



# MSK Imaging Conference

07/22/2016

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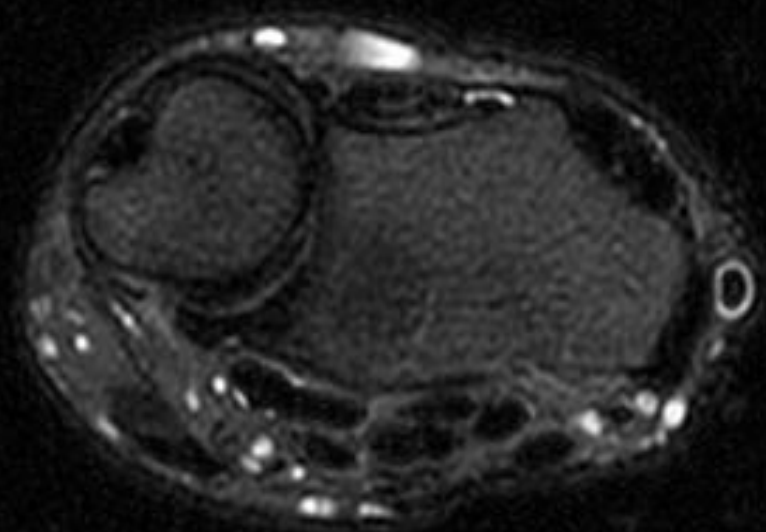
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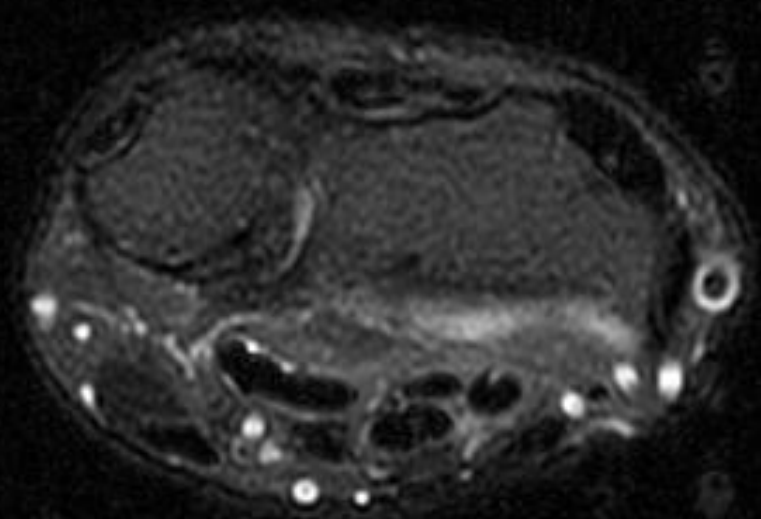
UCSD Radiology

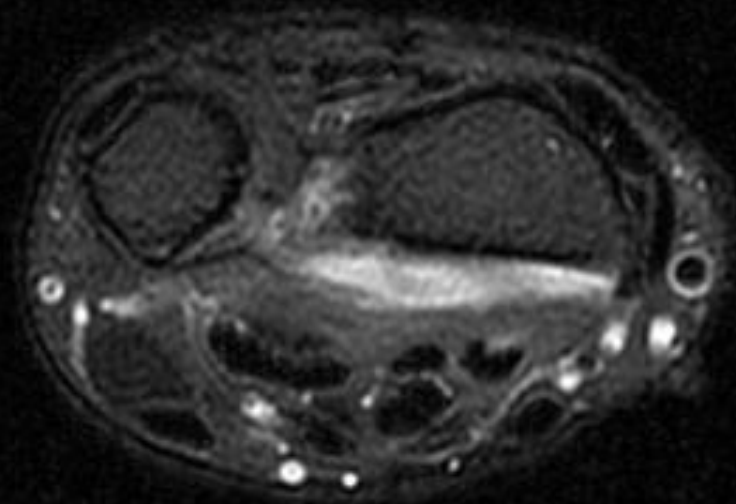
- A 51 years old female with chronic thumb pain, and inability to actively flex the thumb interphalangeal joint
- Possible trigger thumb versus rupture of the flexor pollicis longus tendon
- Possible left elbow epicondylitis
- Additional history:
  - Work related injury on 12/05/2015 (approximately 6 months ago)

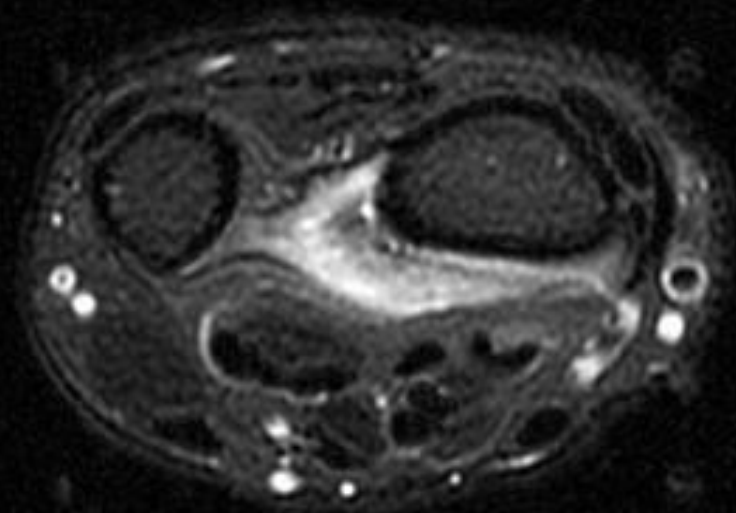
# Examinations obtained:

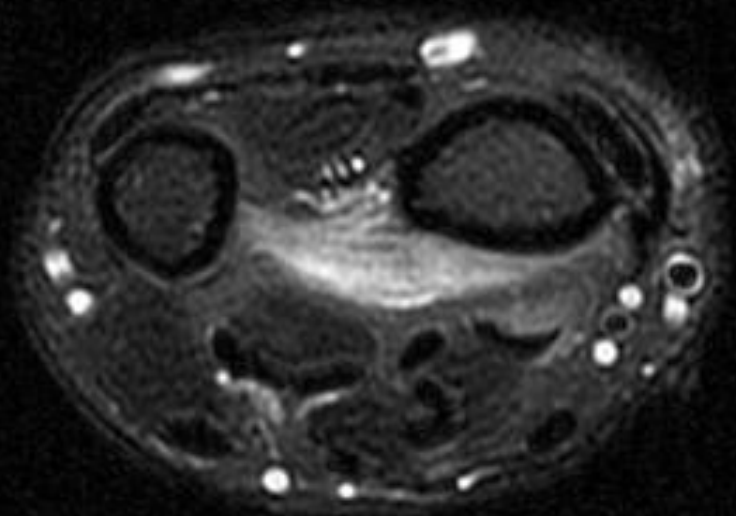
- MRI of the left forearm without contrast
- MRI of the left thumb without contrast



