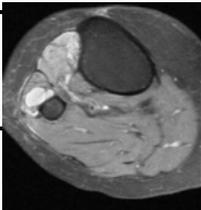




Nerve Entrapment Syndromes

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 University of California School of Medicine
 San Diego, California



Nerve entrapment syndromes

Introduction

- Chronic entrapment
- Commonly as the nerve passes through an osseoligamentous tunnel, or under an aponeurotic margin
- One side fixed, one moves -> friction
 - More common in upper limb
- Inflamed or thickened nerve
- May see mass pressing on nerve – not true entrapment
- Secondary changes in muscles of nerve distribution

Nerve entrapment syndromes

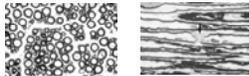
History

- Initially described by:
 - Astley Cooper 1820
 - James Paget 1850
- First surgical decompression
 - Learmonth 1930
- Common types
 - Carpal tunnel syndrome
 - Cubital tunnel - Ulnar nerve at the elbow
 - Guyon's canal – Ulnar nerve at the wrist
 - Suprascapular syndrome

Nerve entrapment syndromes

Pathology

- Chronic blunt injury -> ischemic changes
 - Edema
 - Dislocation of the nodes of Ranvier



- Structural changes to myelin sheath and axon
- Focal segmental demyelination is constant
- Complete recovery is due to remyelination

- Incomplete recovery due to Wallerian degeneration

Myelinated axons osmic acid stain

Nerve entrapment syndromes

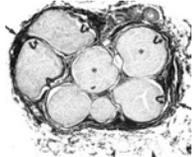
Clinical

- Depends on nerve involved
- Irritative sensory symptoms
 - Pain and paresthesias
- Ablative sensory symptoms
 - Numbness
- Ablative motor signs
 - Weakness and atrophy
- If mixed nerve – sympathetic dystrophy
 - Dry, thin, hairless skin

Nerve entrapment syndromes

Clinical

- Most peripheral entrapped nerves Sens. and Motor
 - Notable exceptions:
 - Anterior interosseous nerve (motor)
 - Deep ulnar (motor)
 - Lateral femoral cutaneous (sensory)
 - Superficial branch of radial nerve (sensory)

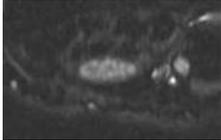
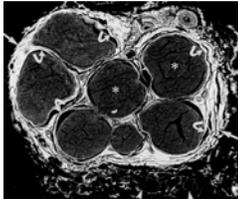


Nervi nervorum

Nerve entrapment syndromes

Normal Peripheral Nerve

- Peripheral nerve encased by epineurium
- Groups of axons encased by perineurium
- Fascicular appearance
- Profuse blood supply

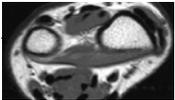
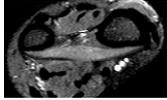
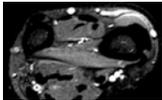



Murphy MD, et al. "Imaging of Musculoskeletal Nerogenic Tumors: Radiologic-Pathologic Correlation." Radiographics 1999;19:1253-1280

Nerve entrapment syndromes

Muscle signal intensity with 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

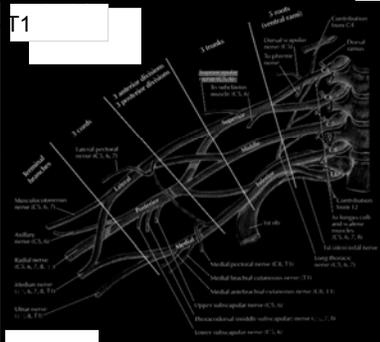




24F with questionable palpable wrist mass

Nerve entrapment syndromes

Brachial Plexus

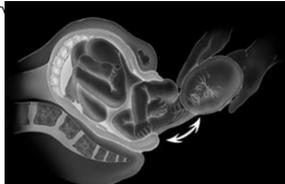
- Roots C5-T1
- Trunks
- Divisions
- Cords
- Branches
- Nerves



Neurologic Thoracic Outlet Syndrome

Erb-Duchenne Palsy

- Tearing of 5-6th roots
- Infants – delivery – shoulder dystocia.
- Adults Fall or blow to shoulder
- Affects –
 - Suprascapular nerve C5-6
 - Musculocutaneous nerve
 - Axillary C5-6
- Waiters tip



Neurologic Thoracic Outlet Syndrome

Erb-Duchenne Palsy

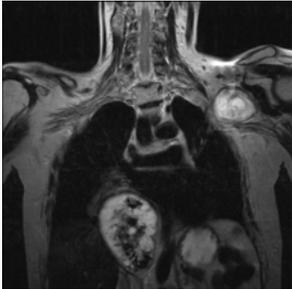
- Glenoid hypoplasia
- Abnormally tapered acromion
- Hypoplastic Humeral Head
- Radial head/ulnar dislocation




