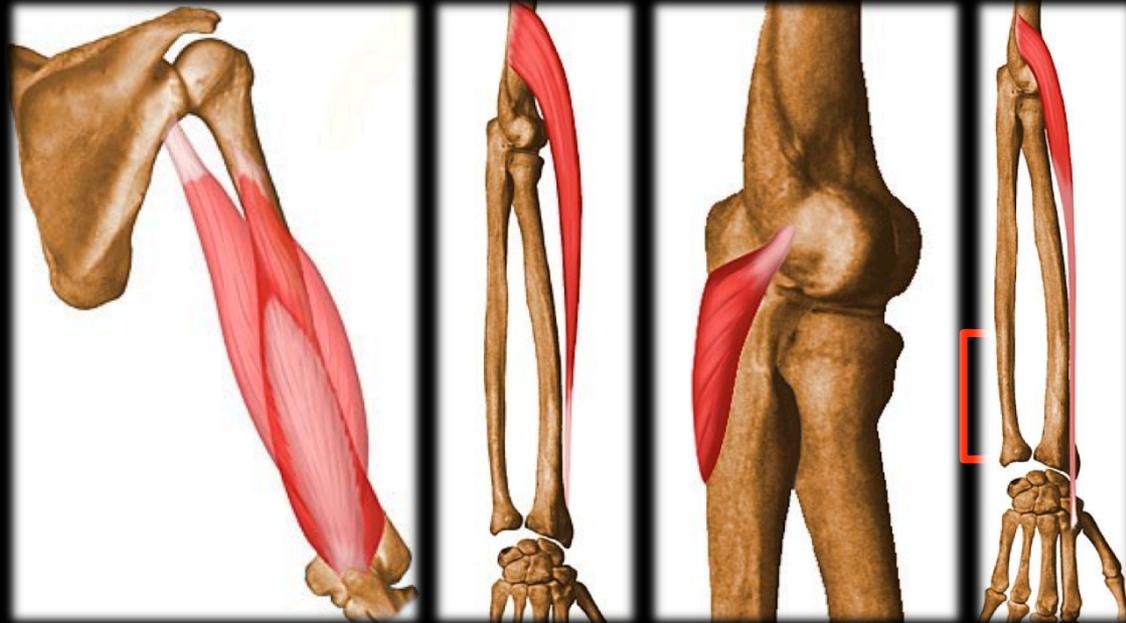
Radial Nerve

- posterior cord of brachial plexus
 - around posterolateral humeral shaft
 - dorsally along spiral groove between lateral & medial heads of triceps muscle
 - enters anterior compartment by piercing lateral intermuscular septum ~10cm proximal to lateral epicondyle
 - superficial branch
 - deep branch



Radial Nerve

- muscle supply
 - triceps
 - brachioradialis
 - anconeus
 - extensor carpi radialis longus
- cutaneous innervation to posterior upper arm



triceps

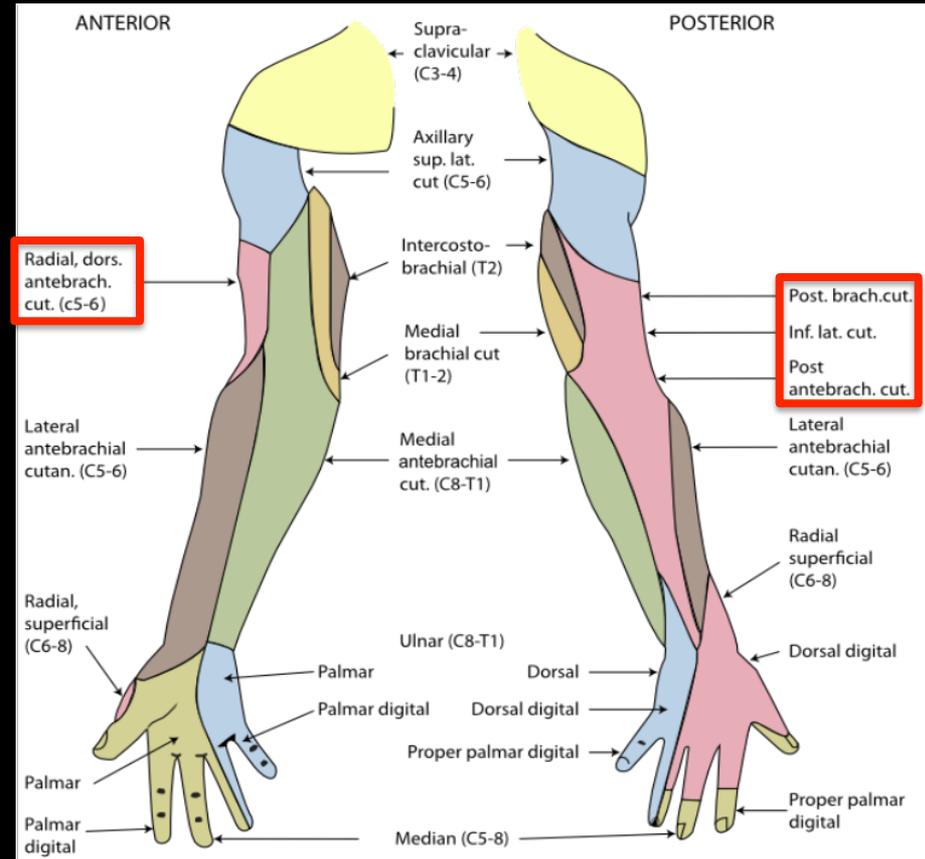
brachioradialis

anconeus

ECRL

Radial Nerve

- muscle supply
 - triceps
 - brachioradialis
 - anconeus
 - extensor carpi radialis longus
- cutaneous innervation to posterior upper arm



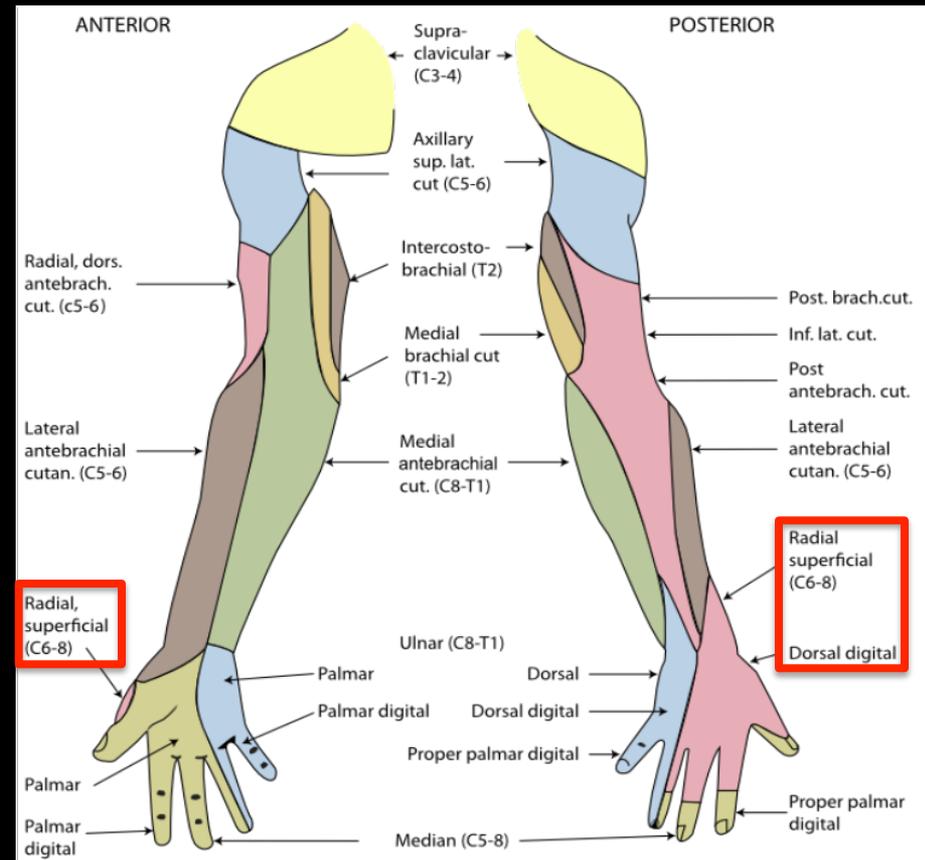
Radial Nerve

- sites of entrapment at arm & elbow
 - spiral groove
 - lateral head of triceps muscle
- causes
 - Saturday night palsy
 - classic radial neuropathy secondary to intoxication
 - humeral shaft fracture
 - misuse of crutches
 - deep intramuscular injections
 - fibrous arch of lateral head of triceps muscle
 - weight lifters



Radial Nerve

- clinical features (spiral groove)
 - functional loss
 - accessory forearm supination
 - elbow flexion
 - wrist & digital extension
 - thumb abduction
 - sensory loss dorsolateral hand
 - elbow extension is spared
 - triceps muscle branch proximal to spiral groove

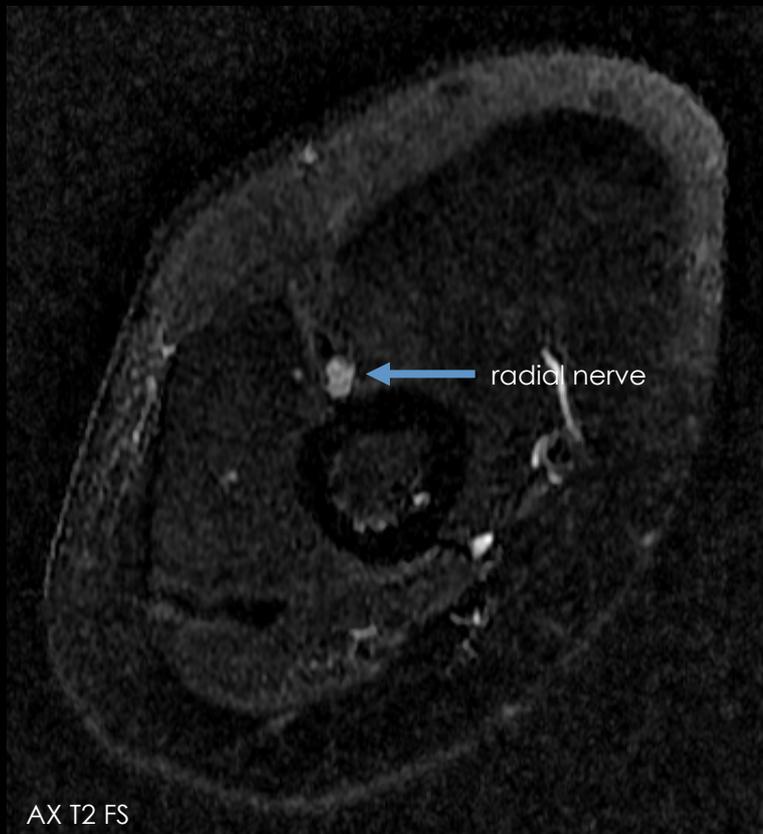


Radial Nerve

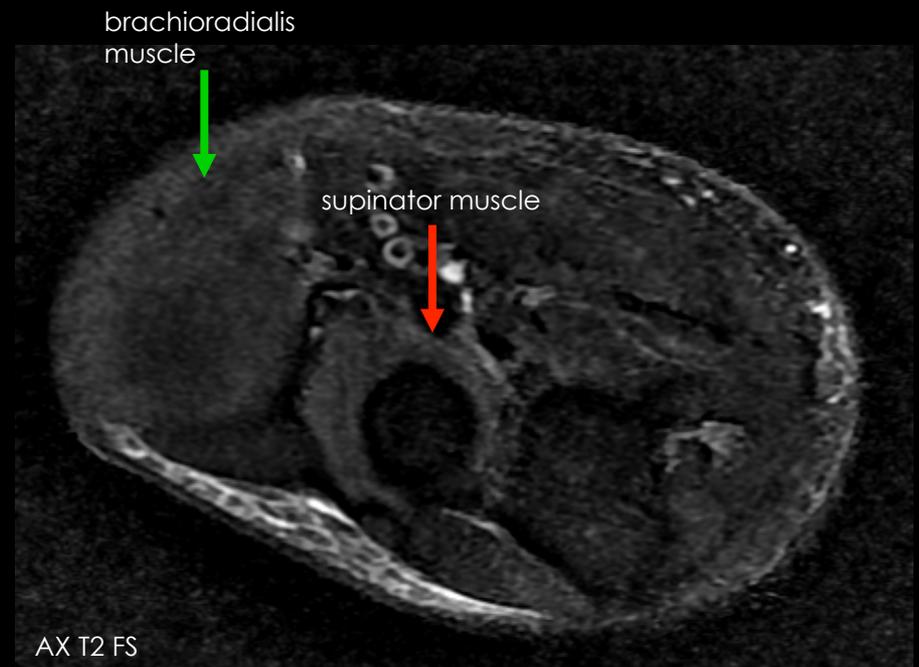
- MR imaging
 - muscle edema in some or all muscles
 - spiral groove entrapment
 - most except for triceps muscle
 - proximal muscles = high radial nerve entrapment
 - triceps muscle
 - extensor carpi radialis longus muscle
 - anconeus muscle
- US
 - neuroma
 - focal swelling
 - hypoechogenicity
 - loss of normal fascicular pattern

Saturday Night Palsy

56-year-old patient with possible history of trauma, numbness of arm and weakness of extensor muscles

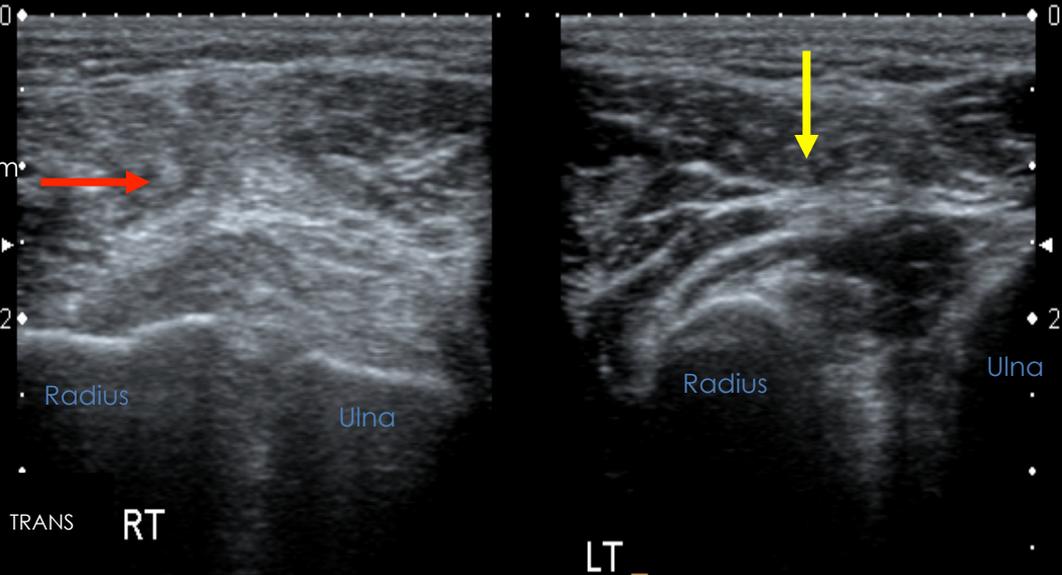
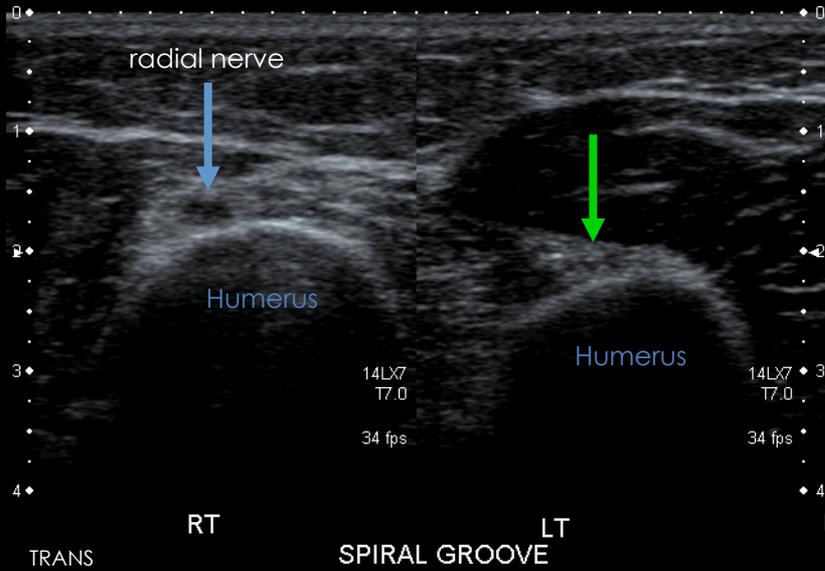