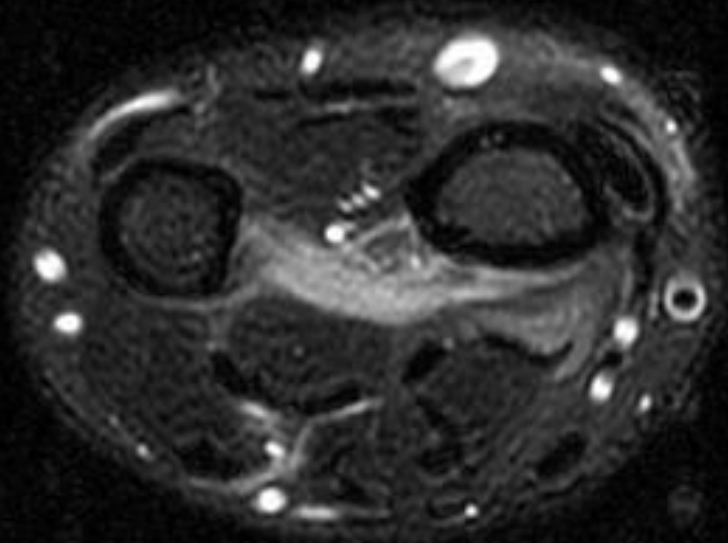


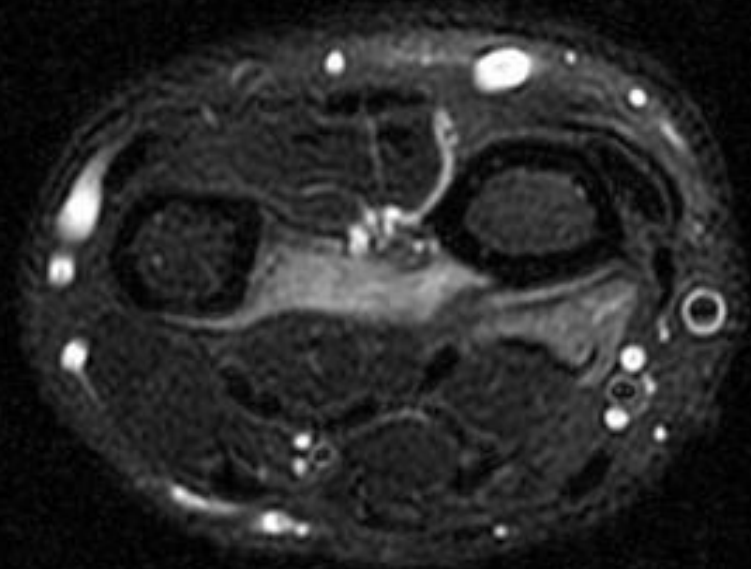


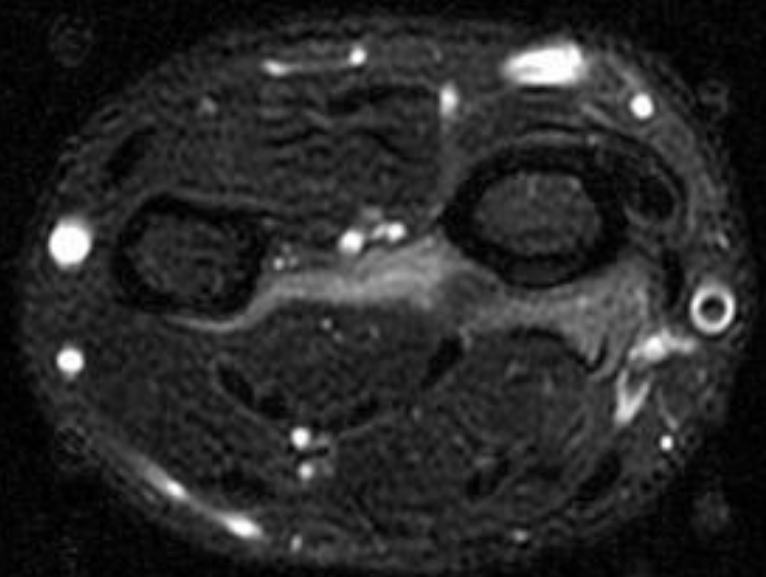


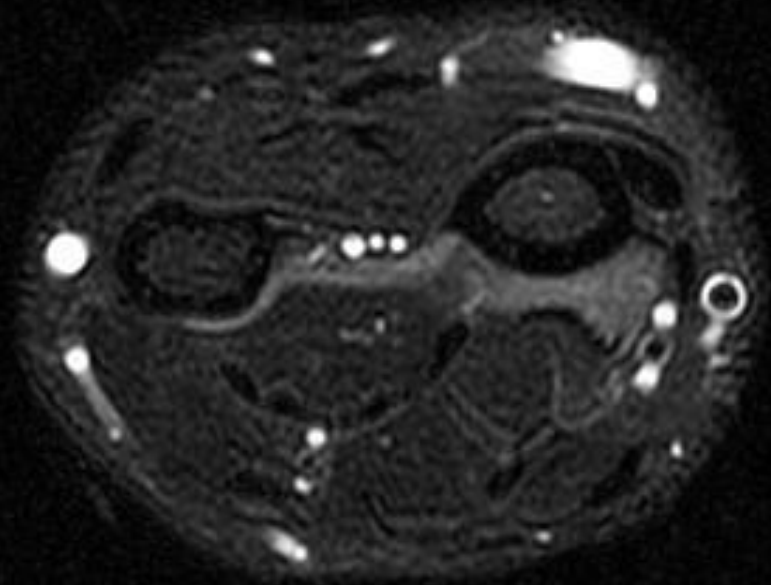


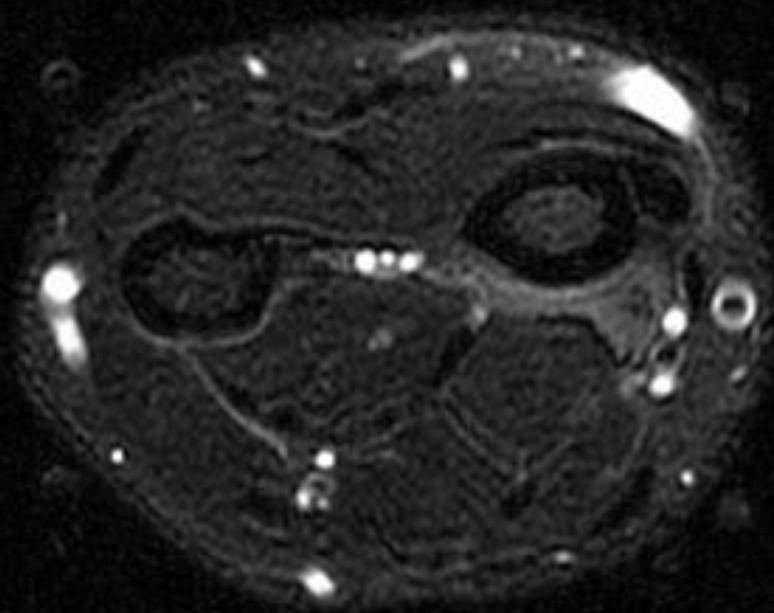


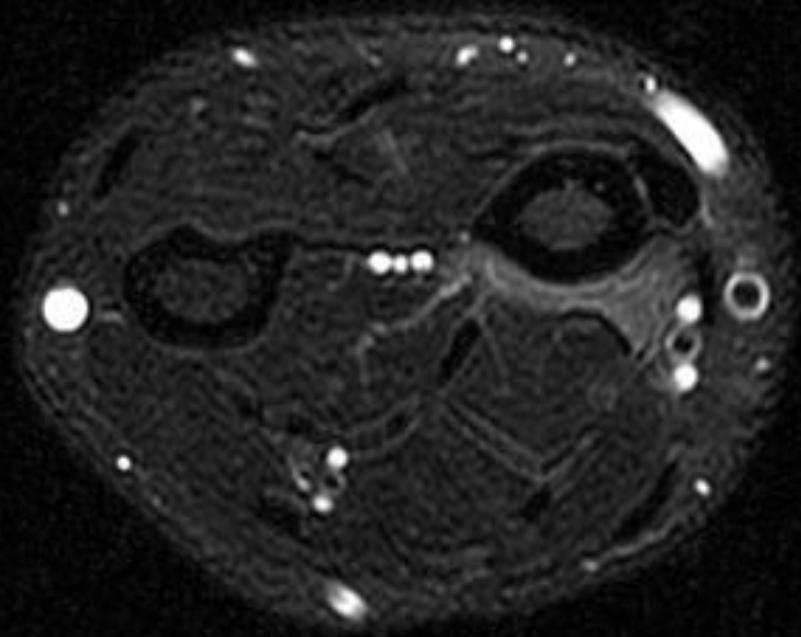


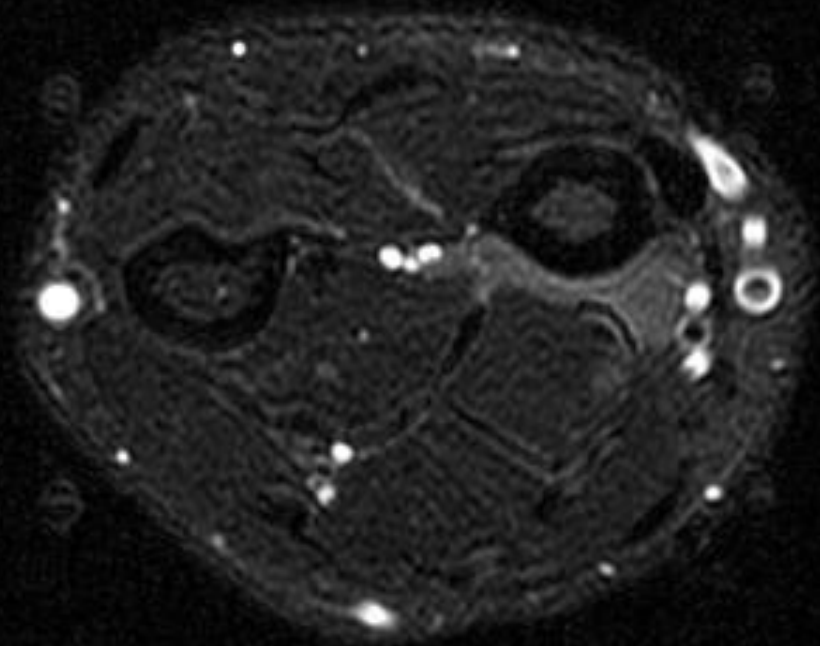




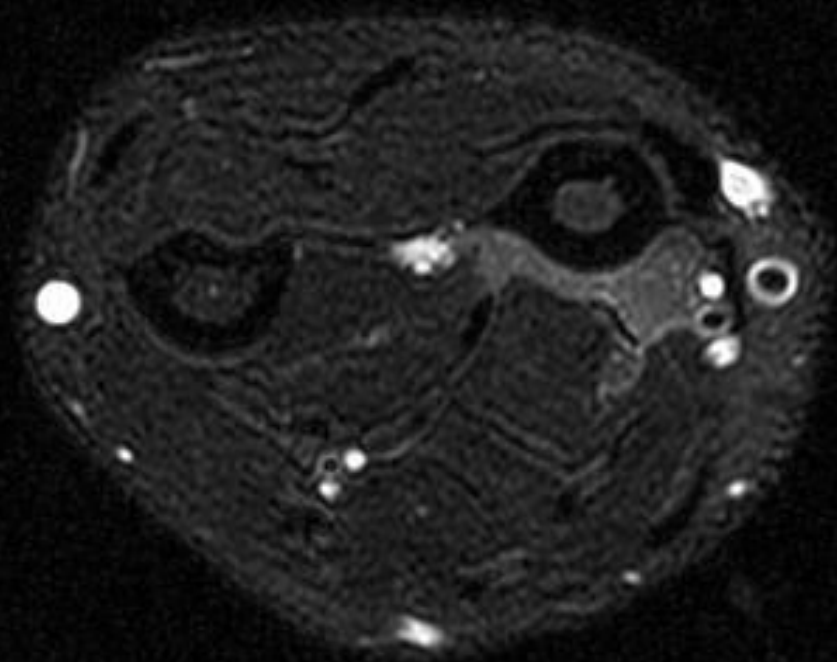




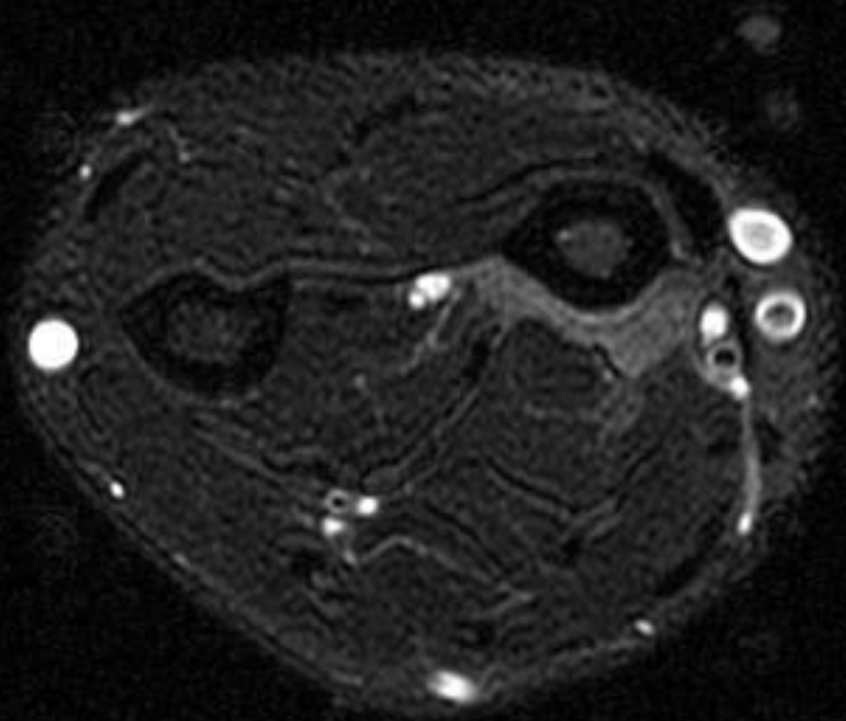


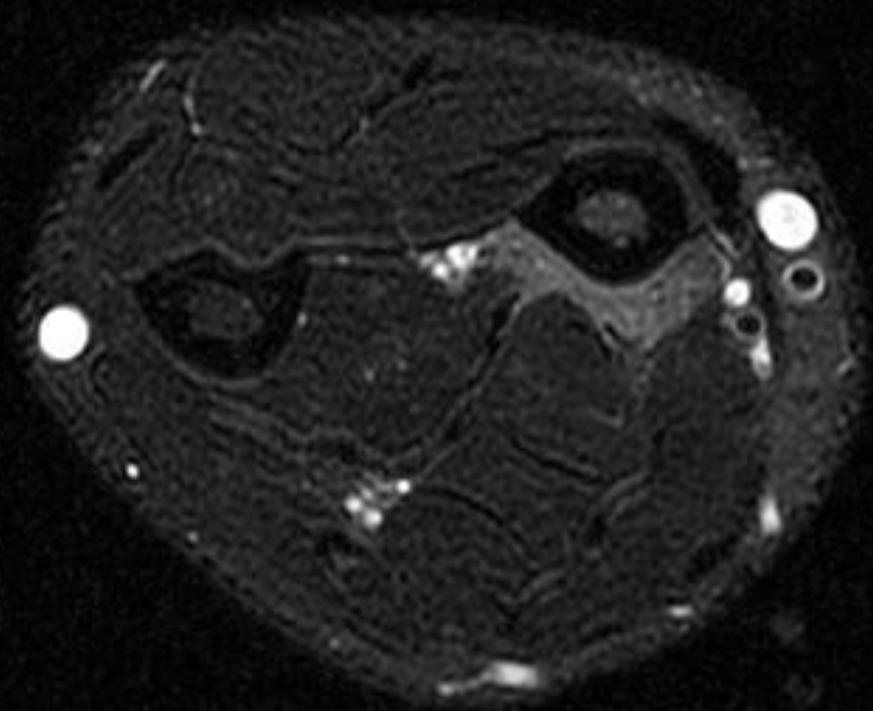


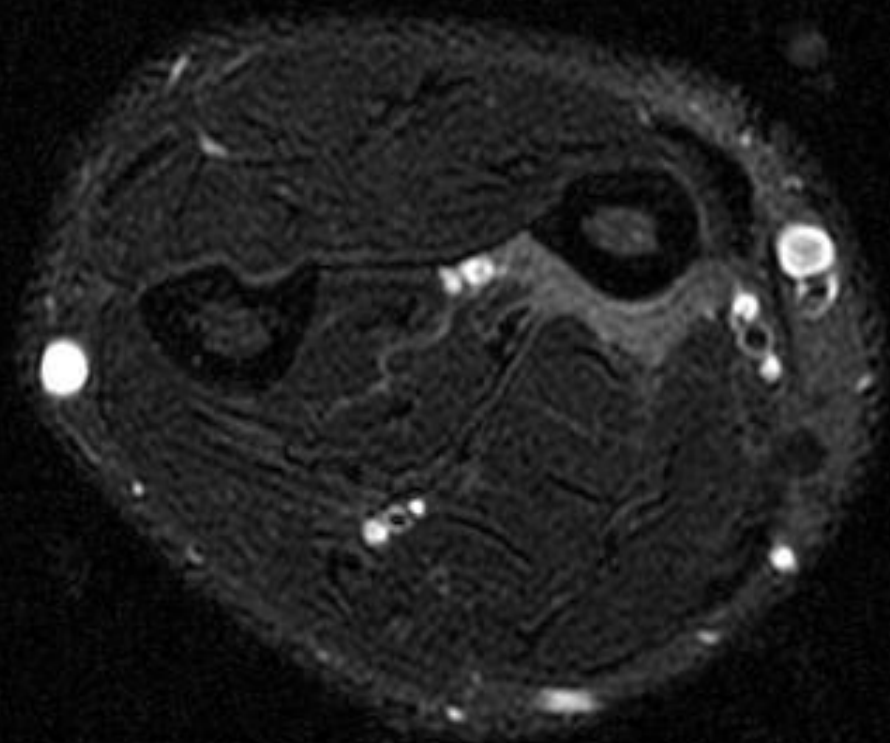


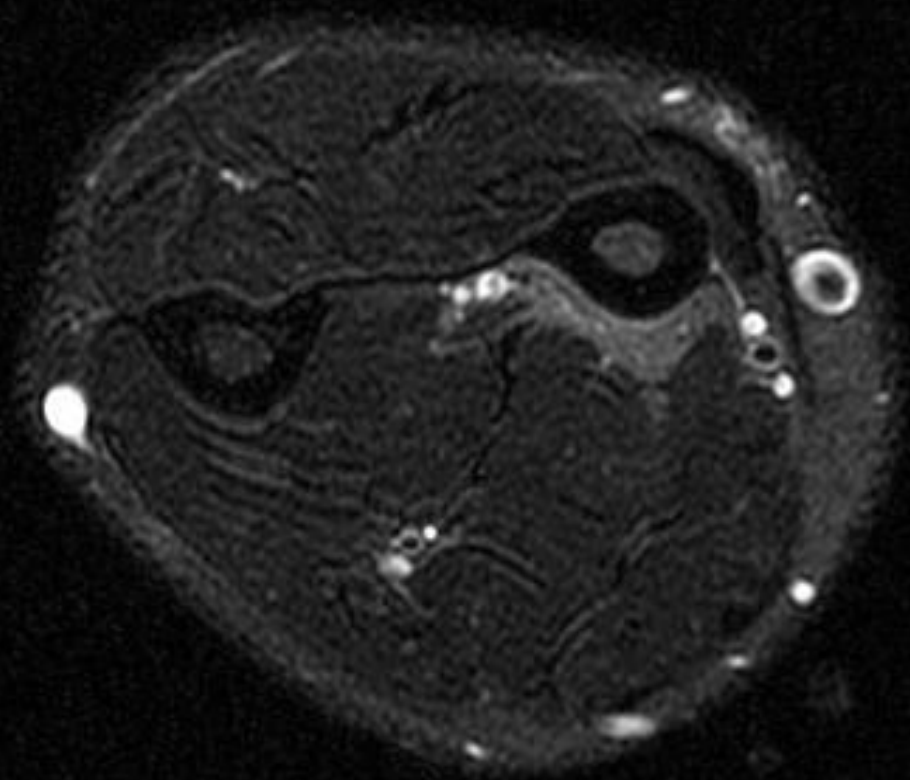