2 4 year old

Nerve entrapment syndromes

Brachial Plexus Compression



35F NF1 with ancient Schwannoma

Nerve entrapment syndromes
Neurologic Thoracic Outlet Syndrome

- Brachial plexus compression
 - True (Classic)
 - Congenital band or Cx rib - rare
 - Nonspecific
 - Compression or traction in cervicoaxillary canal
- Can have combined neurovascular
 - Usually traumatic

Nerve entrapment syndromes
Neurologic Thoracic Outlet Syndrome

- F:M 3.5:1
- Sensory symptoms > motor
 - Motor intrinsic hand muscle atrophy
- Principally arm pain, may be chest
 - Exacerbated by abduction



Cervical ribs 36F

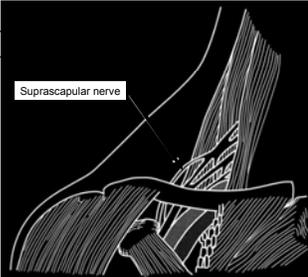
Neurologic Thoracic Outlet Syndrome
Klumpke Palsy

- Lower brachial plexus lesion
- Excessive abduction
 - Breech delivery (rare)
 - Clutching whilst falling
- Pancoast tumor
- Cervical rib
- Tear C8/T1
- Lumbricals and Interossei
- Claw hand.



Entrapment syndromes
Suprascapular nerve

- C5-6 roots, arises off superior trunk
- Supplies supra and infraspinatus
- Compressed in
 - Suprascapular notch
 - Spinoglenoid notch



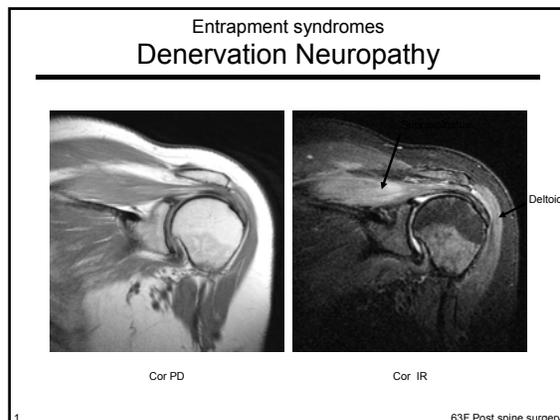
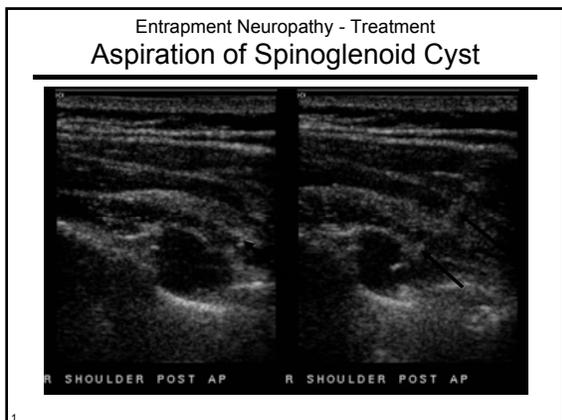
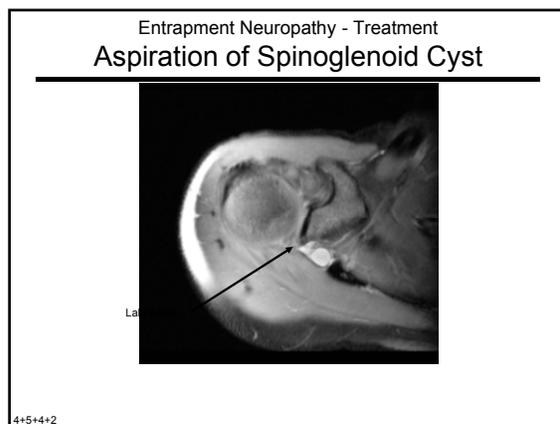
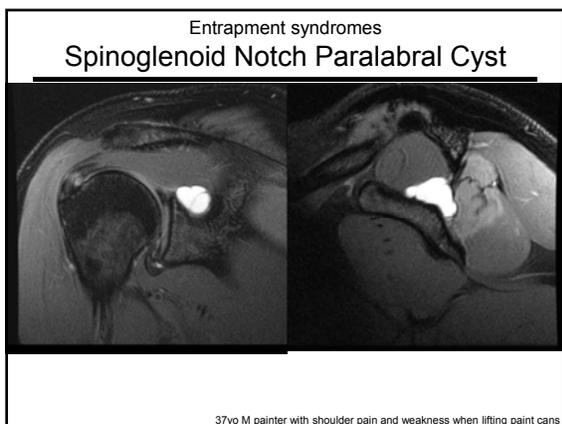
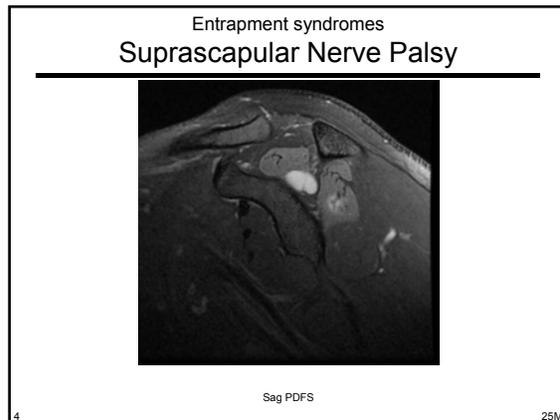
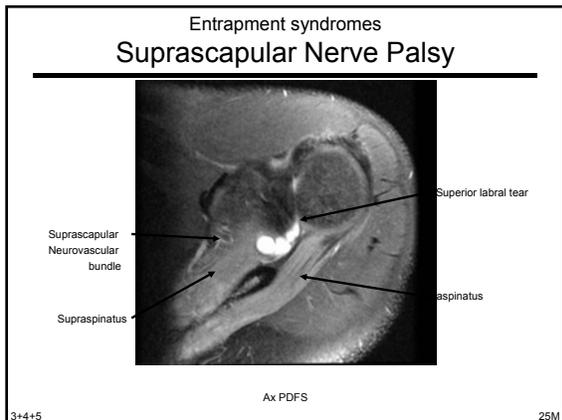
Entrapment syndromes
Suprascapular nerve