spiral groove



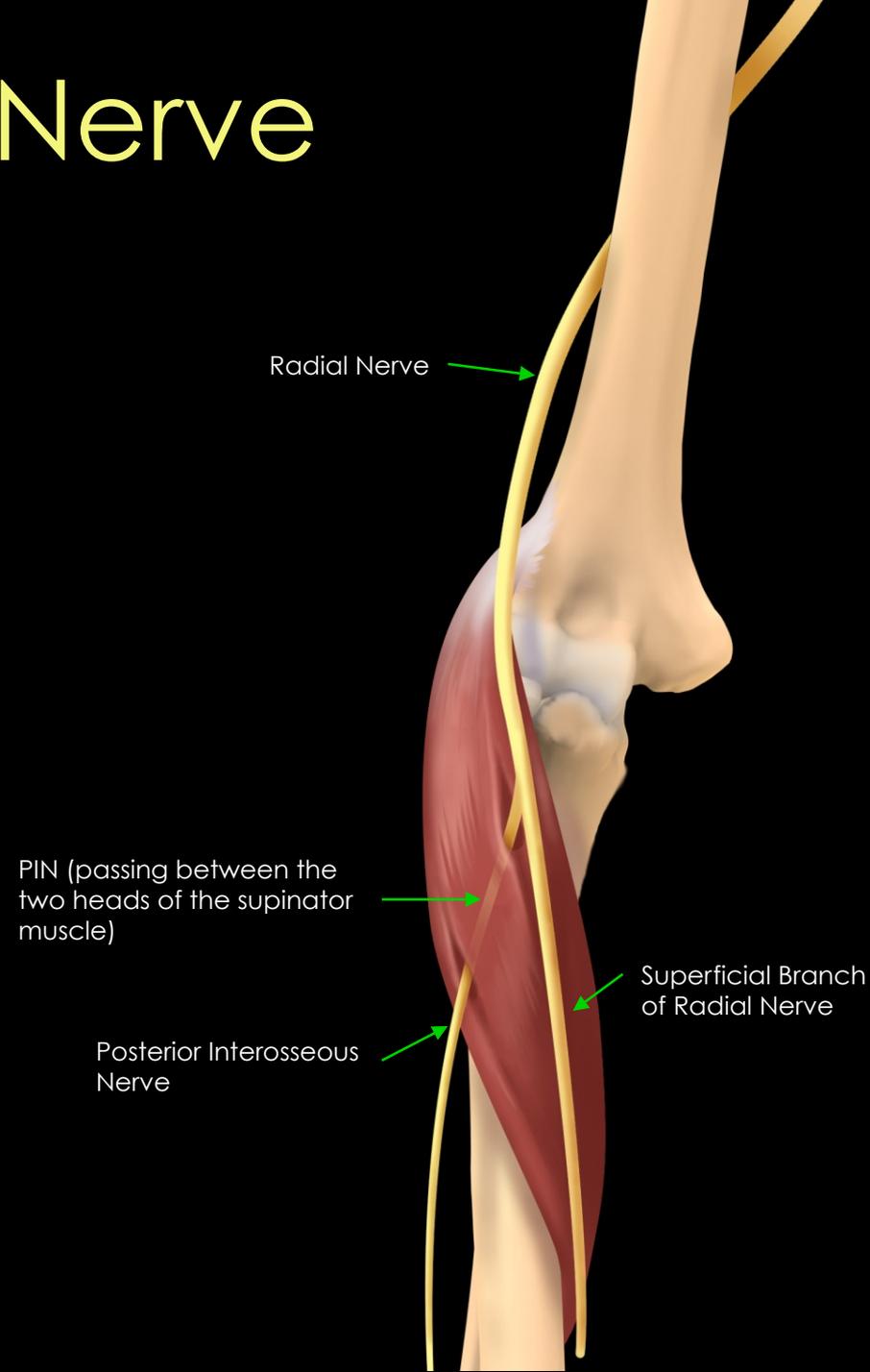
Saturday Night Palsy

50-year-old patient with history of trauma and a flaccid right arm following shoulder subluxation



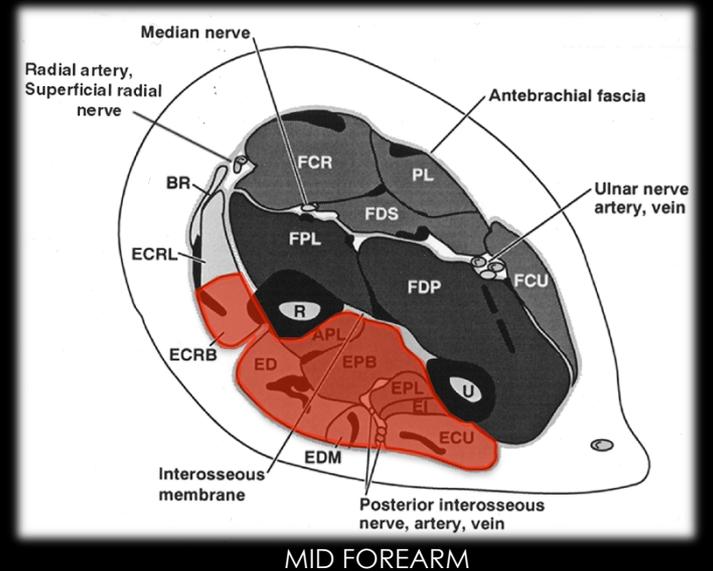
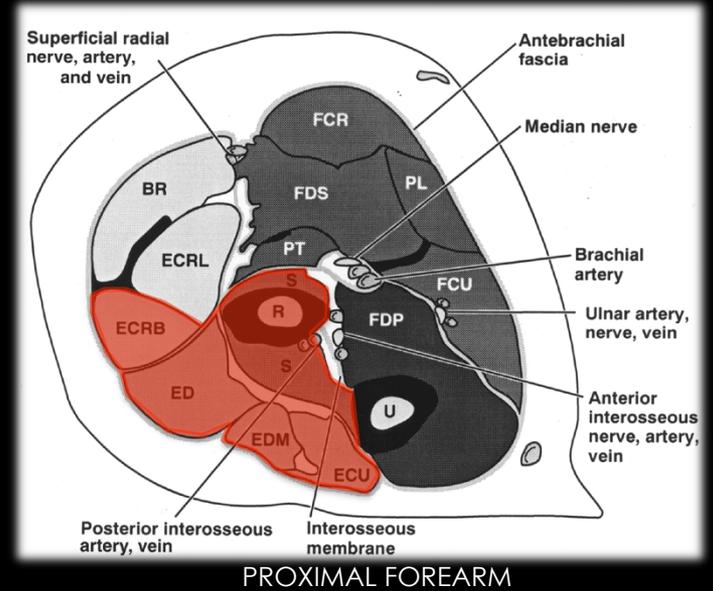
Radial Nerve

- radial tunnel
 - mobile wad
 - elbow joint capsule
 - radiocapitellar joint
 - arcade of Frohse
 - fibrous arch at proximal superficial head supinator muscle
- divides
 - deep motor branch
 - posterior interosseous nerve
 - between superficial & deep portions of supinator muscle
 - along dorsal surface of interosseous membrane
 - superficial sensory branch
 - deep to brachioradialis muscle



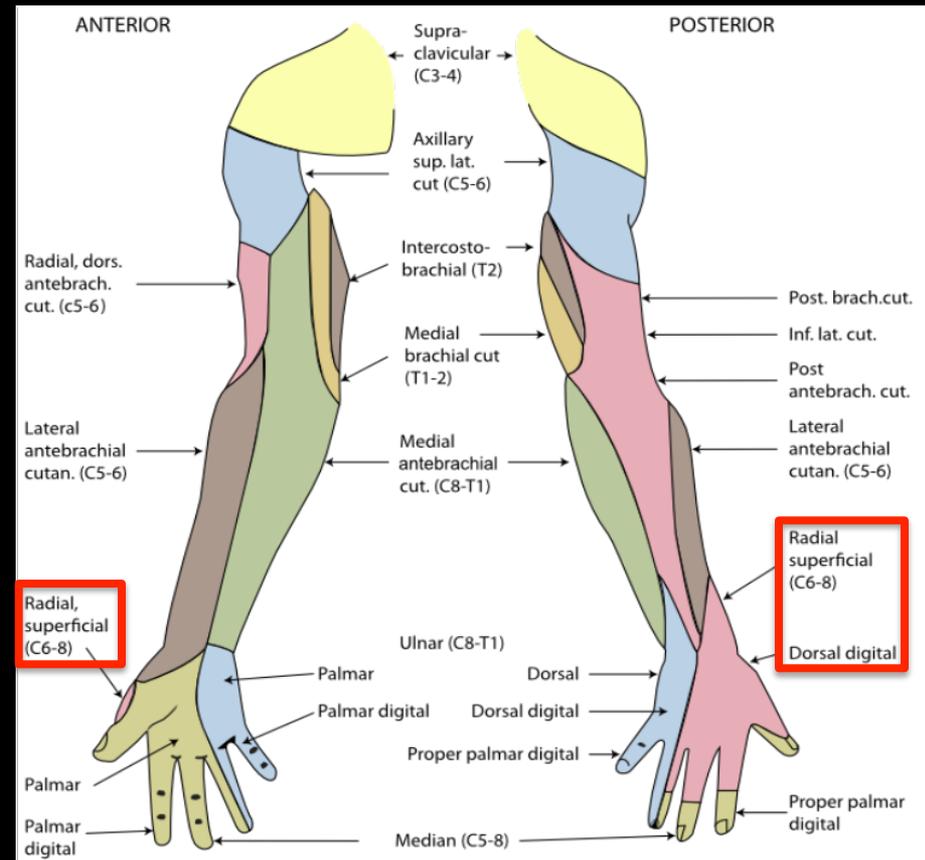
Radial Nerve

- muscle supply (PIN)
 - supinator
 - abductor pollicis longus
 - extensor carpi ulnaris
 - extensor digitorum communis
 - extensor indicis
 - extensor digiti minimi
 - extensor pollicis longus
 - extensor pollicis brevis
 - extensor carpi radialis brevis
- cutaneous innervation to dorsolateral hand (superficial branch)



Radial Nerve

- muscle supply (PIN)
 - supinator
 - abductor pollicis longus
 - extensor carpi ulnaris
 - extensor digitorum communis
 - extensor indicis
 - extensor digiti minimi
 - extensor pollicis longus
 - extensor pollicis brevis
 - extensor carpi radialis brevis
- cutaneous innervation to dorsolateral hand (superficial branch)



Posterior Interosseous Nerve

- sites of entrapment at elbow
 - radiocapitellar joint & radial tunnel
 - arcade of Frohse
 - leash of Henry
 - vessels arising from recurrent radial artery
- causes
 - involvement of posterior interosseous nerve (PIN) with two distinct syndromes
 - differentiation based on presence or absence of neurologic deficits
 - radial tunnel syndrome
 - pain involving dorsolateral forearm
 - PIN syndrome
 - pain & paresis of extensor muscles
 - speculation: different nerve fibers are affected
 - PIN also carries sensory afferent fibers from wrist & innervated muscles

Posterior Interosseous Nerve

- causes
 - forceful supination & pronation
 - athletes & workers
 - trauma
 - fibrous bands
 - thickened arcade of Frohse or margin of ECRB tendon
 - space-occupying lesions
 - ganglia, bursae, lipomas, recurrent pulsating radial vessels, synovitis, neurogenic tumors

Posterior Interosseous Nerve

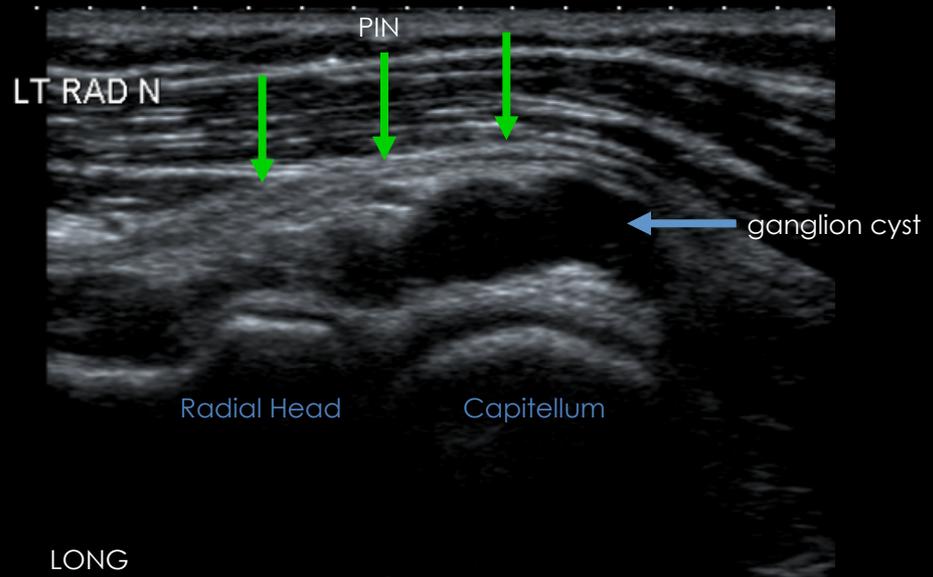
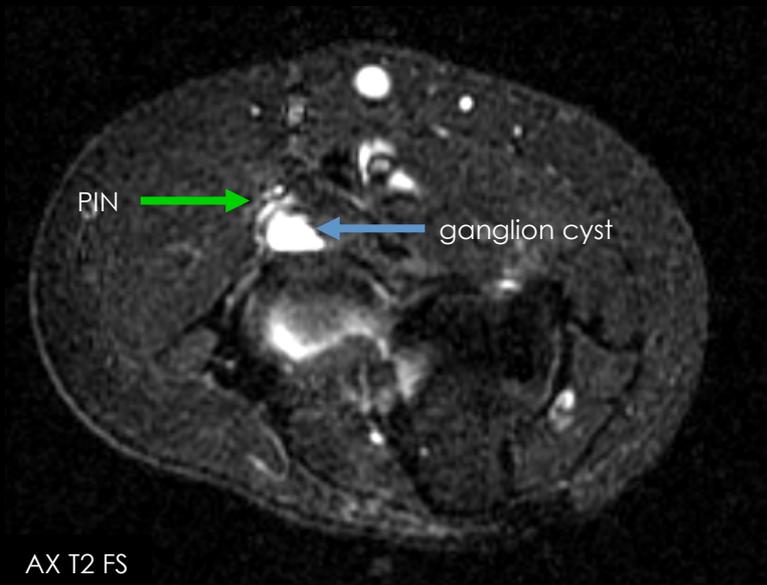
- clinical features
 - radial tunnel syndrome
 - pain over anterolateral proximal forearm
 - clinically similar to lateral epicondylitis
 - both are simultaneously present in 7%
 - 5% of patients with recurrent “tennis elbow” may have radial tunnel syndrome
 - PIN syndrome
 - inability to extend metacarpophalangeal joints of thumb & fingers
 - pain over supinator muscle, exacerbated by forced extension of fingers & supination of forearm

Posterior Interosseous Nerve

- MR imaging
 - exclude mass lesion
 - muscle signal alterations
- US
 - exclude lateral epicondylitis
 - focal nerve swelling & loss of normal fascicular pattern
 - adjacent & proximal to compression

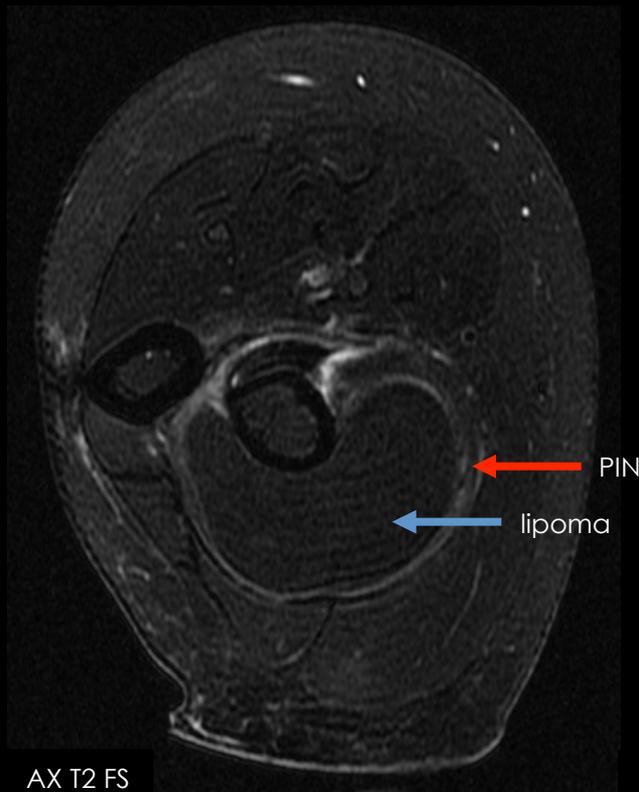
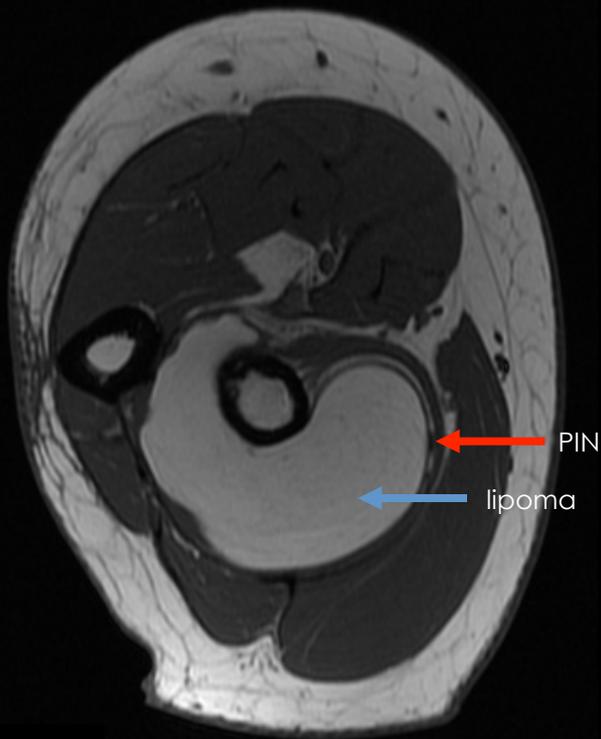
Radial Tunnel Syndrome