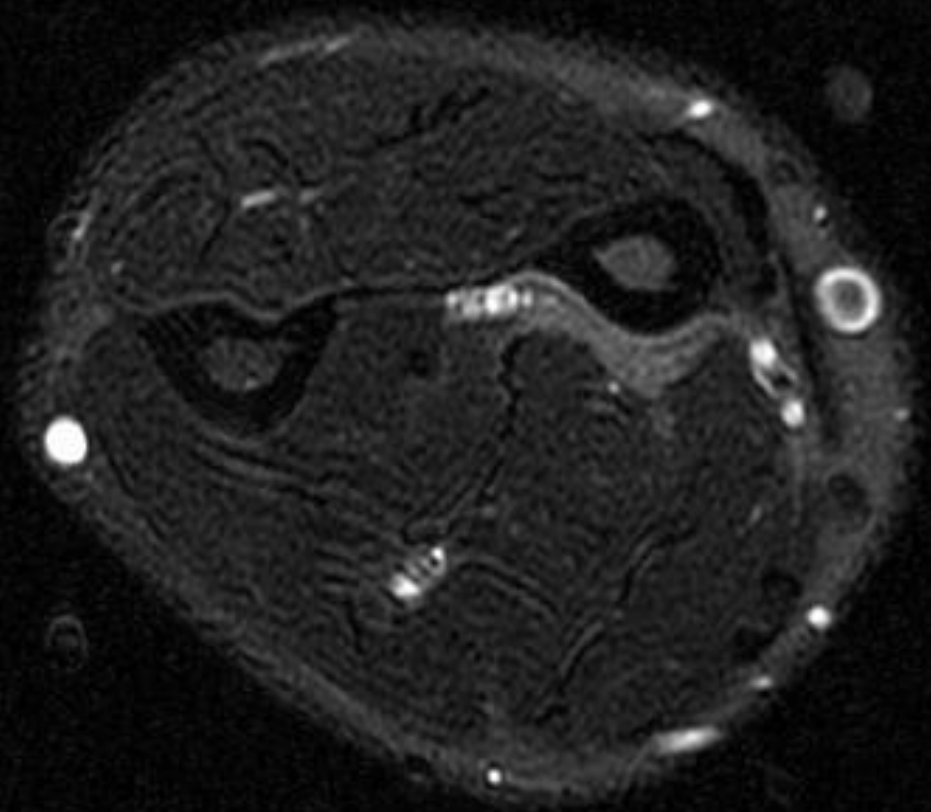


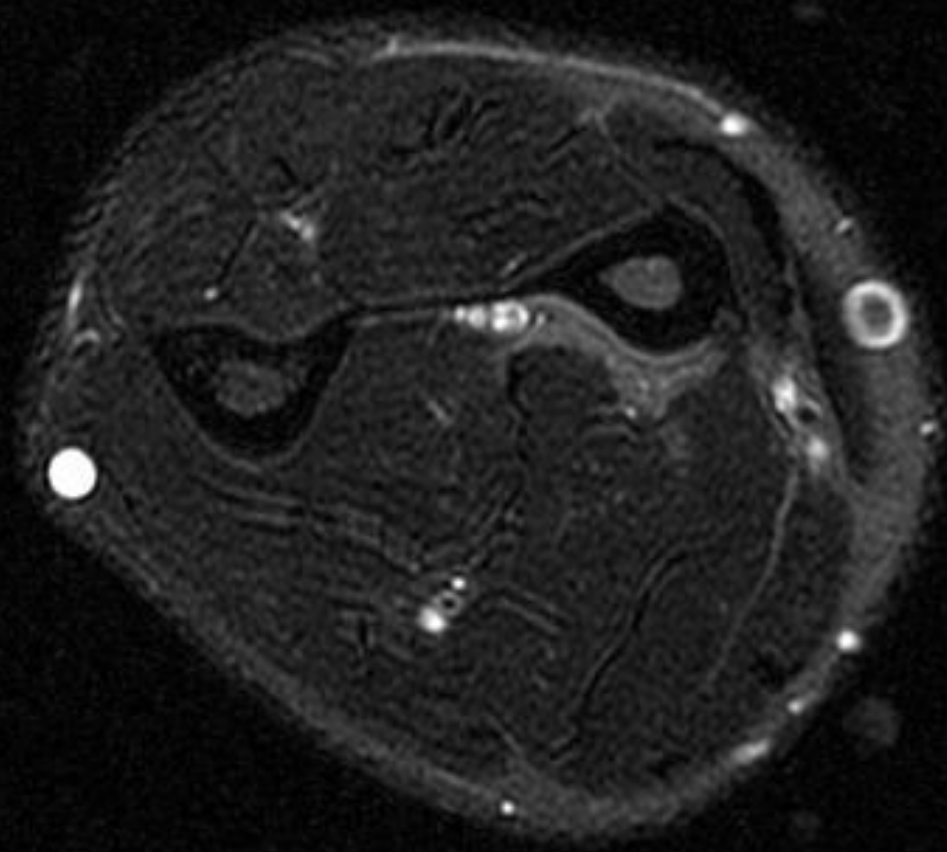


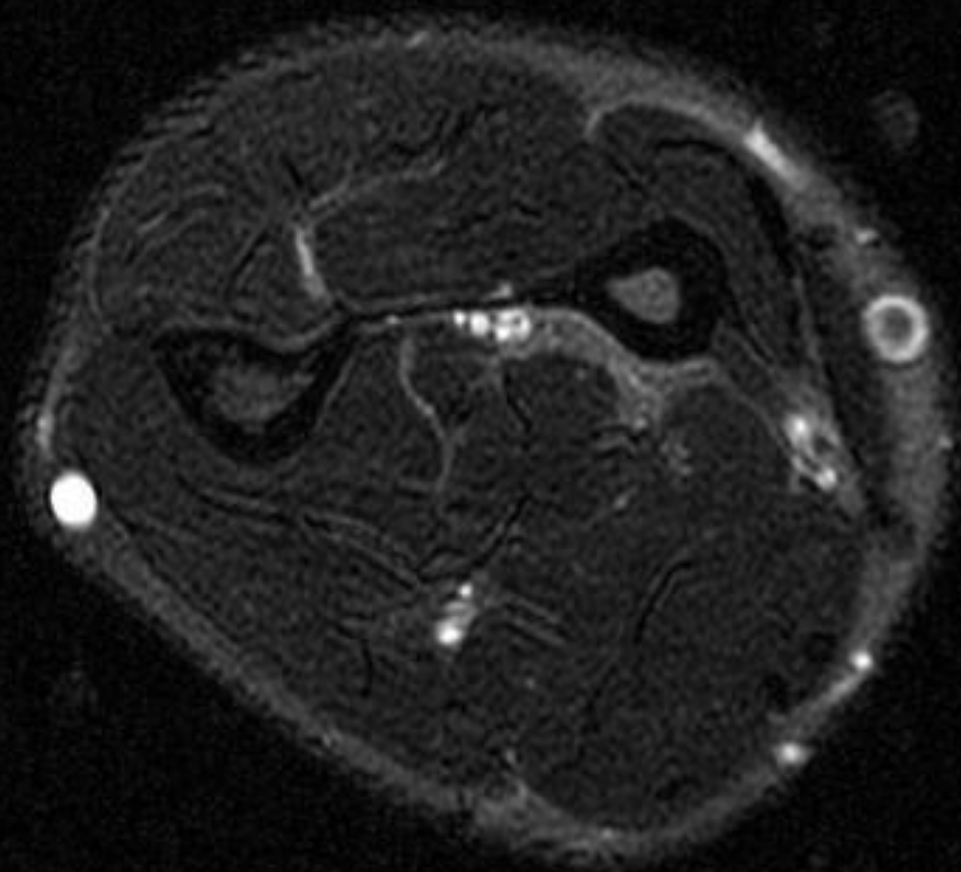




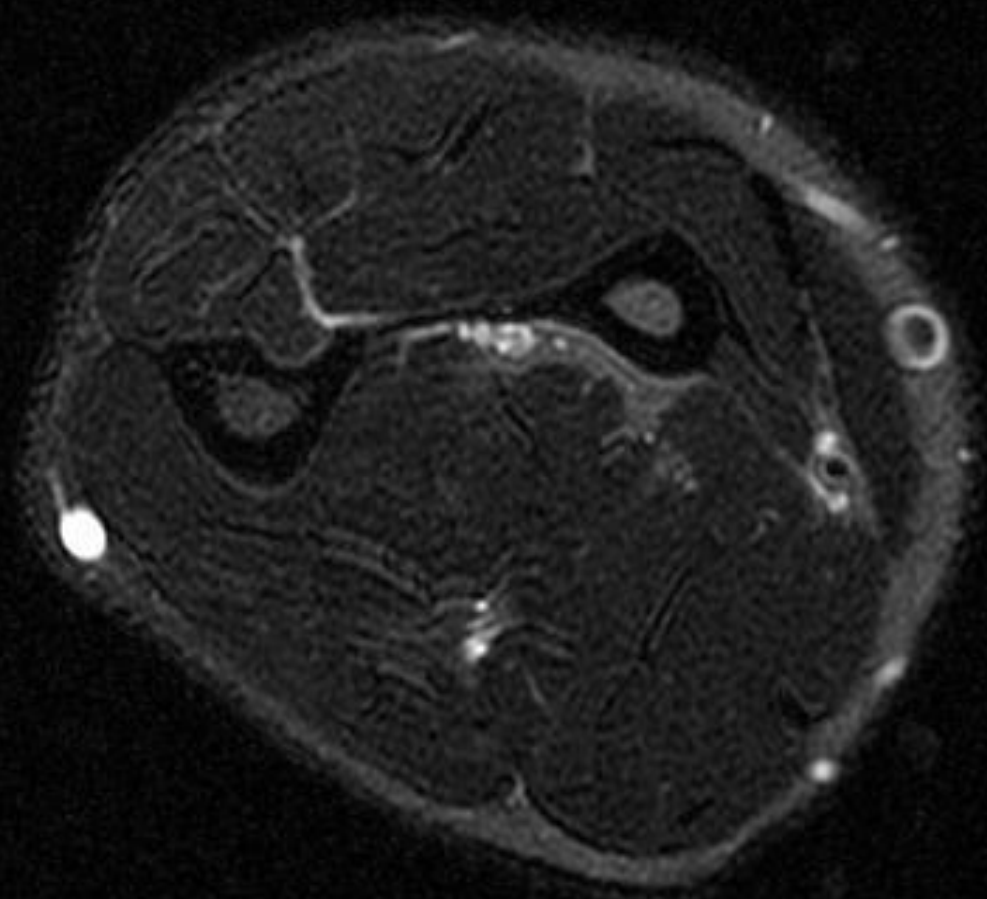




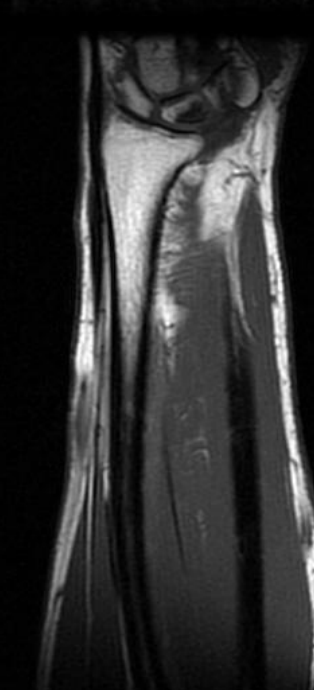
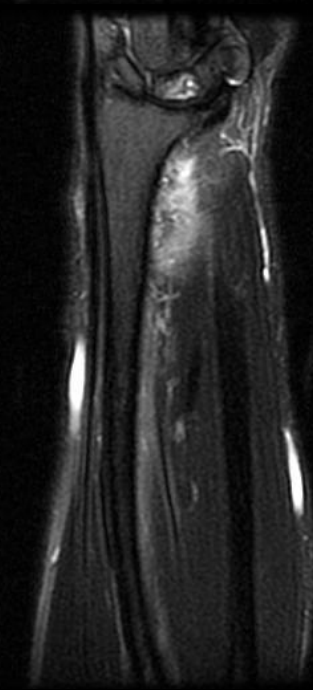
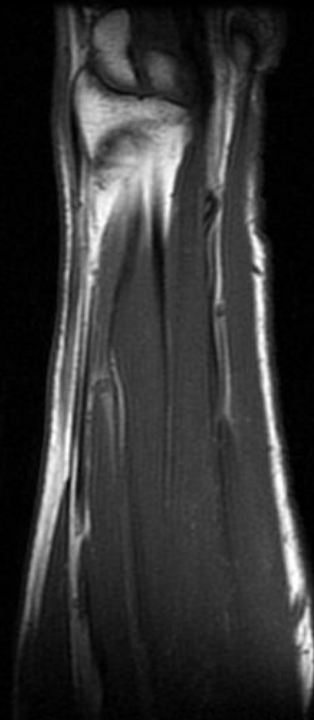
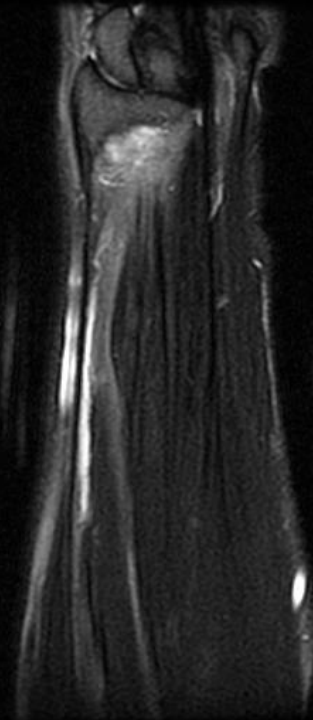


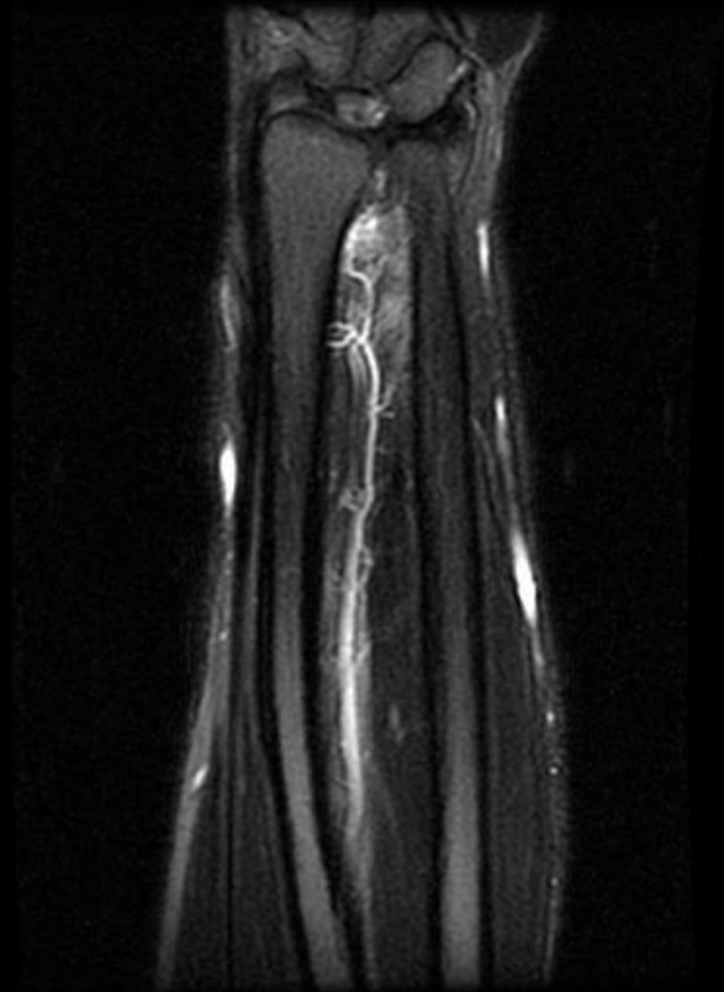


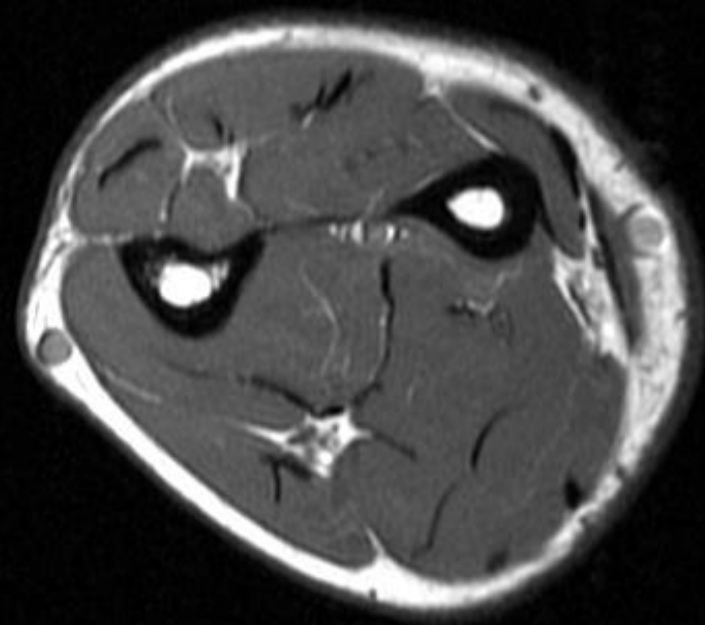
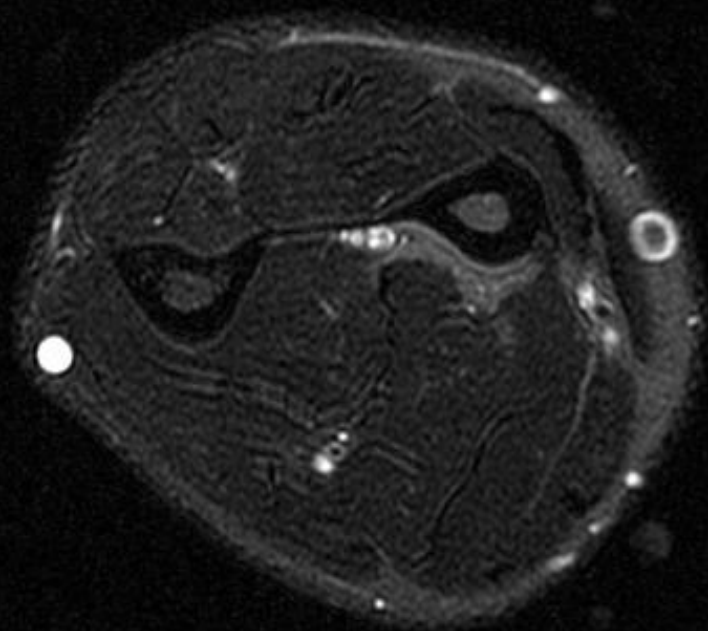












# Differential Diagnosis

- Denervation edema, peripheral nerve impingement
- Post traumatic changes
- Brachial plexus neuritis
- Infectious myositis and pyomyositis
- Diabetic spontaneous myonecrosis
- Inflammatory myopathy
- Necrotizing fasciitis

# Peripheral Neuropathy

- Entrapment neuropathies
- Nonentrapment neuropathies
- Muscle SI in entrapment/denervation:
  - Acute (< 1 month): T1 - normal; STIR - ↑ SI; enhancement: +
  - Subacute (1-6 months): T1 - ± normal; STIR - ↑ SI; enhancement: ±
  - Chronic (> 6 months): T1 - ↑ SI; STIR - ↓ SI; enhancement - none

# Peripheral Neuropathy

## Entrapment neuropathies

- Supracondylar process syndrome
- Pronator syndrome
- Anterior interosseous nerve syndrome
- Carpal tunnel syndrome
- Posterior interosseous nerve syndrome
- Cubital tunnel syndrome
- Guyon canal syndrome

## Nonentrapment neuropathies

- Traumatic nerve injuries
- Infectious and inflammatory conditions
- Polyneuropathies
- Mass lesions at anatomic locations where entrapment syndromes typically do not occur