46-year-old patient with history of lateral elbow pain diagnosed as lateral epicondylitis



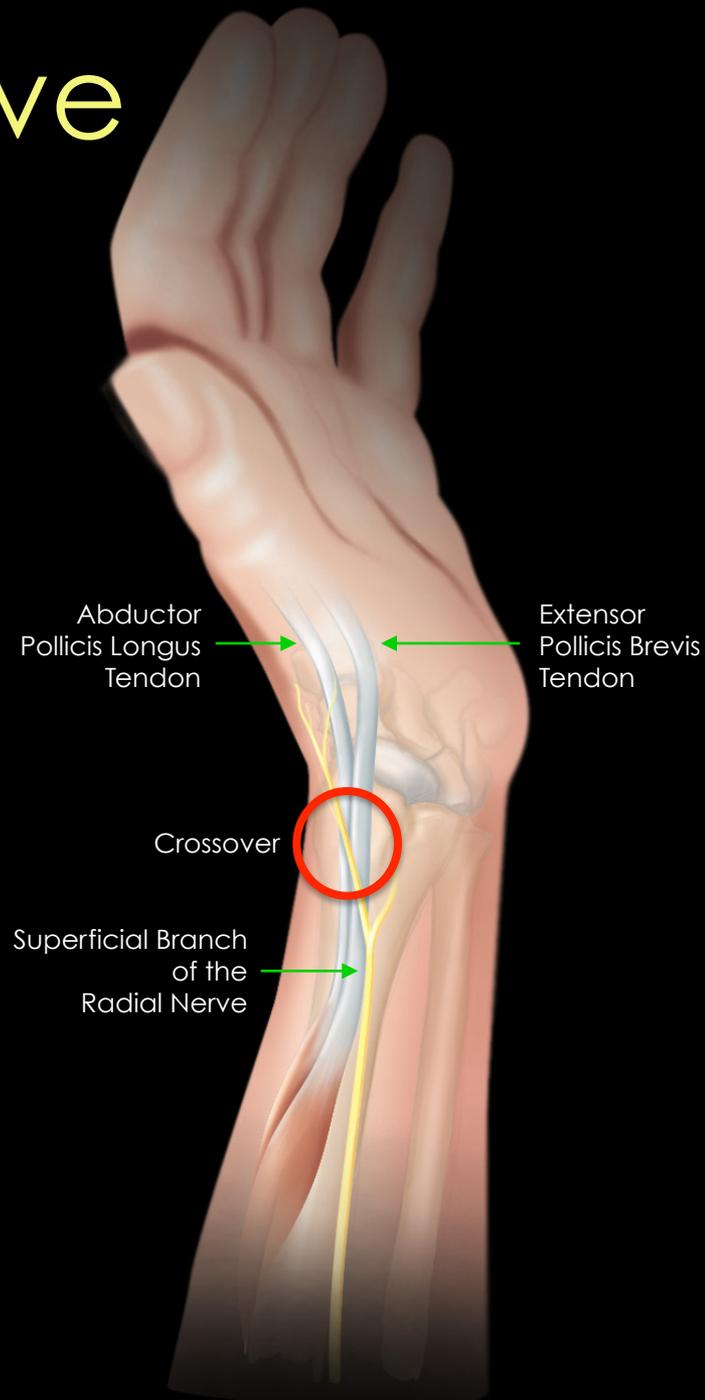
Posterior Interosseous Nerve Syndrome

59-year-old patient with a lump and vague weakness of forearm, without sensory symptoms



Radial Nerve

- superficial branch of radial nerve
 - deep to the brachioradialis tendon to pierce fascia & become subcutaneous
 - around radial aspect of wrist
 - dorsum of wrist, hand & two-and-a-half radial fingers to level of PIP joints
 - crosses 1st extensor compartment



Superficial Branch of Radial Nerve

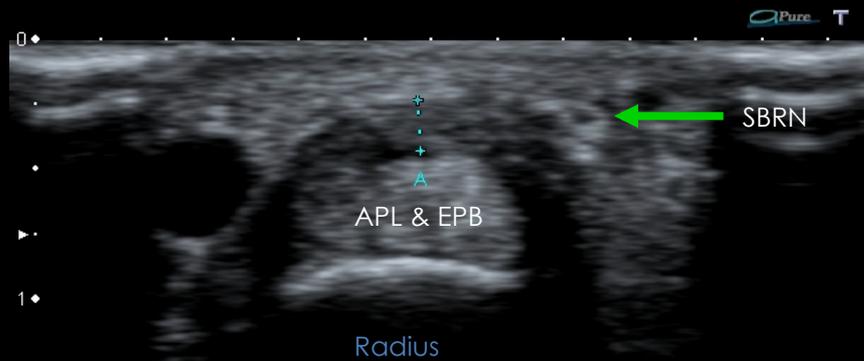
- clinical features
 - Wartenburg syndrome or cheiralgia paresthetica
 - nerve involvement at wrist causing paresthesia over dorsal thumb
 - causes
 - de Quervain tenosynovitis
 - injury during venipuncture
 - compression: handcuffs, casts, wristbands
 - entrapment at distal third of forearm
 - pain over distal radial forearm with associated paresthesia
 - positive Tinel sign

Superficial Branch of Radial Nerve

- US
 - comparison with asymptomatic contralateral side
 - identification of swollen nerve
 - de Quervain disease prior to surgical release
 - avoid incomplete relief of symptoms
 - aggravation of neuritis symptoms

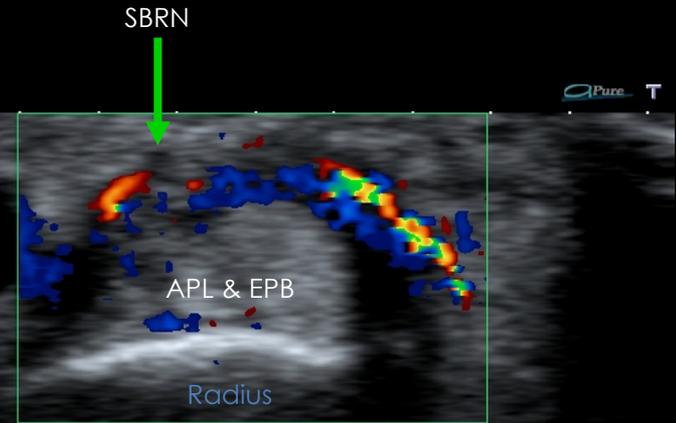
Wartenburg Syndrome

49-year-old patient with paresthesia over dorsal radial hand and vague pain along radial side of forearm radiating both proximally and distally



RT EXT 1 DST RAD

TRANS



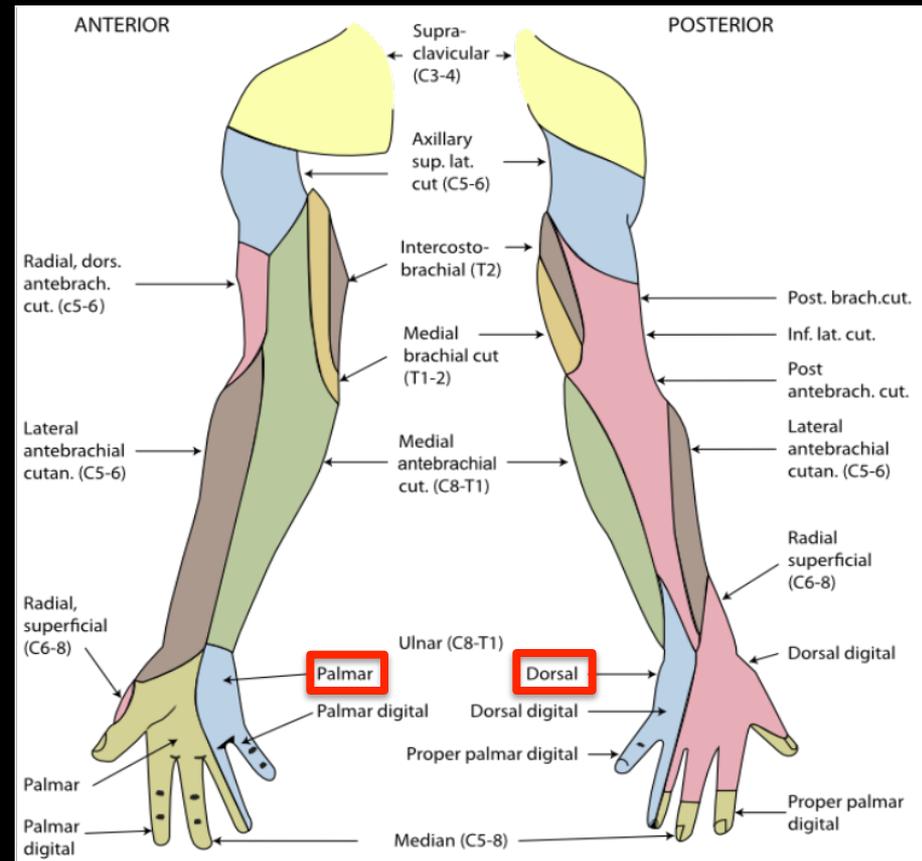
RT EXT 1 DST RAD

TRANS

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T14.0
CF 7.2
10 fps

Ulnar Nerve

- muscle supply
 - flexor carpi ulnaris
 - flexor digitorum profundus
 - 4th & 5th fingers
- cutaneous innervation
 - palmar cutaneous nerve
 - hypothenar eminence
 - dorsal ulnar cutaneous nerve
 - 5th & half of 4th fingers



Ulnar Nerve

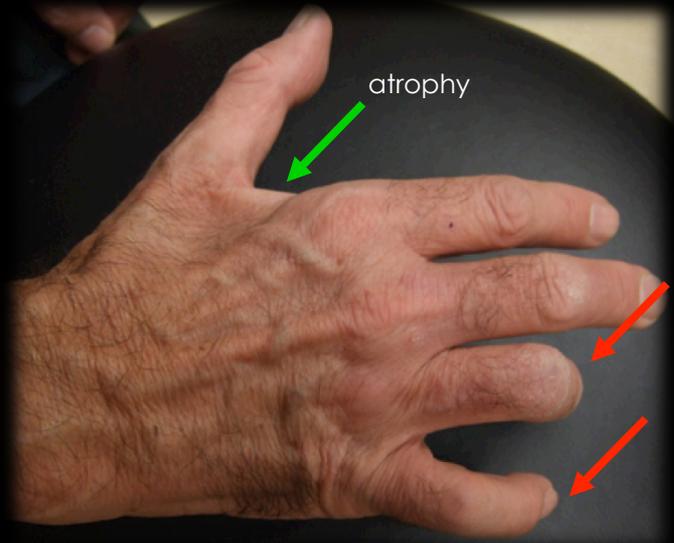
- sites of entrapment at elbow
 - arcade of Struthers
 - medial intermuscular septum
 - cubital tunnel
 - between two heads of flexor carpi ulnaris muscle
 - flexor pronator aponeurosis

Ulnar Nerve

- cubital tunnel syndrome
 - 2nd most common neuropathy in upper limb
 - volume change during elbow flexion
 - tightening arcuate ligament
 - bulging medial head triceps muscle
 - causes
 - blunt trauma
 - compression
 - anconeus epitrochlearis muscle
 - osteophytes
 - ganglia
 - synovitis
 - lax ulnar collateral ligament
 - tardy ulnar nerve palsy
 - delayed neuropathy
 - valgus instability
 - ulnar nerve subluxation
 - 10-16% of individuals
 - may be associated with symptoms of neuritis

Ulnar Nerve

- clinical features
 - medial elbow pain radiating to hand
 - exacerbated by elbow flexion
 - pain or numbness at ulnar aspect of hand & fingers
 - weakness of finger abduction, thumb adduction, pinching of thumb & forefinger
 - muscle atrophy
 - flexion contractures

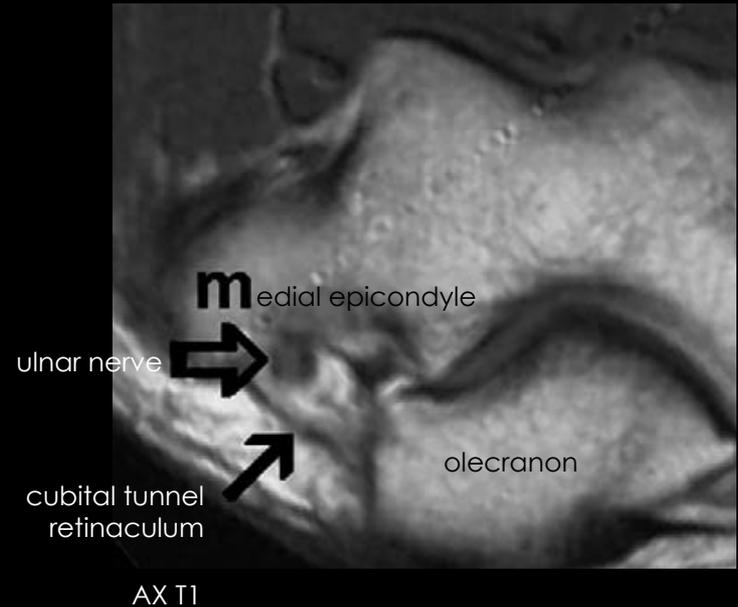


Ulnar Nerve

- US
 - assess entire course of nerve to determine site of compression (when EMG nonlocalizing)
 - hypoechoic & swollen nerve proximal to compression or “hourglass” constriction
 - dynamic evaluation throughout elbow flexion & appreciation of “snapping” sensation
 - ulnar nerve
 - triceps muscle

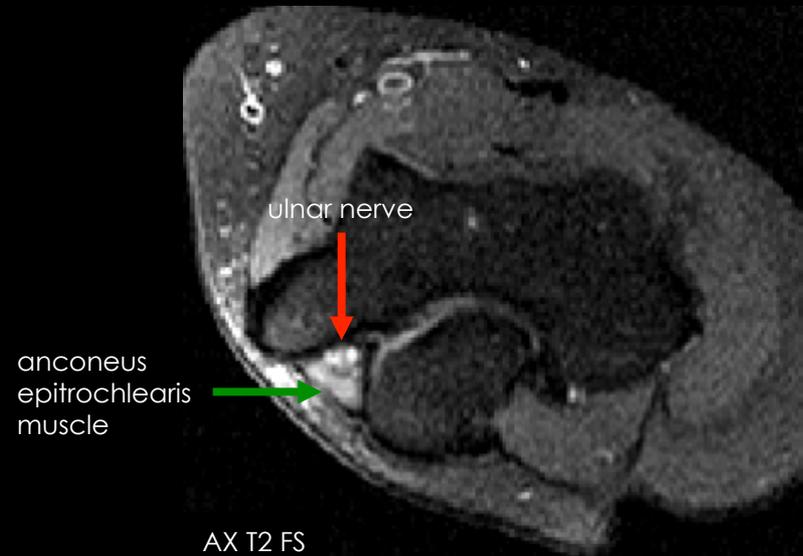
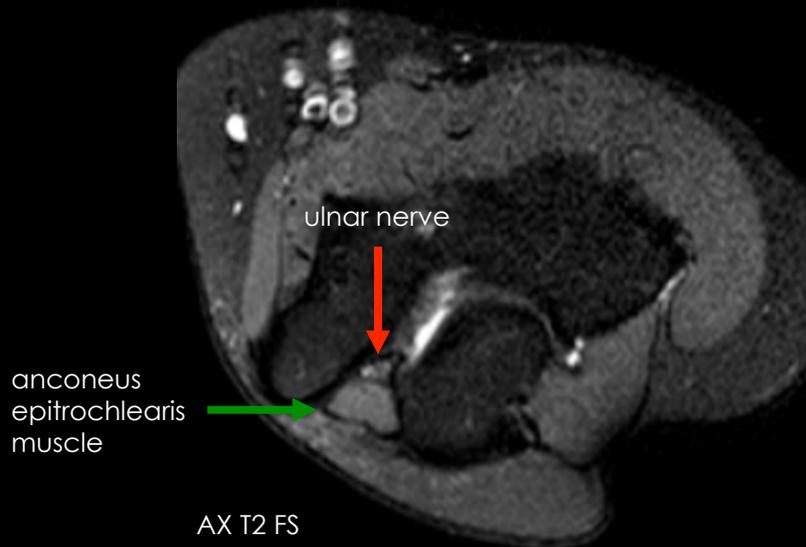
Ulnar Nerve

- MR imaging
 - comprehensive assessment
 - appearance of normal ulnar nerve
 - round, hypointense surrounded by fat
 - may be hyperintense in asymptomatic individuals
 - focal nerve thickening & fascicular distortion is pathologic
 - anconeus epitrochlearis
 - 4-34% of individuals
 - muscle edema or atrophy



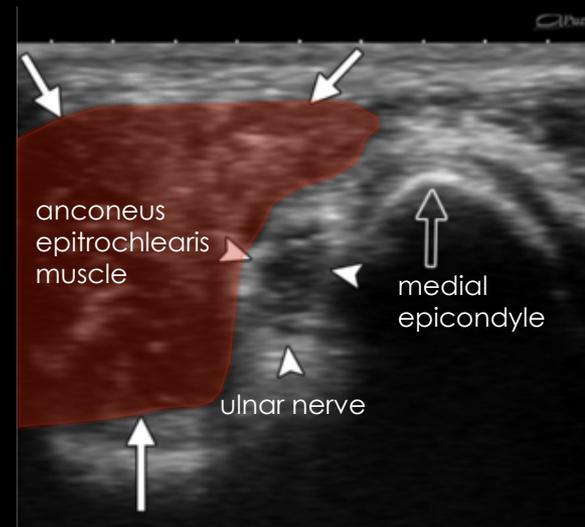
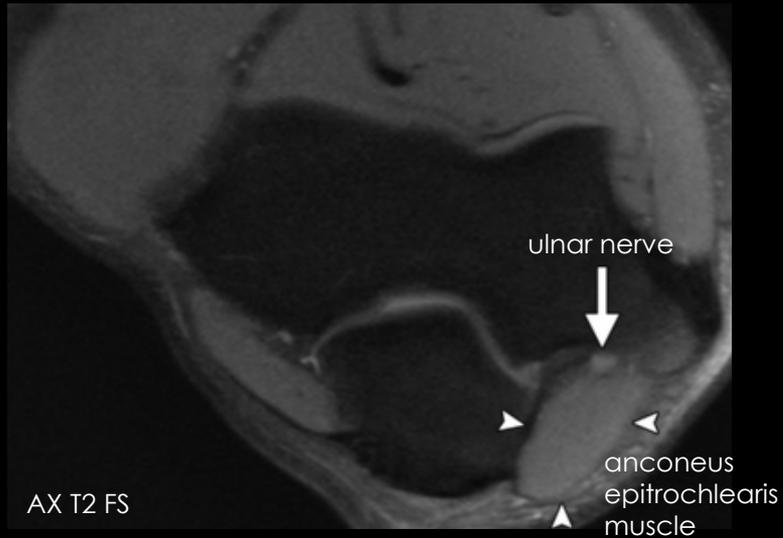
Anconeus Epitrochlearis

31-year-old patient with constant tingling and numbness in ring & little fingers



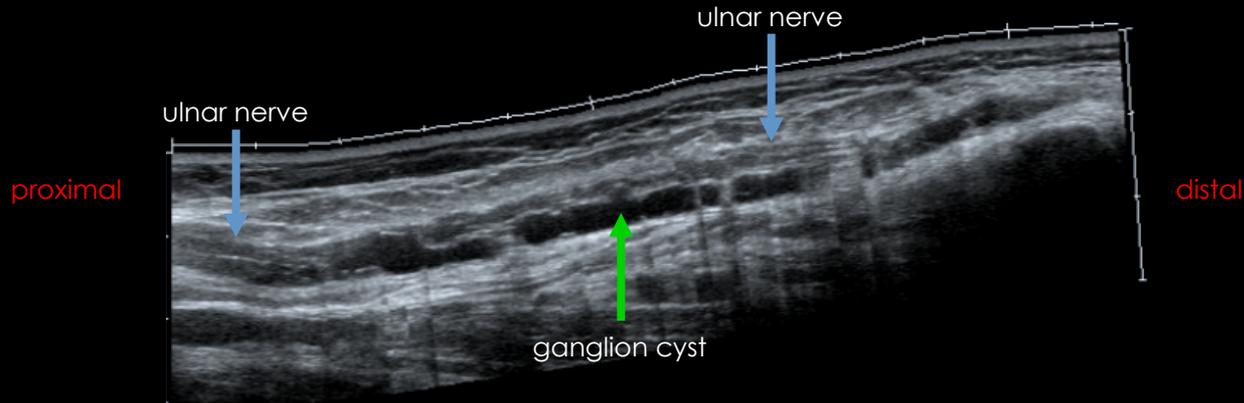
Anconeus Epitrochlearis

35-year-old patient with hand weakness

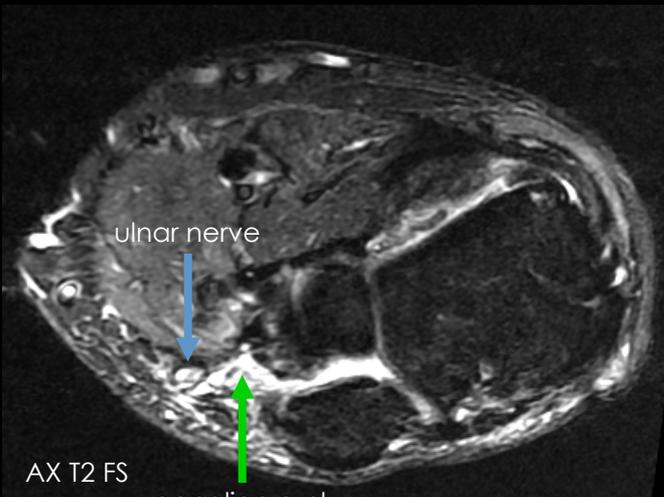


Intraneural Ganglion Cyst

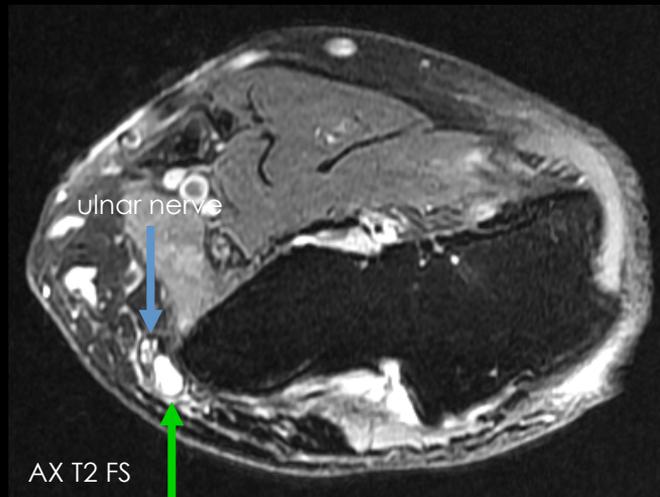
59-year-old patient with two year history of ulnar nerve symptoms



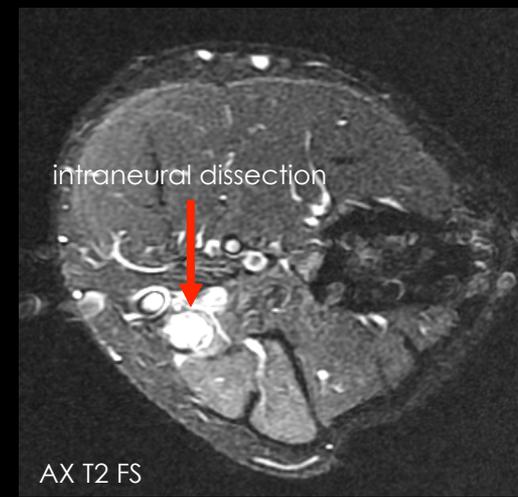
PANORAMIC PROXIMAL TO ELBOW



distal



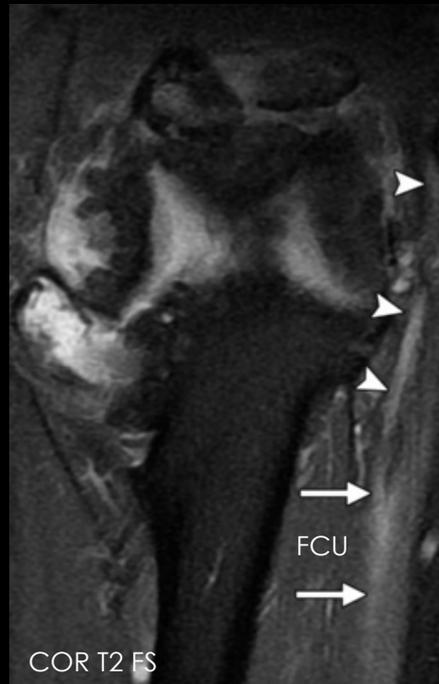
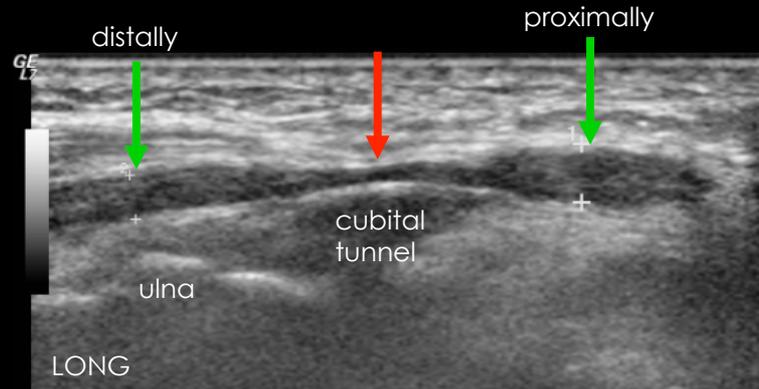
ganglion cyst



proximal

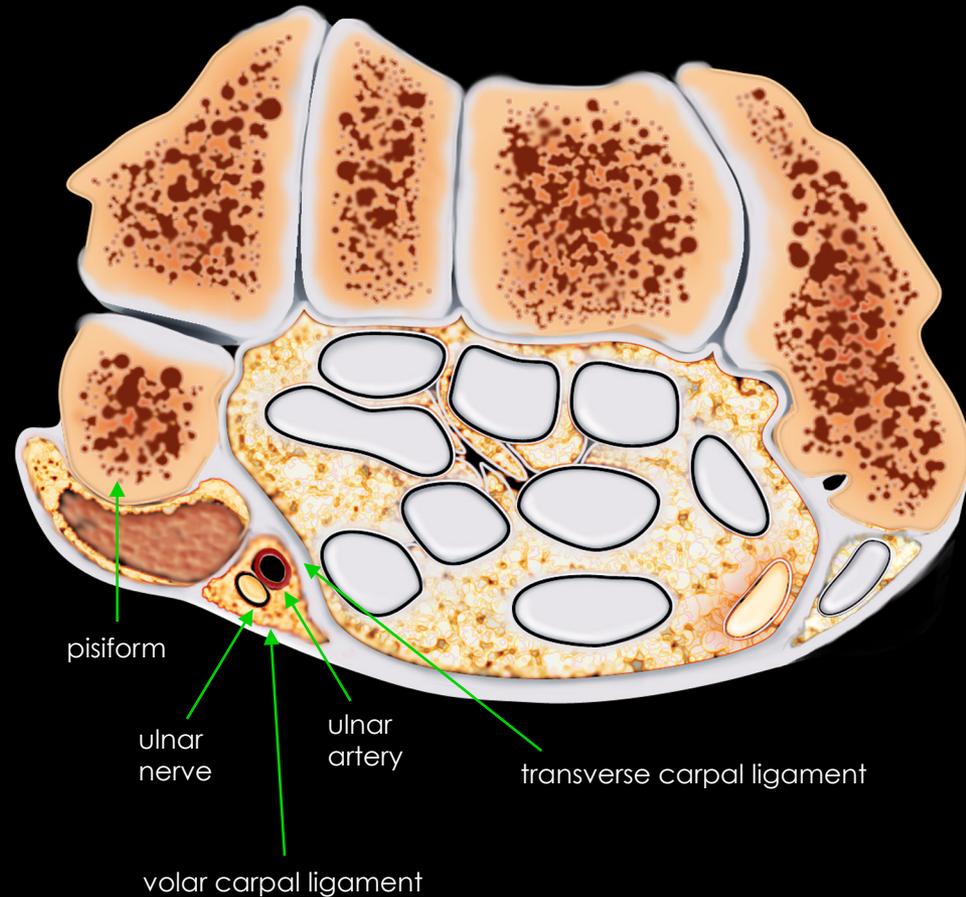
Cubital Tunnel Syndrome

44-year-old patient with prior elbow fracture and new ulnar motor weakness



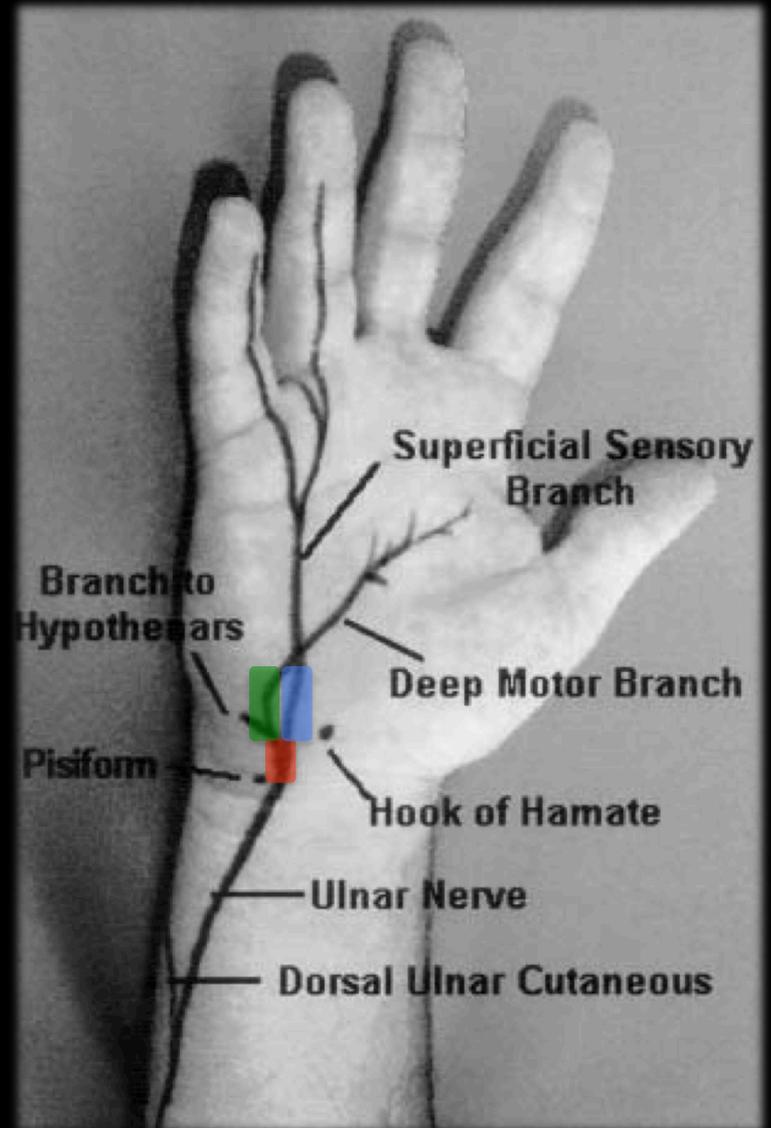
Ulnar Nerve

- forearm
 - deep to flexor carpi ulnaris muscle proximally & lateral to muscle distally
- wrist
 - through Guyon's canal aka pisohamate tunnel
 - pisiform
 - hamate hook
 - flexor retinaculum
 - volar carpal ligament
 - divides
 - superficial sensory branch
 - deep motor branch
 - around hamate hook, posteriorly through hypothenar muscles, crossing deep palm to adductor pollicis muscle



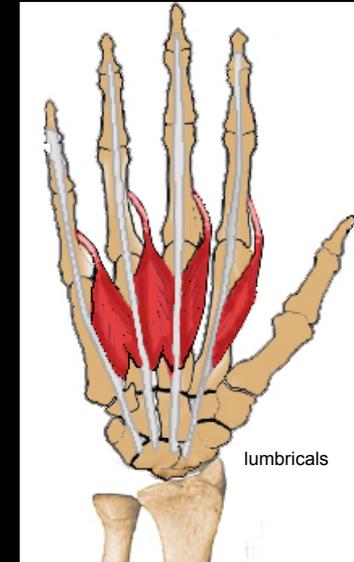
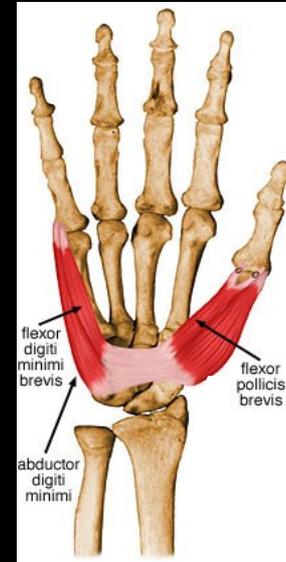
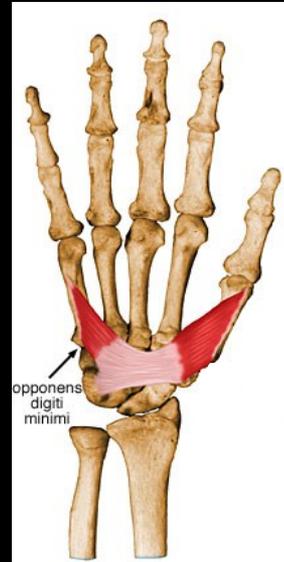
Ulnar Nerve