## Ulnar Nerve

- Medial cord of brachial plexus
- C8, T1

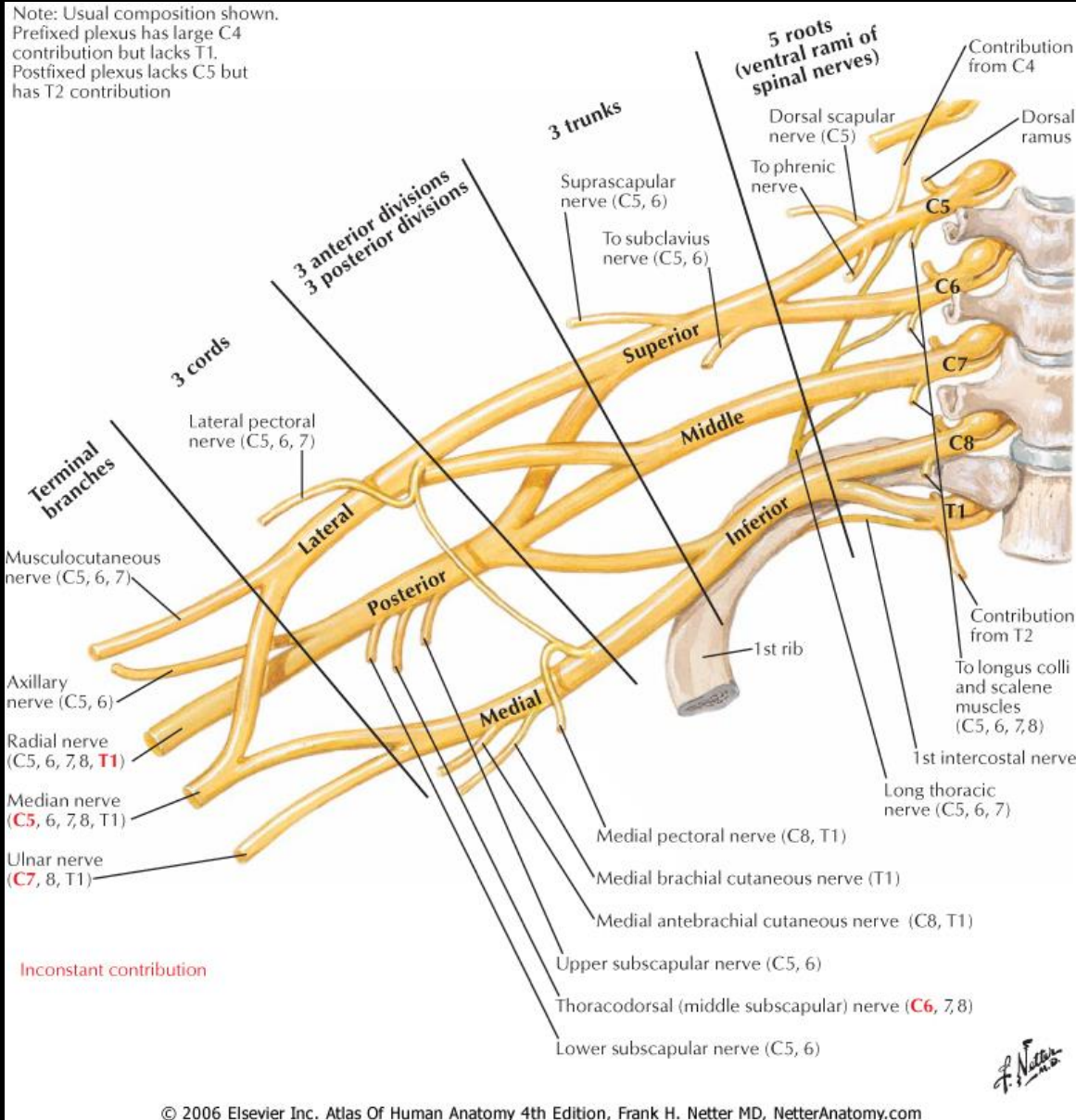
## Median Nerve

- Both medial and lateral cords of brachial plexus
- C6-8, T1

## Radial Nerve

- Posterior cord of brachial plexus
- C5-C8

Note: Usual composition shown.  
 Prefixed plexus has large C4 contribution but lacks T1.  
 Postfixed plexus lacks C5 but has T2 contribution





## Ulnar Nerve

- Enters the forearm under the aponeurosis of the FCU alongside the ulna
- Supplies FCU and medial half of FDP
- Three branches in the forearm :
  - Muscular branches
  - Palmar branch
  - Dorsal branch

## Median Nerve

- Arises from the cubital fossa
- Passes between the two heads of pronator teres.
- Travels between FDS and FDP.
- Emerges between FDS and FPL.
- Two branches in the forearm:
  - Anterior interosseous
  - Palmar cutaneous

## Radial Nerve

- Passes anterior to the lateral epicondyle
- Branches into:
  - Superficial branch
  - Deep branch
- Deep branch continues as the posterior interosseous nerve after piercing the supinator muscle

## Ulnar Nerve

- Cubital tunnel syndrome
- Guyon canal syndrome

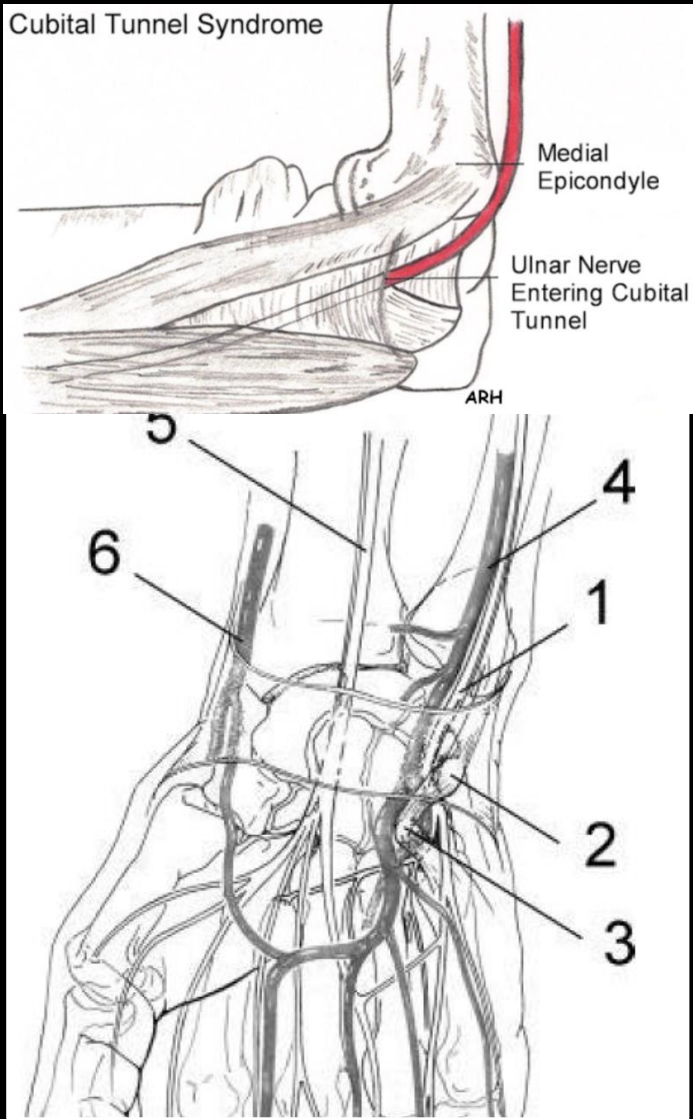
## Median Nerve

- Supracondylar process syndrome
- Pronator syndrome
- Anterior interosseous nerve syndrome
- Carpal tunnel syndrome