- zones
 - 1: proximal to bifurcation
 - 2: deep motor branch
 - 3: superficial sensory branch



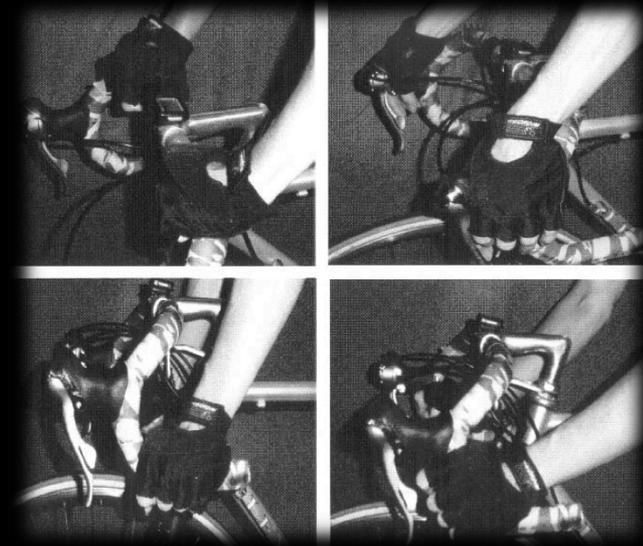
Ulnar Nerve

- muscle supply
 - hypothenar
 - palmaris brevis
 - 3rd & 4th lumbricals
 - interossei
 - palmar
 - dorsal
 - adductor pollicis
 - deep head of flexor pollicis brevis



Ulnar Nerve

- sites of entrapment at wrist
 - Guyon's canal
 - tendinous arch of adductor pollicis muscle
- causes
 - ganglia from pisotriquetral joint
 - chronic repetitive trauma
 - use of tools (hypothenar hammer syndrome)
 - bicycle handlebars (cyclist's palsy)
 - crutches
 - lipoma
 - pisotriquetral osteoarthritis
 - pisiform hamate coalition
 - os hamuli proprium
 - fractures
 - muscle anomalies
 - accessory abductor digiti minimi
 - accessory or reversed palmaris longus
 - hypertrophic flexor carpi ulnaris



Ulnar Nerve

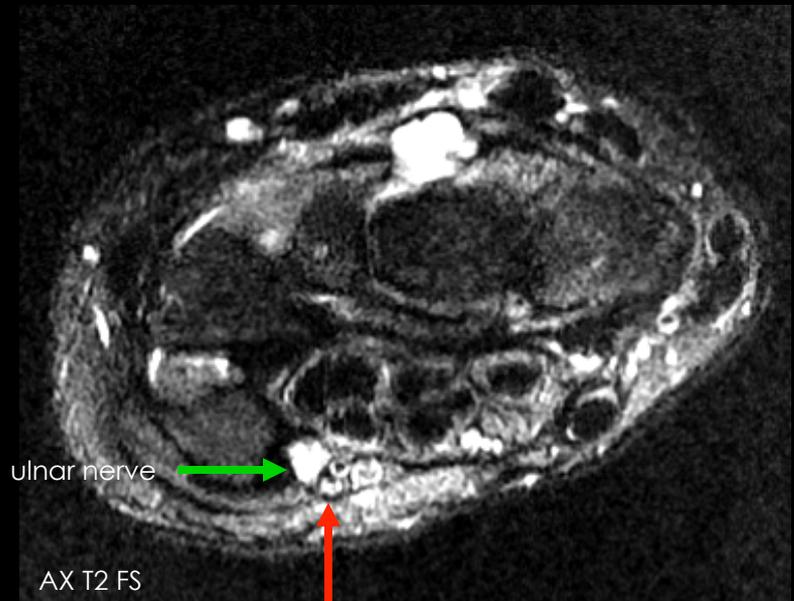
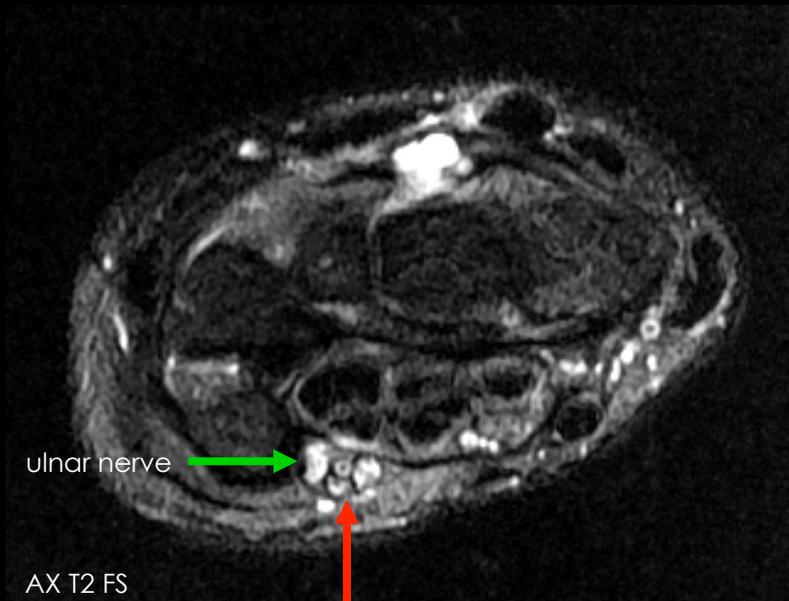
- clinical features
 - depending on site of lesion relative to ulnar nerve bifurcation
 - type 1 syndrome (most common)
 - proximal to or within Guyon's canal
 - » weakness of all ulnar intrinsic hand muscles
 - » sensory loss
 - without dorsal sensory deficit of hand
 - type 2 syndrome
 - deep motor branch in region of hook of hamate
 - » weakness of ulnar intrinsic hand muscles
 - anatomic location determines which muscles
 - » no sensory loss
 - type 3 syndrome
 - superficial sensory branch
 - » sensory loss over volar aspect of the ulnar two fingers
 - » no motor loss

Ulnar Nerve

- MR imaging
 - T1-weighted imaging
 - round, oval hypointense structure in Guyon's canal
 - surrounded by fat
 - 3mm
 - anomalous or accessory muscles or fibrous bands
 - indirect evidence of entrapment
 - muscle edema or atrophy
- US
 - level of pisiform
 - thin, round structure medial to ulnar artery
 - bifurcation into sensory & motor branches
 - ganglia & space occupying lesions

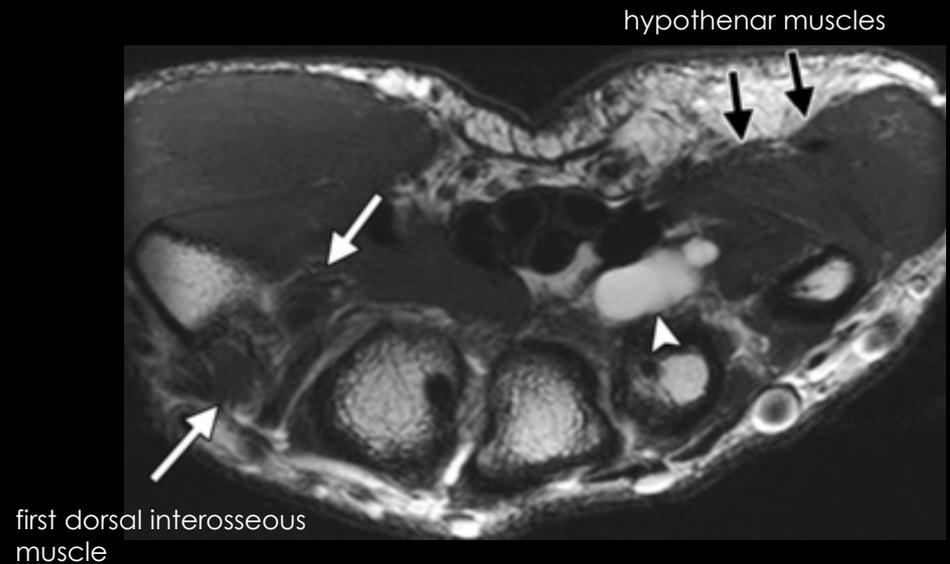
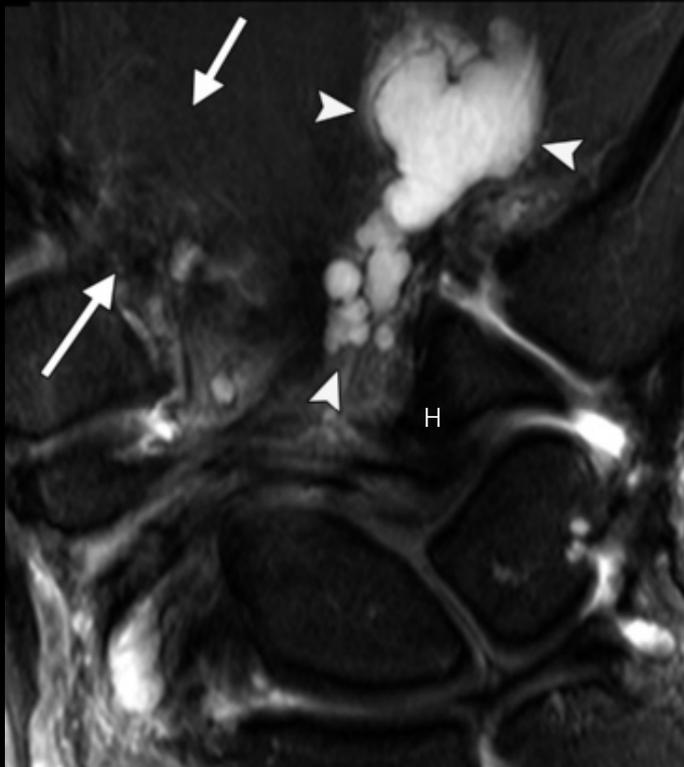
Guyon's Canal Syndrome

29-year-old massage therapist with new onset ulnar dysesthesia and decreased grip strength

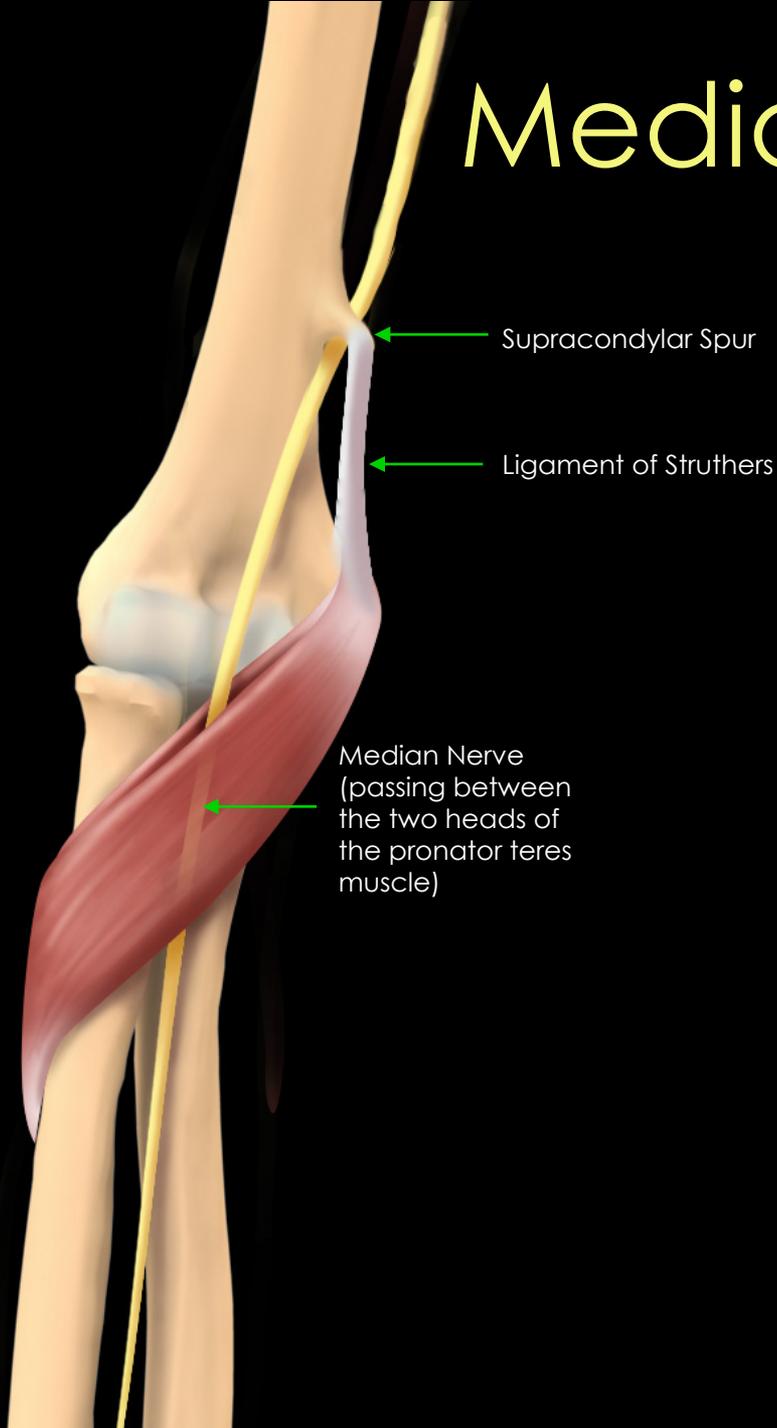


Ganglion Cyst

39-year-old patient with ulnar motor symptoms, without sensory abnormalities and negative US of Guyon's canal



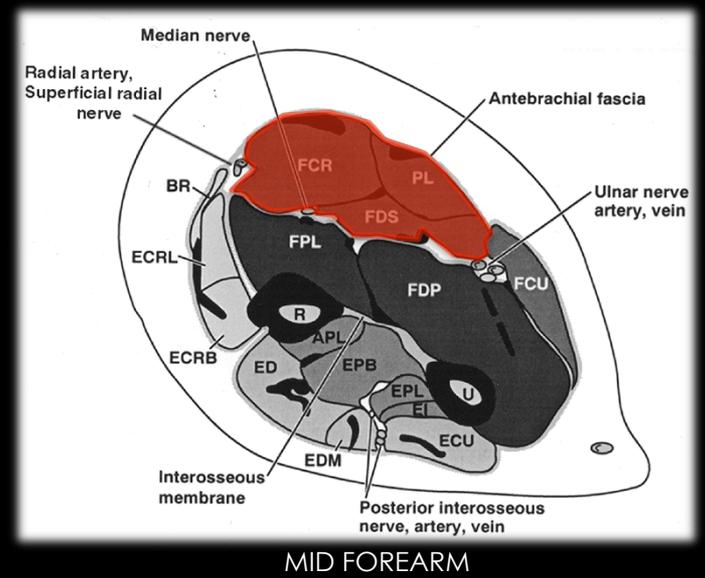
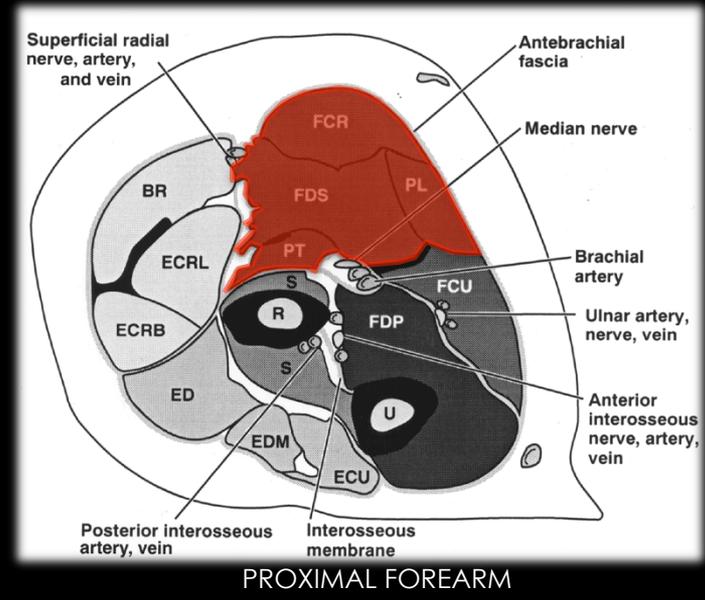
Median Nerve



- medial & lateral cords of brachial plexus
- medial to biceps muscle & deep to bicipital aponeurosis
- between humeral & ulnar heads of pronator teres muscle
- deep to fibrous arch of flexor digitorum superficialis
- anterior interosseous nerve
 - 5cm proximal to medial epicondyle
- Martin-Gruber anastomosis
 - anomalous communication between median or anterior interosseous nerve & ulnar nerve
 - up to 40%

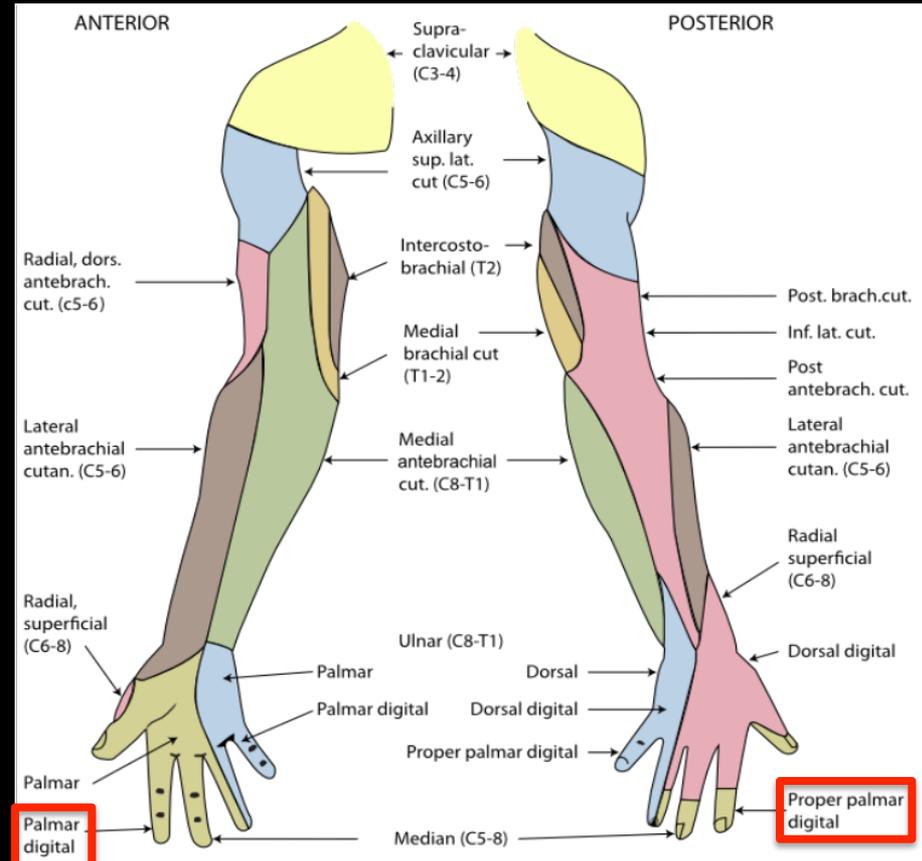
Median Nerve

- muscle supply
 - pronator teres
 - flexor carpi radialis
 - palmaris longus
 - flexor digitorum superficialis
- cutaneous innervation
 - palmar & distal dorsal aspects of 1st, 2nd, 3rd & half of 4th digits



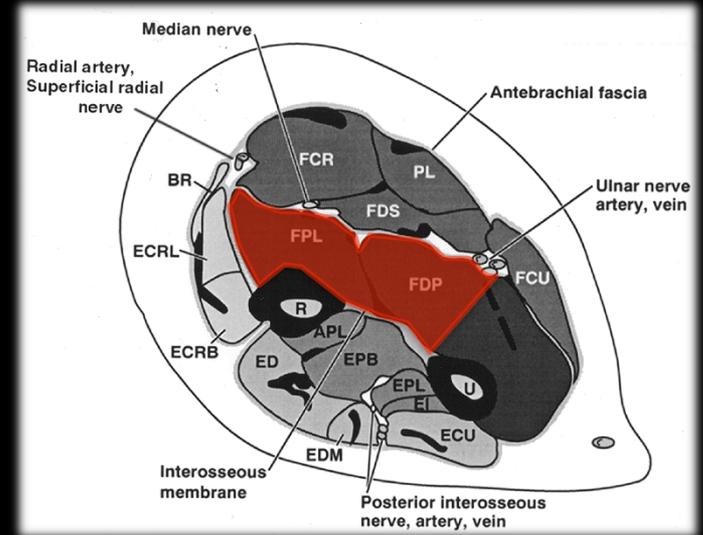
Median Nerve

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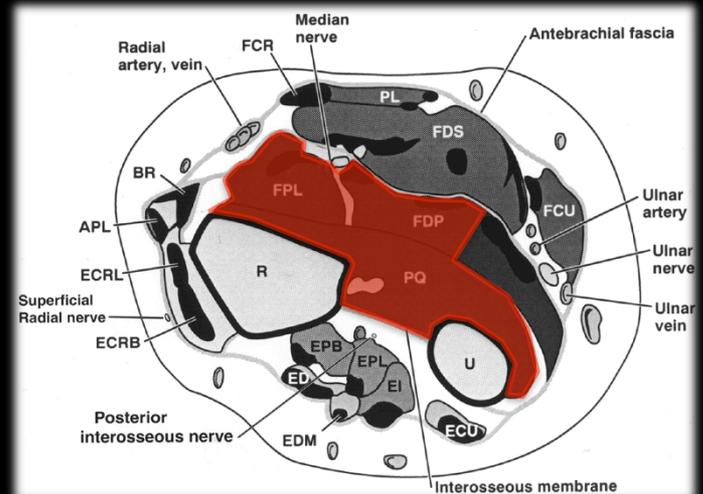


Anterior Interosseous Nerve

- muscle supply
 - flexor digitorum profundus to 2nd & 3rd digits
 - flexor pollicis longus
 - pronator quadratus



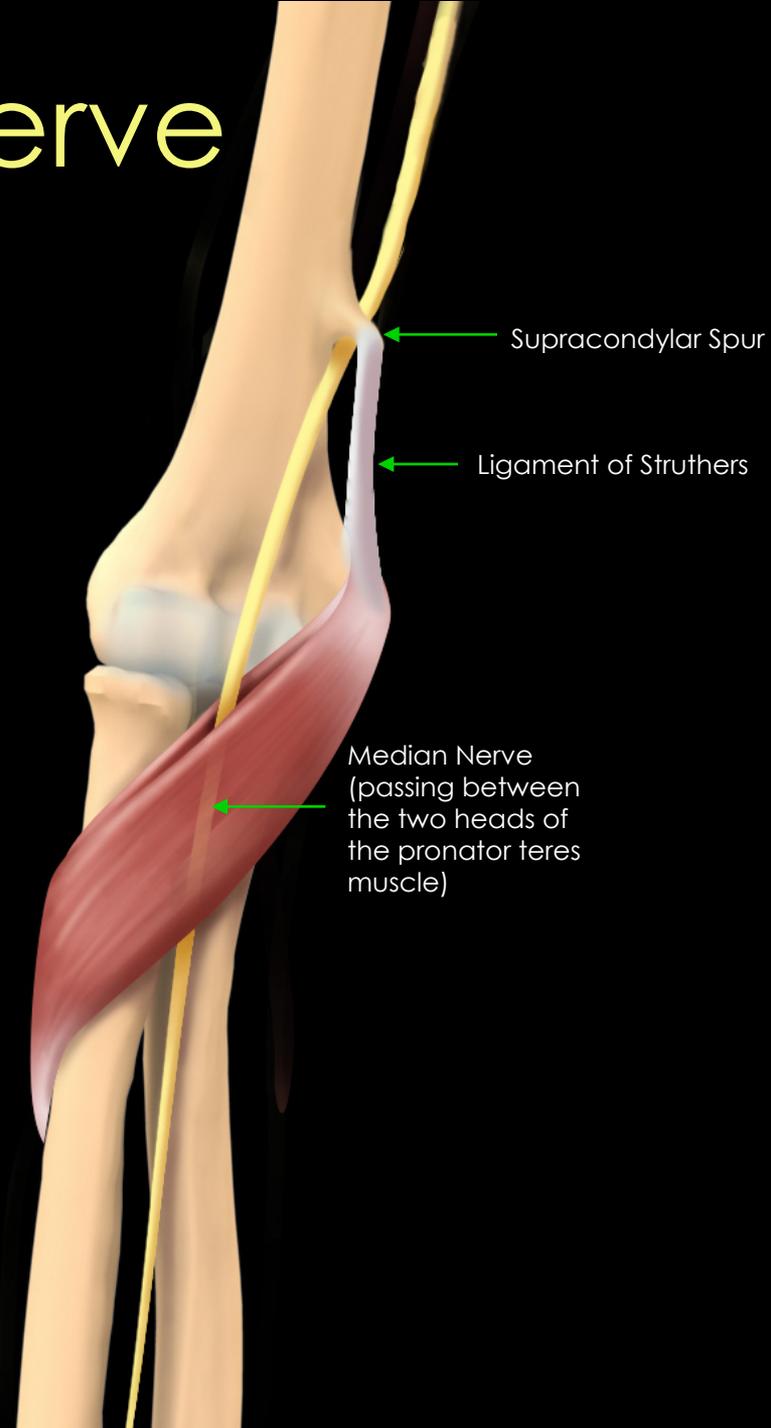
MID FOREARM



DISTAL FOREARM

Median Nerve

- sites of entrapment at elbow
 - supracondylar spur & Struthers ligament
 - between humeral & ulnar heads of pronator teres muscle (pronator syndrome)
 - lacertus fibrosus
 - fibrous arch of flexor digitorum superficialis muscle



Median Nerve

- causes
 - supracondylar fracture
 - elbow dislocation
 - injection injury
 - aberrant median artery
 - crossing branch of radial artery
 - soft tissue mass

Anterior Interosseous Nerve

- causes
 - anterior interosseous nerve syndrome or Kiloh-Nevin syndrome
 - direct trauma
 - compression
 - midshaft radial fracture
 - poorly applied casting
 - repetitive heavy lifting
 - soft tissue mass
 - tendinous origin of pronator teres muscle
 - enlarged bicipital bursa
 - varices
 - anatomical abnormalities
 - Gantzer muscle
 - vascular anomalies

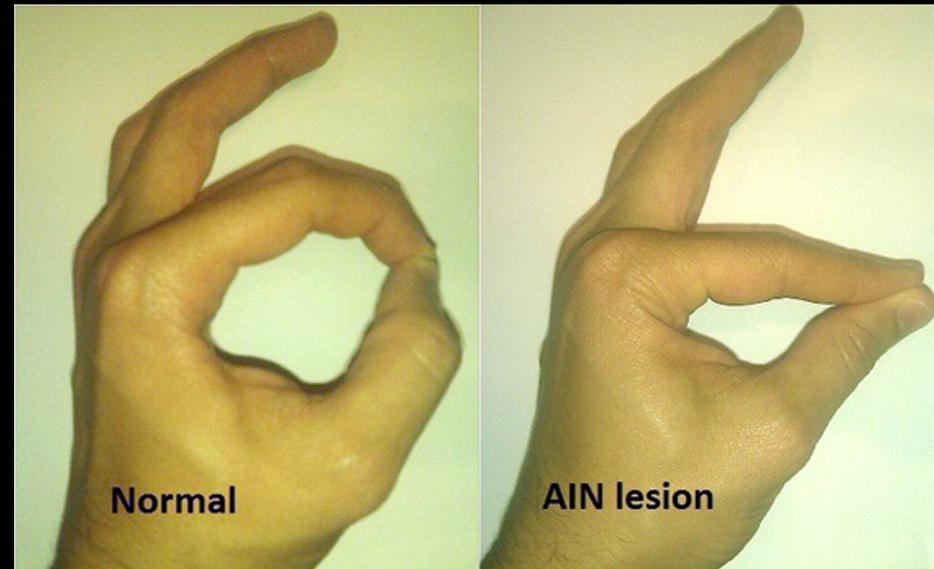
Median Nerve

- clinical features
 - volar forearm pain
 - paresthesia & sensory loss of innervated digits
 - pronator muscle weakness
 - sensory loss over thenar eminence

 - exacerbated by forearm supination & elbow extension
 - pronator syndrome
 - pronator teres muscle is spared

Anterior Interosseous Nerve

- clinical features
 - motor dysfunction
 - flexor pollicis longus
 - flexor digitorum profundus (radial half)
 - pronator quadratus
 - unable to form an O
 - differential diagnosis
 - tendon rupture



Median Nerve

- radiography
 - supracondylar spur
- MR imaging
 - pronator syndrome
 - normal or altered nerve signal intensity
 - denervation pattern (edema & atrophy) is important
 - deeper course of median nerve between brachialis & pronator muscles
 - 17% asymptomatic elbows

Median Nerve

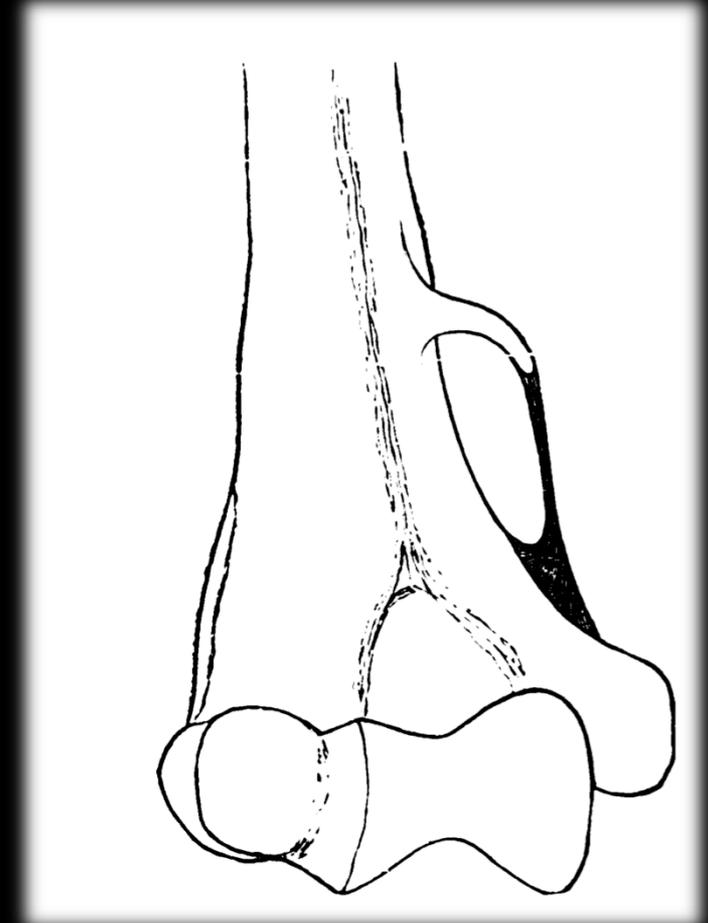
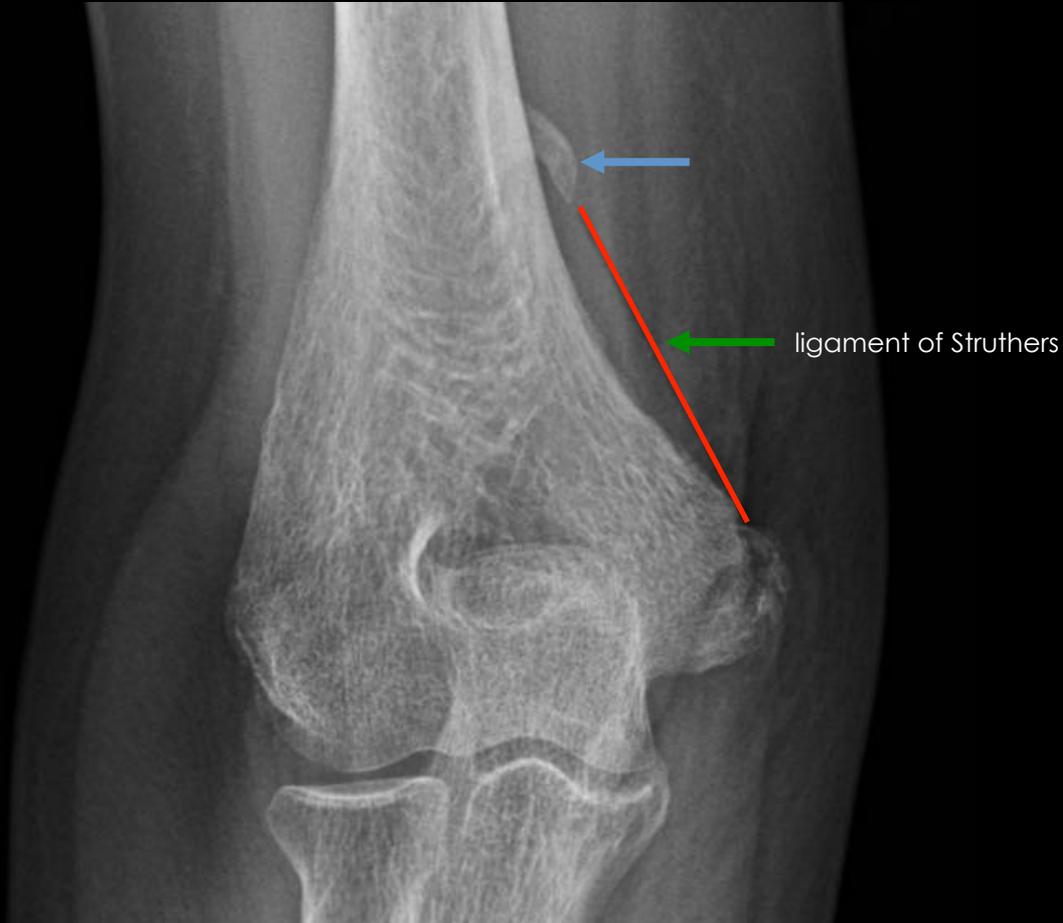
- US
 - dynamic compression deep to bicipital aponeurosis with pronation & supination
 - suspected median nerve laceration