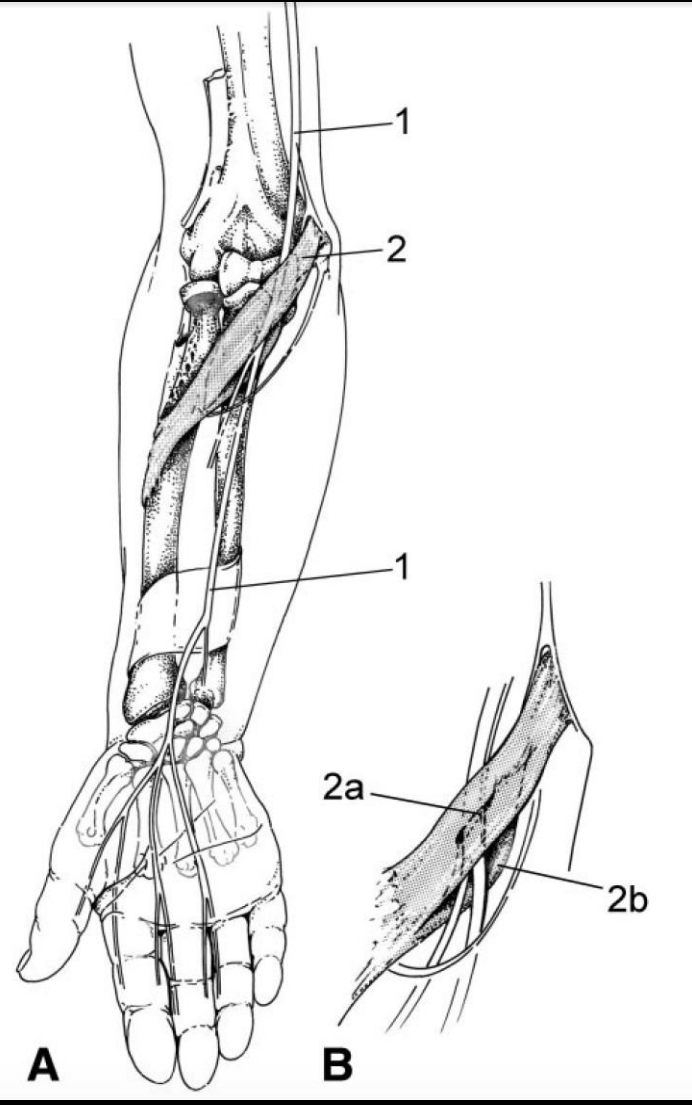
## Radial Nerve

- Posterior interosseous nerve syndrome

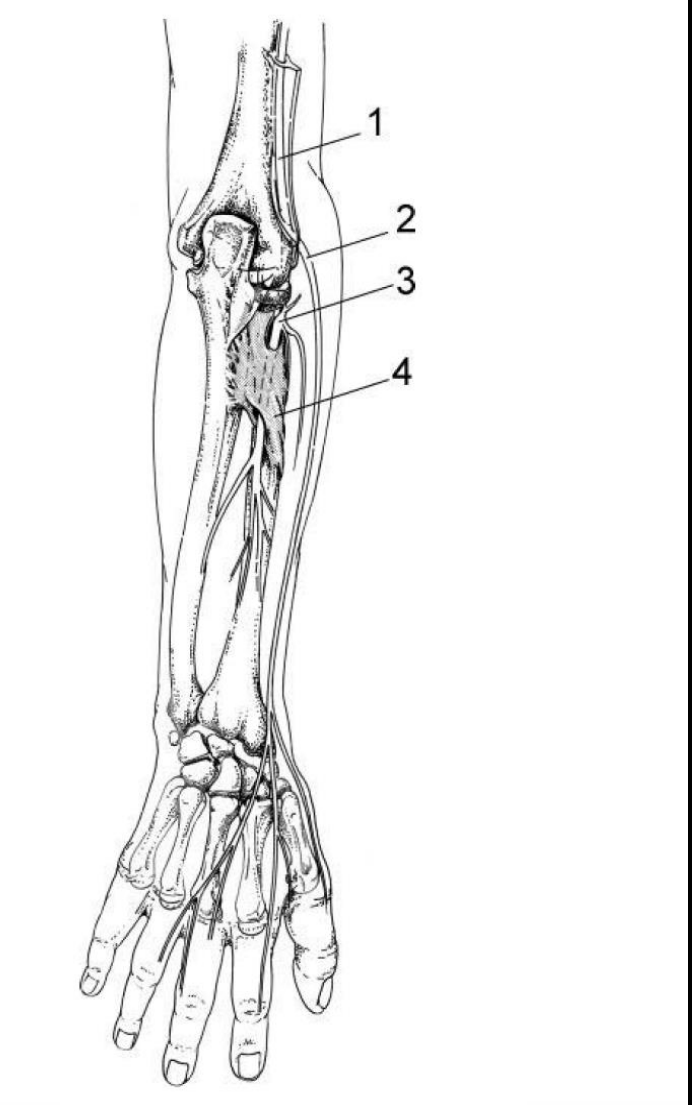
# Ulnar Nerve



# Median Nerve

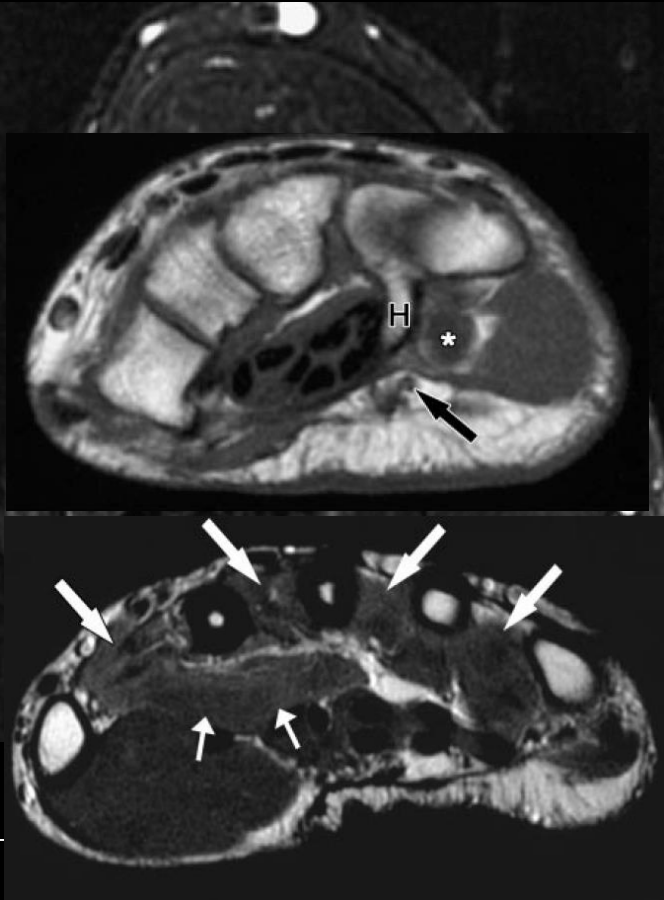


# Radial Nerve



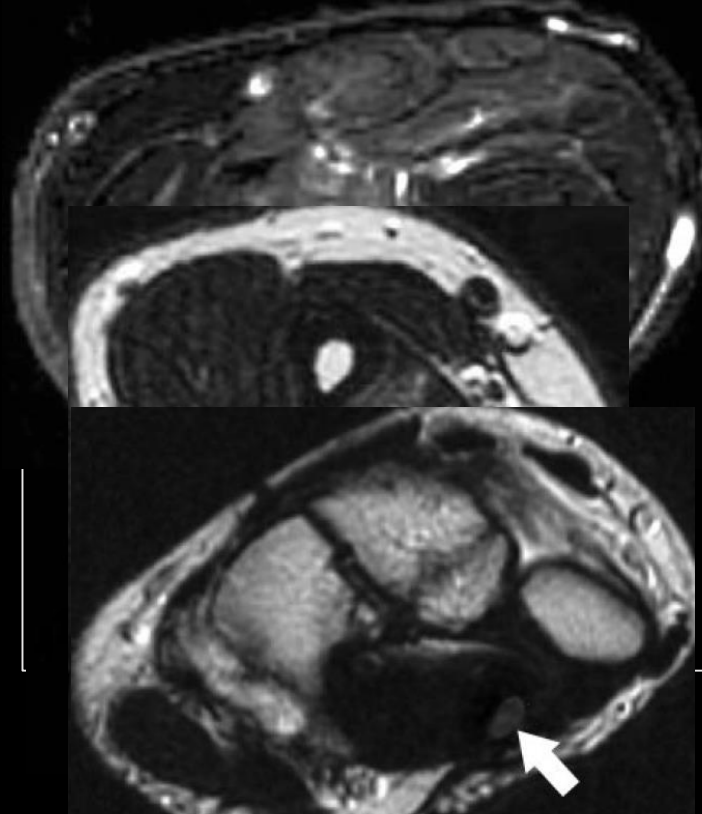
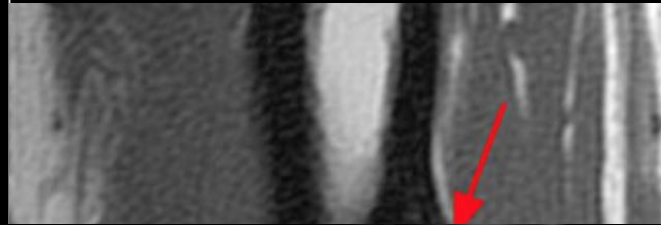
# Ulnar Nerve

- Cubital tunnel syndrome



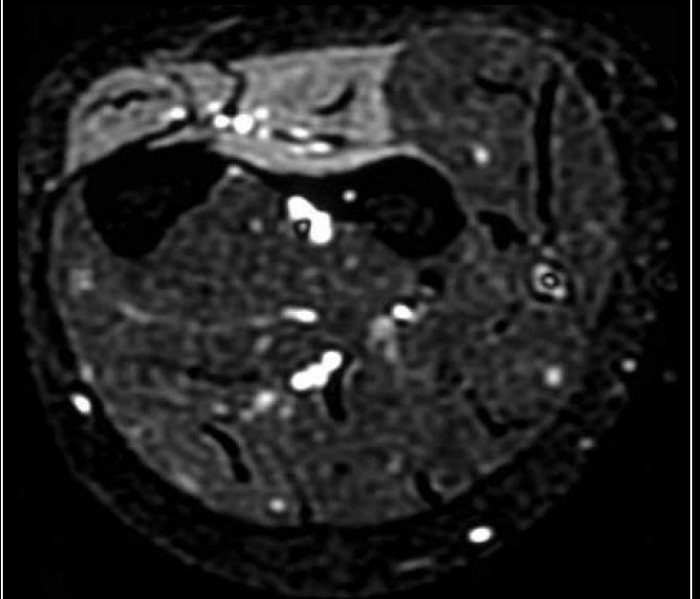
# Median Nerve

- Supracondylar process syndrome



# Radial Nerve

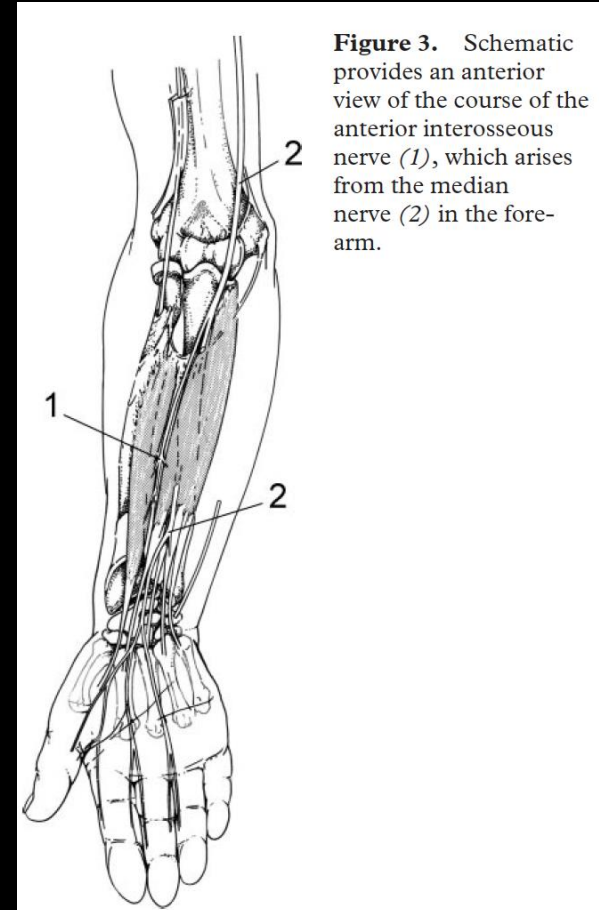
- Posterior interosseous nerve syndrome and the radial nerve



# Anterior Interosseous Nerve Syndrome

Anterior interosseous nerve:

- Purely motor
- Arises 5–8 cm distal to the lateral epicondyle
- Fibres destined to form it may be isolated as far proximally as the level of the brachial plexus
- Passes through/under the pronator teres