Anterior Interosseous Nerve

- MR imaging
 - muscle edema or atrophy
 - most reliable sign of AIN lesion
 - edema with pronator quadratus muscle
 - edema within non-AIN-innervated muscles
 - flexor carpi radialis
 - flexor digitorum profundus to 3rd & 4th digits

Supracondylar Process

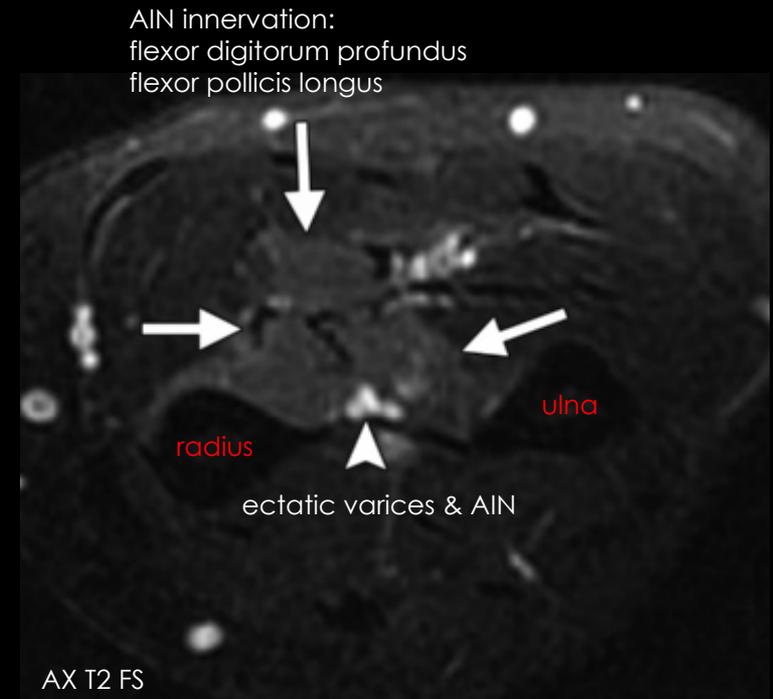
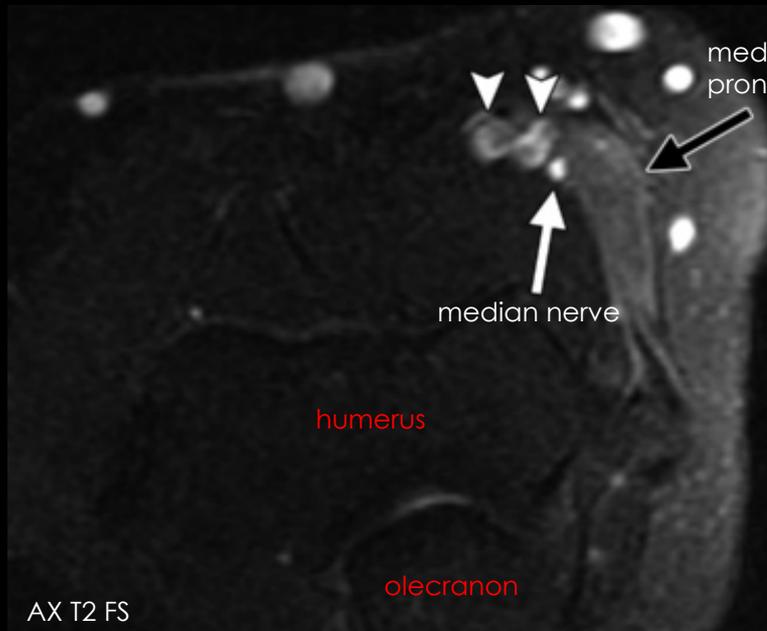
68-year-old patient with vague medial forearm pain



Sir John Struthers (1849)

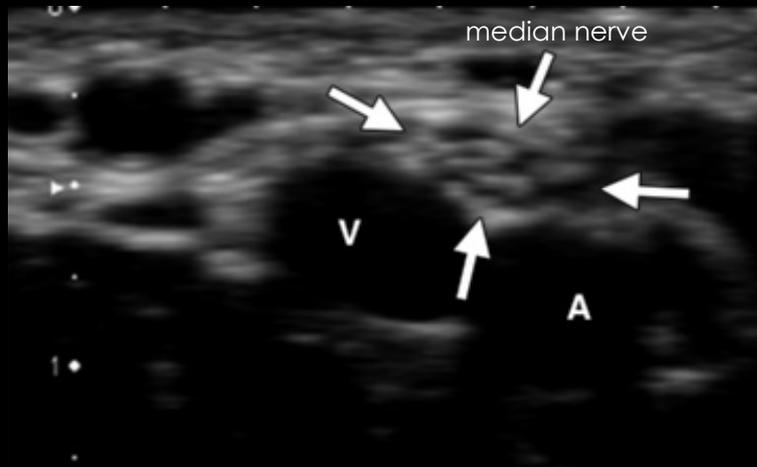
Median Nerve & AIN

48-year-old weight lifter with burning and discomfort in the fingers & clinical exam suggesting AIN injury

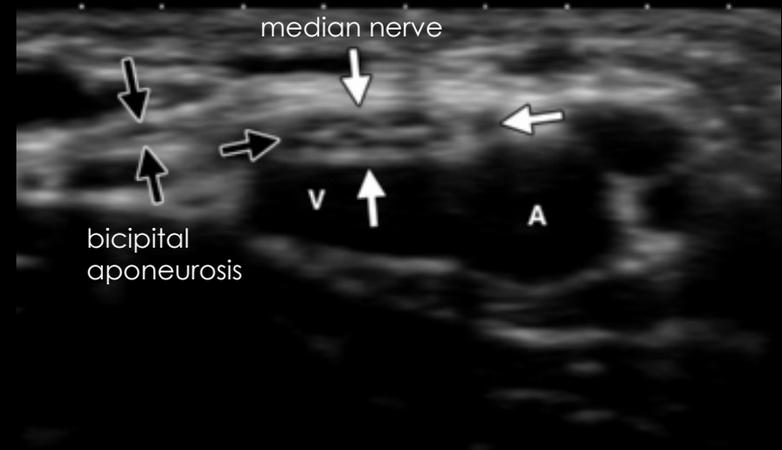


Median Nerve

34-year-old manual labourer with intermittent episode of shooting pain radiating from anterior elbow to wrist, particularly with pronation



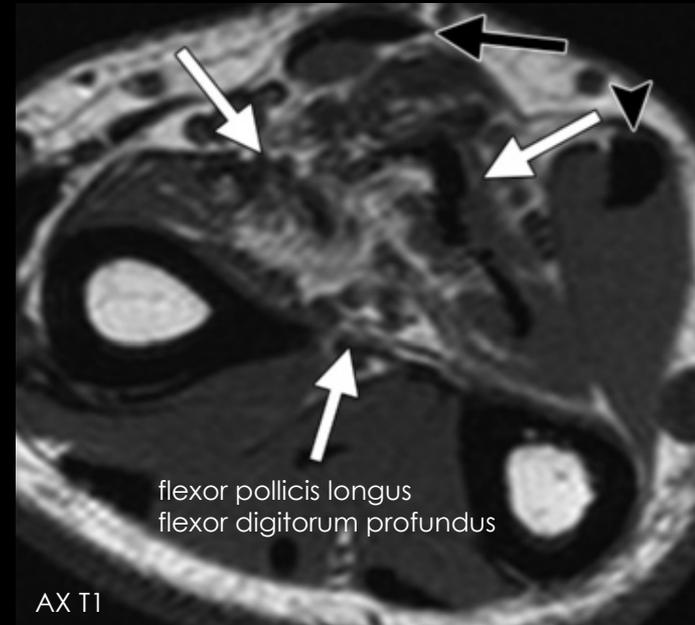
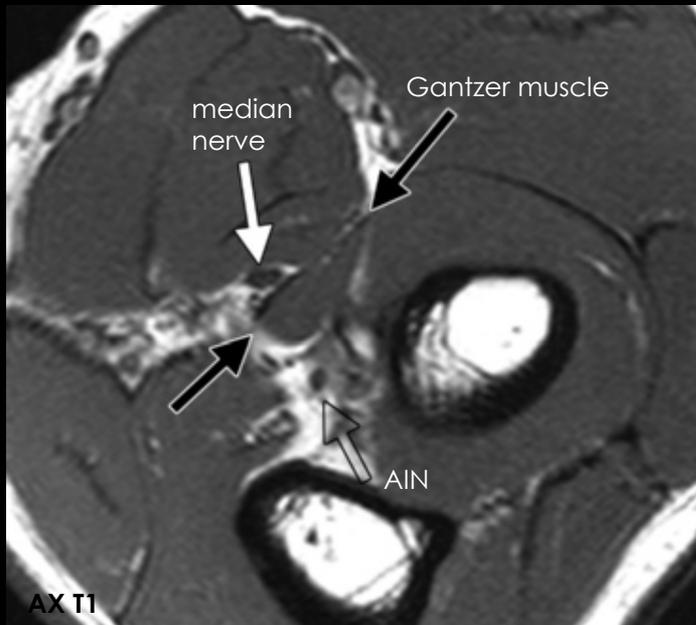
supination



pronation

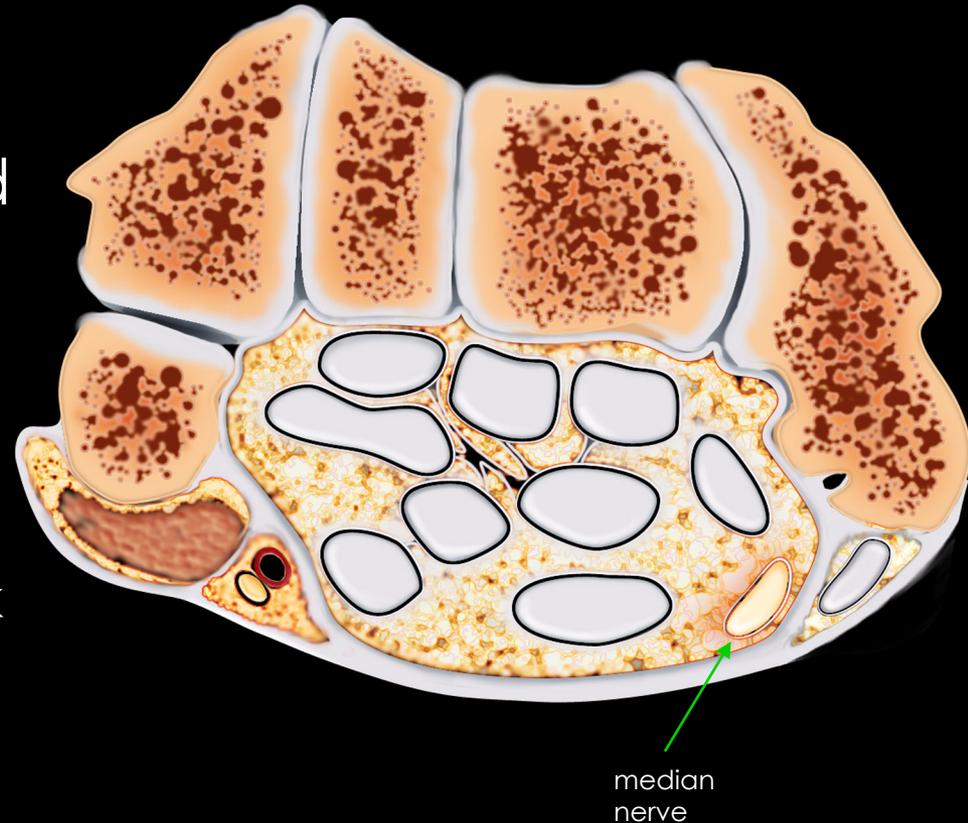
Anterior Interosseous Nerve (Kiloh-Nevin) Syndrome

39-year-old patient with weakness of wrist and forearm musculature



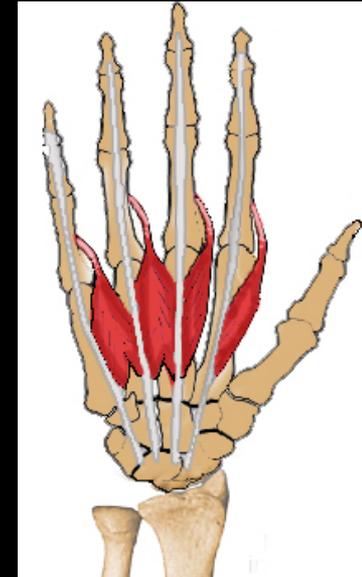
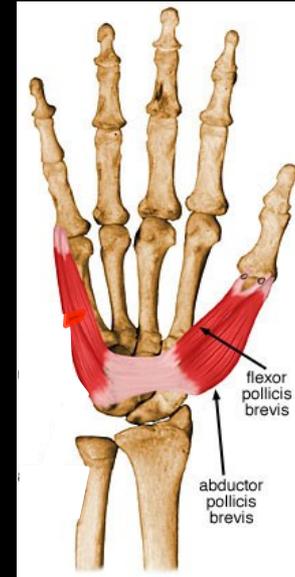
Median Nerve

- carpal tunnel – 6cm
 - carpal bones
 - tubercles of scaphoid & trapezium
 - pisiform & hamate hook
 - flexor retinaculum
 - proximally: thin & slack
 - distally: thick & taut



Median Nerve

- distal to carpal tunnel
 - terminal motor branches
 - opponens pollicis
 - abductor pollicis brevis
 - superficial head of flexor pollicis brevis
 - 1st & 2nd lumbricals
 - 4 terminal sensory branches
 - thumb, index, middle & half of ring fingers

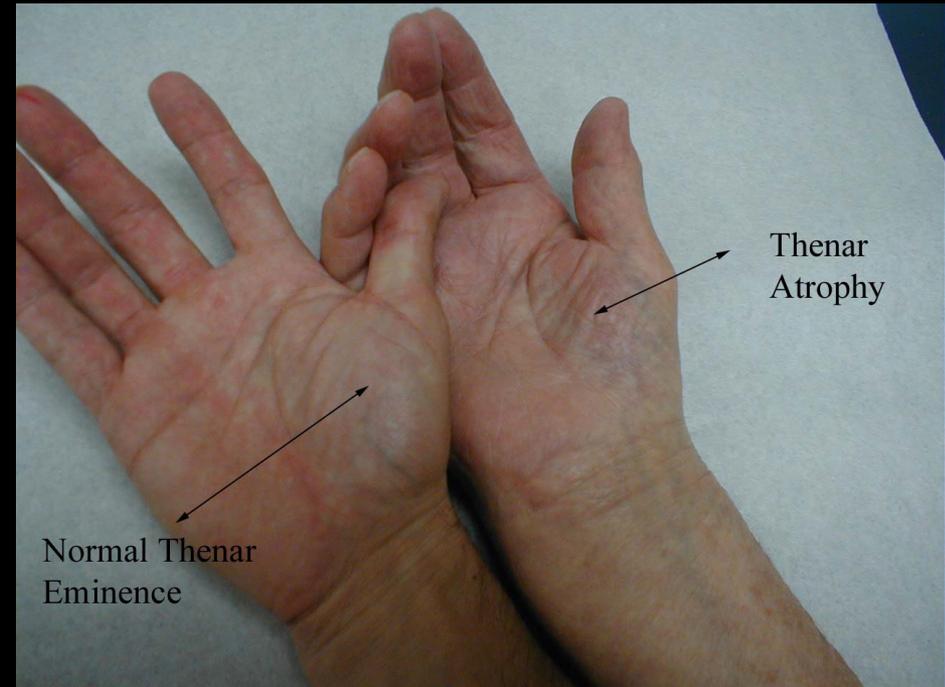


Median Nerve

- sites of entrapment at wrist
 - carpal tunnel
 - recurrent branch of median nerve
 - pierces or wraps around flexor retinaculum
 - metacarpal tunnels
- causes
 - carpal tunnel syndrome
 - middle aged women
 - precise cause is often unknown
 - etiologies
 - diabetes, rheumatoid arthritis, gout, calcium pyrophosphate deposition, amyloid deposition, pregnancy, hypothyroidism
 - mass lesions: ganglia, lipomas, neurofibromas
 - postoperative: incomplete release, granulation tissue