# Anterior Interosseous Nerve Syndrome

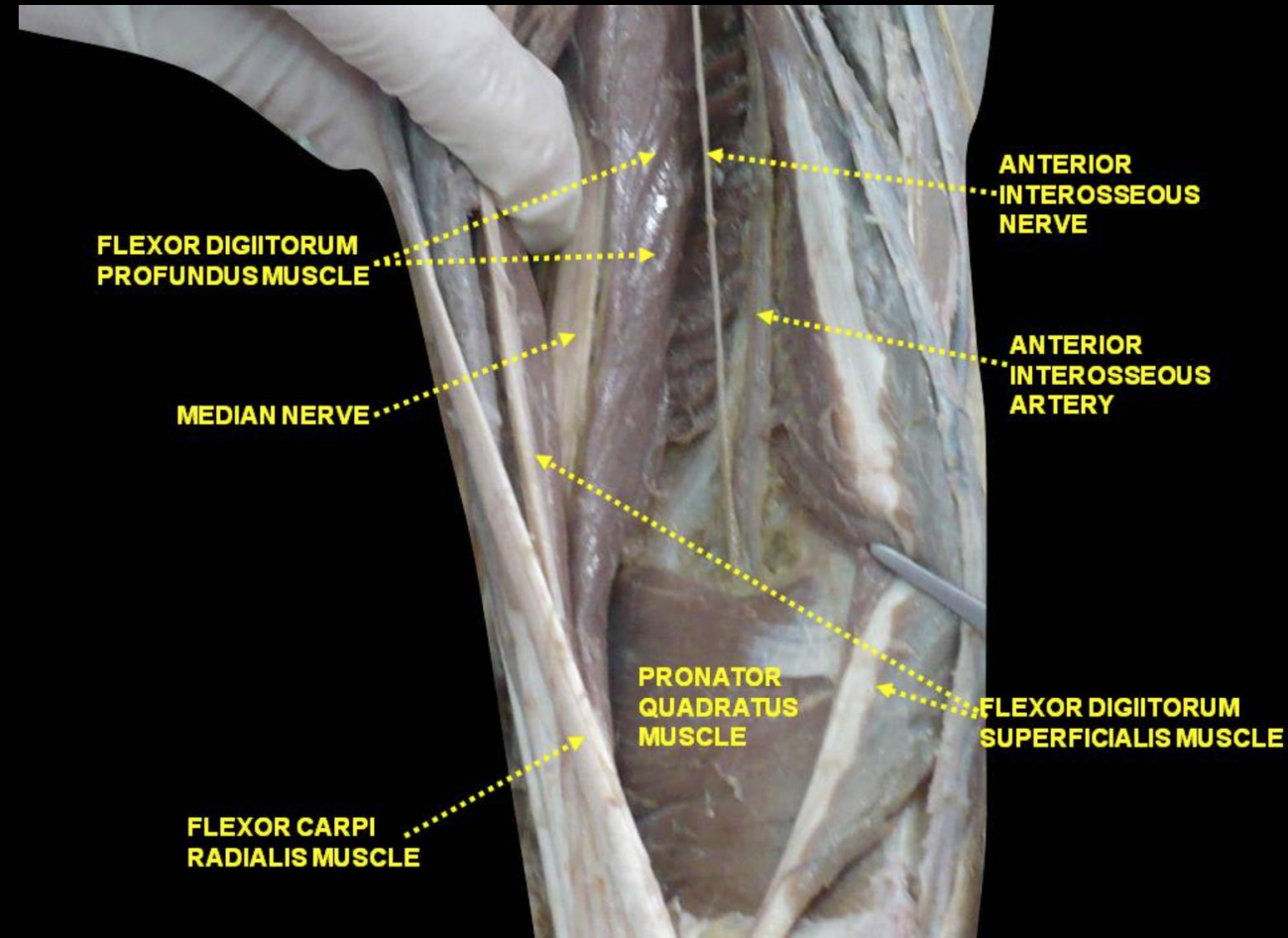
Anterior interosseous nerve:

- Innervates

- Pronator quadratus

- Flexor digitorum profundus (FDP) to the index and long fingers

- Flexor pollicis longus (FPL)



# Anterior Interosseous Nerve Syndrome

- Duchenne de Boulogne in 1872 reported an isolated palsy of the FPL
- 1952, Kiloh and Nevin described the clinical manifestations of an isolated compression of the AIN in detail.
- Rare, 1% off all compression syndromes in the upper limb
- Types:
  - Complete (typical)
  - Incomplete (atypical)
  - Traumatic
  - Non-traumatic

## Causes:

- Tendinous origin of the deep head of pronator teres
- Tendinous origin of FDS to the middle finger
- Thrombosis of the ulnar collateral vessels which cross it
- Accessory muscles and tendons from FDS
- Accessory head of FPL (Gantzer's muscle)
- Aberrant radial artery
- Tendinous origin of palmaris longus or flexor carpi radialis brevis
- Enlarged bicipital bursa

# Anterior Interosseous Nerve Syndrome

- Characteristic physical examination finding is a patient's inability to make an "OK" sign.



- Diagnosis:
  - Clinical
  - Electromyography
  - MRI:
    - Early: No T1WI MR changes
    - Late: Fat atrophy of muscles supplied by median or anterior interosseous nerves
- Management:
  - Conservative: Spontaneous recovery in 8-10 wk
  - Decompression surgery for severe or refractory cases





# Increased MR Signal Intensity in the Pronator Quadratus Muscle: Does It Always Indicate Anterior Interosseous Neuropathy?

## Subjective Assessment

- 2 radiologists noted abnormal, increased signal in the PQ in 53% and 54% of the patients, respectively
- Homogeneous and tended to involve the radial > ulnar aspect
- Most obvious on the fat-saturated proton density
- Not seen on the T1-weighted images.

## Objective Assessment

- SI measurements of PQ was greater than that of an adjacent flexor muscle in 79% of MRIs
- On average, PQ SI was 16.6% higher than that of the flexor muscle for the same patient
- No significant difference between males and females

# Increased MR Signal Intensity in the Pronator Quadratus Muscle: Does It Always Indicate Anterior Interosseous Neuropathy?

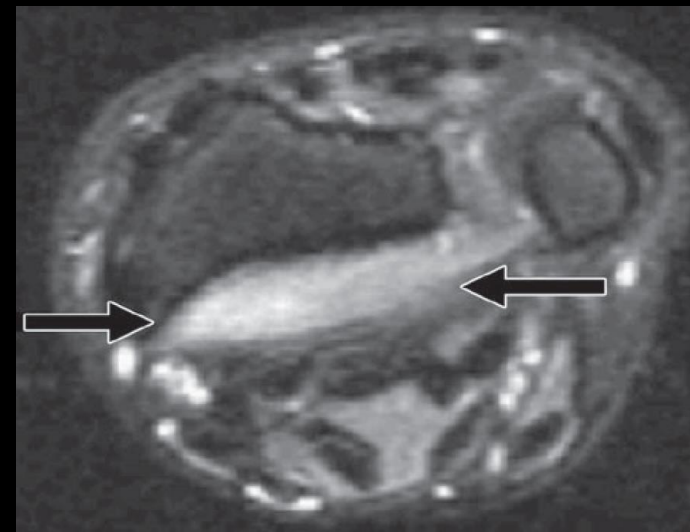
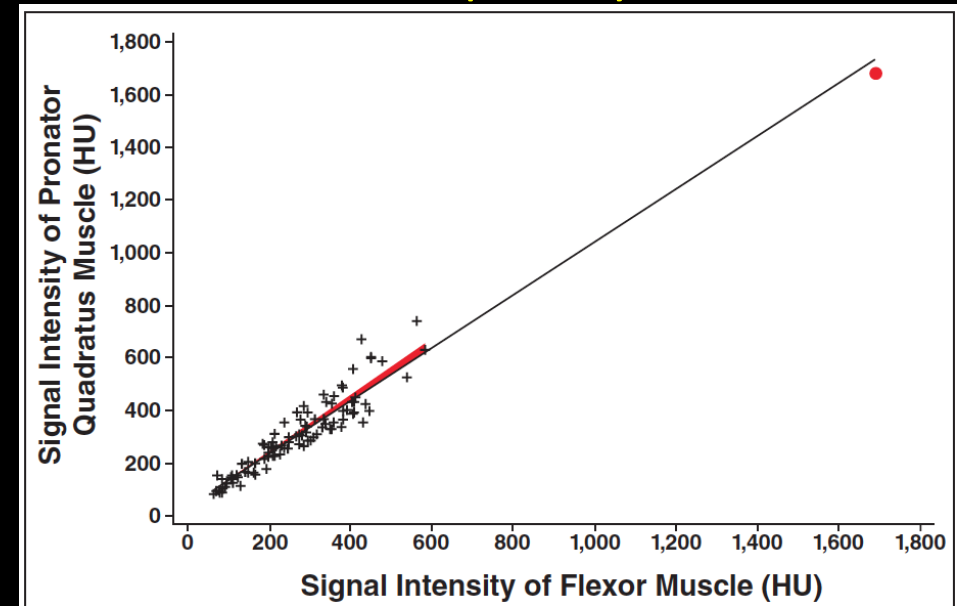
## Causes

- ranging from physiologic phenomena to muscle necrosis

## Differential Diagnosis:

Depends on the pattern of signal alteration

- Focal in muscle contusion/muscle strain
- Intramuscular hematoma
- Compartment syndrome
- Infectious and inflammatory processes, such as pyomyositis, myositis, and myonecrosis



# Reference

- Gustav Andreisek, Peripheral Neuropathies of the Median, Radial, and Ulnar Nerves: MR Imaging Features, Radiographics 2006.
- Ulrich, Anterior interosseous nerve syndrome: retrospective analysis of 14 patients, Orthotruma 2011.
- Gyftopoulos, Increased MR Signal Intensity in the Pronator Quadratus Muscle: Does It Always Indicate Anterior Interosseous Neuropathy?, AJR 2009
- Median Nerve Injury, Statdx, Soion
- <http://radsourc.us/median-nerve-entrapment/>