Median Nerve

- clinical features
 - burning wrist pain radiating into fingers
 - paresthesia & numbness in median nerve distribution
 - symptoms worsening at night & exacerbated by repetitive wrist flexion/extension, strenuous gripping or vibration
 - clumsiness of hand
 - thenar eminence atrophy



Median Nerve

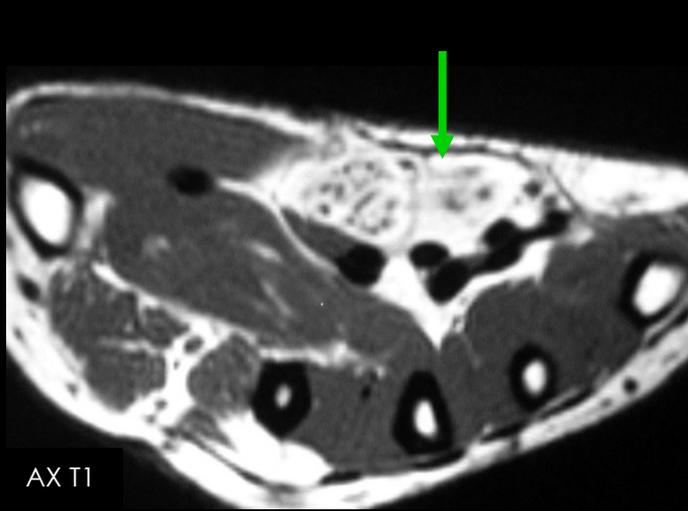
- imaging not required in majority
 - secondary cause
 - doubt about diagnosis
 - atypical presentation
 - recalcitrant symptoms postoperatively
- MR imaging
 - proximal & distal carpal tunnel nerve assessment
 - hyperintensity
 - volar bowing of flexor retinaculum at level of hamate hook (ratio 0.18)
 - increased caliber at level of pisiform
 - flattening at level of hamate hook
 - muscle edema & atrophy
 - chronic or severe
 - isolated recurrent branch at distal carpal tunnel
 - mass lesions
 - pathognomonic fibrolipomatous hamartoma

Median Nerve

- US
 - nerve flattening in distal tunnel
 - palmar bowing of flexor retinaculum
 - reduced nerve echogenicity & loss of normal fascicular pattern
 - nerve swelling & intraneural hypervascularity
 - good predictors
 - useful
 - tenosynovitis
 - ganglia
 - anomalous muscles

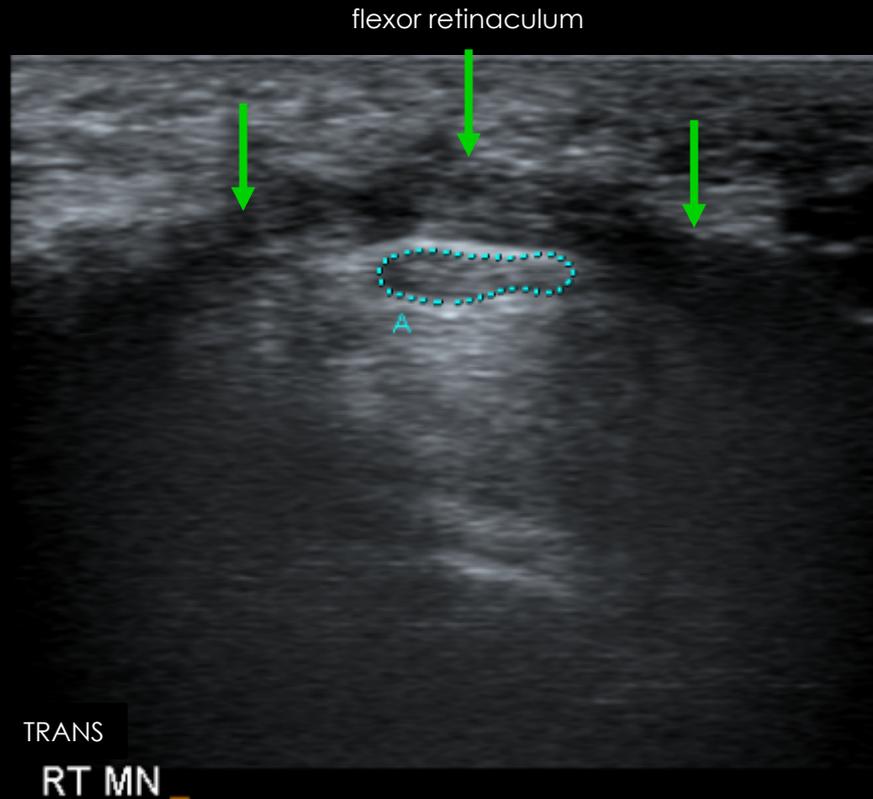
Fibrolipomatous Hamartoma

Patient with symptoms of carpal tunnel and bulkiness and swelling at the volar aspect of wrist



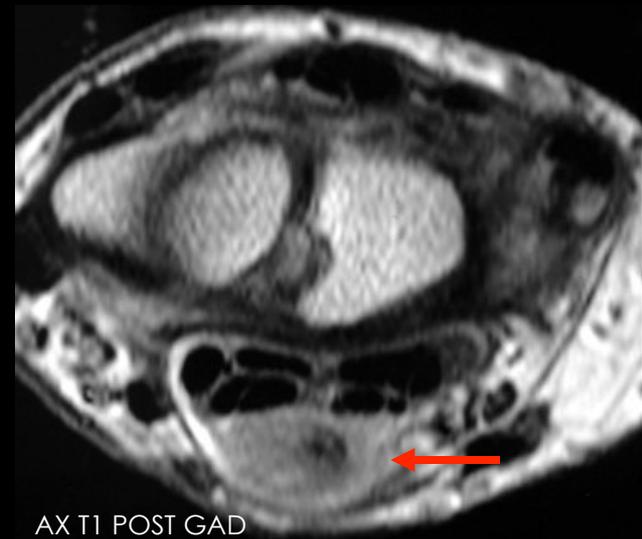
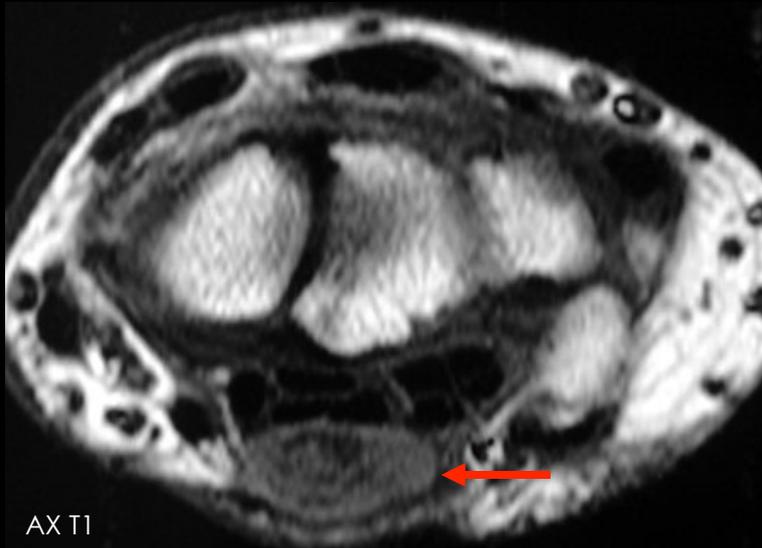
Carpal Tunnel Syndrome

42-year-old patient with prior carpal tunnel release and persistent median nerve symptoms



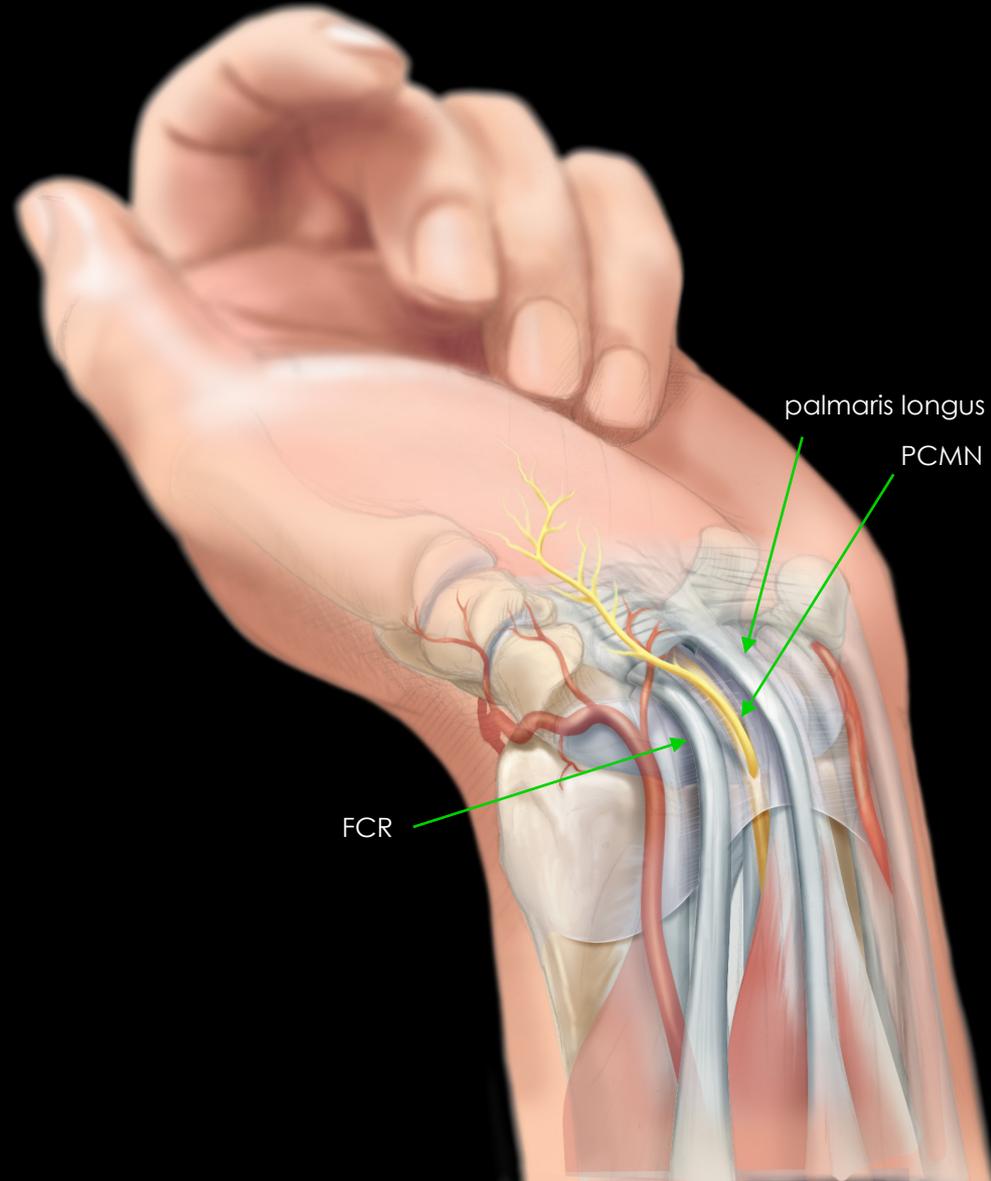
Median Nerve Sarcoma

57-year-old patient with 2 year history of soft, fluctuant mass at volar aspect of wrist, concerning for CTS due to ganglion cyst



Palmar Cutaneous Branch of Median Nerve

- final collateral branch from radial aspect of median nerve in distal forearm
- with median nerve between palmaris longus & flexor carpi radialis tendons
- “palmar cutaneous branch of median nerve tunnel”
 - 1.5cm proximal to wrist
 - 8mm fascial passage between superficial & deep layers of distal antebrachial fascia
 - supplies skin overlying thenar eminence



Palmar Cutaneous Branch of Median Nerve

- causes
 - ganglia of flexor carpi radialis tendon
 - antebrachial fascia
 - atypical palmaris longus muscle
 - entrapment concomitant with carpal tunnel syndrome
 - direct trauma
 - accidental
 - iatrogenic
 - resection of ganglia
 - carpal tunnel release
 - » erroneous skin incisions

Palmar Cutaneous Branch of Median Nerve

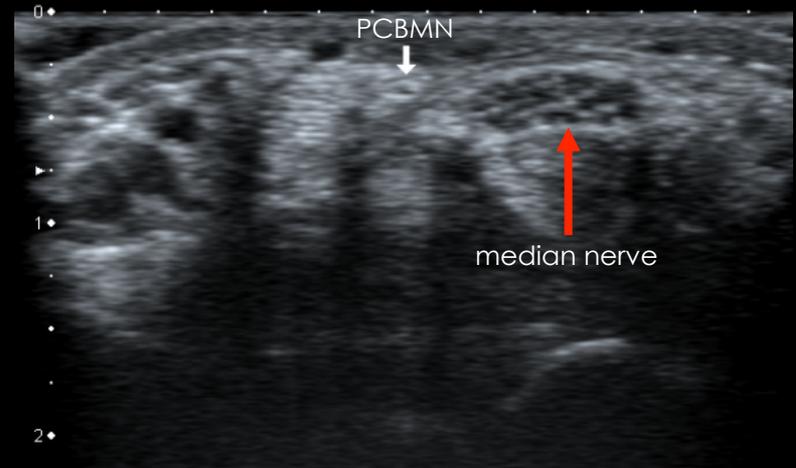
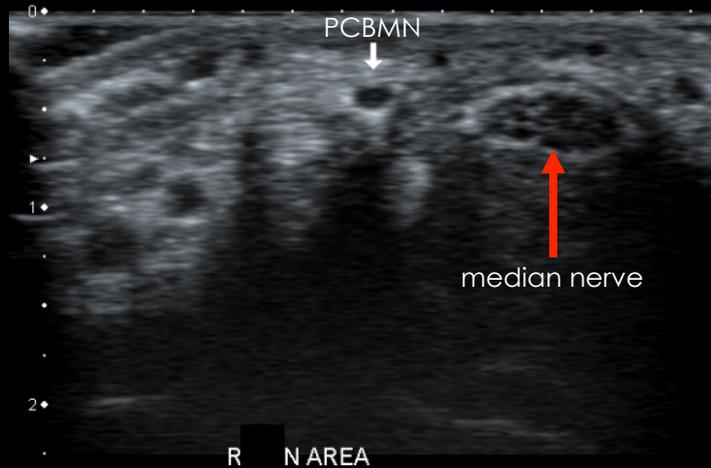
- clinical features
 - overlying thenar eminence
 - new onset of painful discharges
 - sensory loss
 - local numbness
 - hyperesthesia
 - similar to sensory distribution of the median nerve

Palmar Cutaneous Branch of Median Nerve

- US
 - identify nerve in up to 83%
 - focal hypoechoic swelling
 - neuroma due to transection

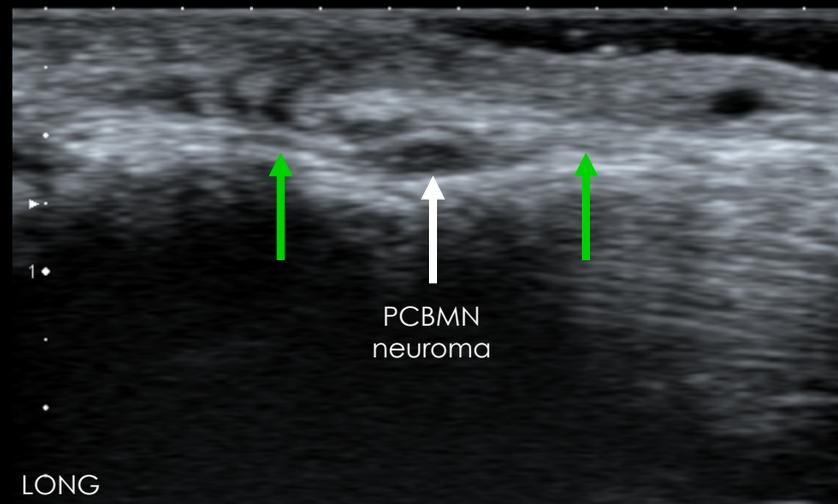
Palmar Cutaneous Branch of Median Nerve

49-year-old patient history of wrist laceration, retracted tear of palmaris longus and persistent hyperesthesia in region of laceration



carpal tunnel distally

carpal tunnel proximally



Summary

- numerous peripheral neuropathies affect the upper limb
- diagnostic mainstay
 - clinical examination
 - electrophysiologic studies
- MR imaging & US
 - useful spatial information
 - narrow differential diagnosis
 - guide treatment
 - valuable in complex cases with discrepant nerve function tests
- awareness of clinical features, relevant anatomy & most common sites & causes of entrapment
 - choice of diagnostic test
 - syndrome identification
 - appropriate case management

Imaging of Peripheral Neuropathies

Involvement of the Upper Limb

Thursday, February 2, 2012

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University of California, San Diego