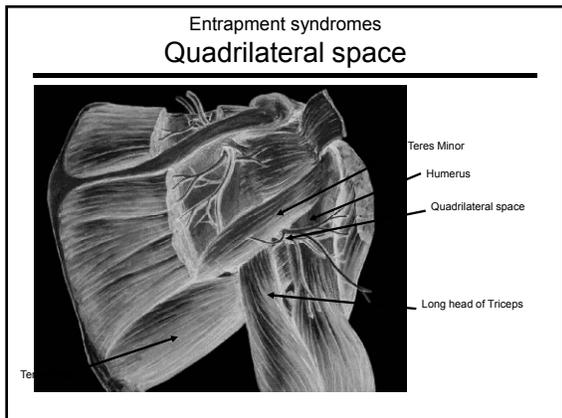
- Upper limb overhead athletes
- Deep dull aching pain – sensory fibers to joint
- Weakness Abd and ER
- Hollow infraspinatus fossa.




Entrapment syndromes
Suprascapular Nerve Injury

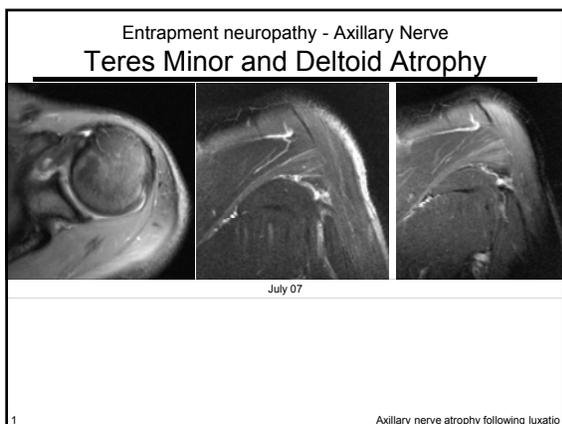
- Suprascapular nerve
 - Mixed motor and sensory
 - Motor: supraspinatus, infraspinatus
 - Sensory:
 - Coracohumeral & coracoacromial ligaments
 - AC and glenohumeral joints
 - Subacromial bursa





Entrapment syndromes
Quadrilateral space

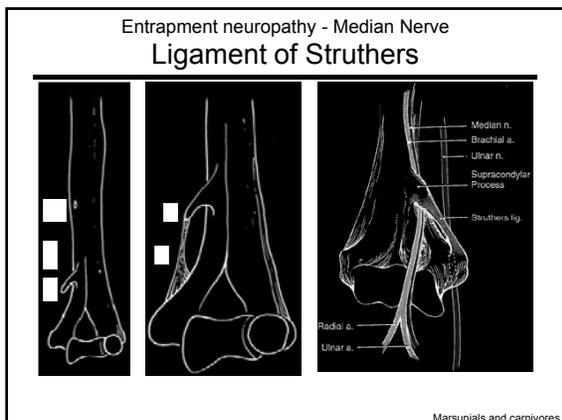
- Compression of axillary nerve (and posterior humeral circumflex artery)
- Fibrous bands, mass, fx.
- Pain and paresthesias of lateral and posterosuperior aspect of shoulder
- Sxs. increase with abduction and ext. rotation
- Weakness and atrophy of deltoid and teres minor

Entrapment neuropathy
Median Nerve

- C5-T1
- Ligament of Struthers
- Lacertus fibrosus
- Pronator Syndrome
 - Between heads of pronator
- Anterior Interosseous Syndrome
 - Within forearm
- Carpal Tunnel Syndrome

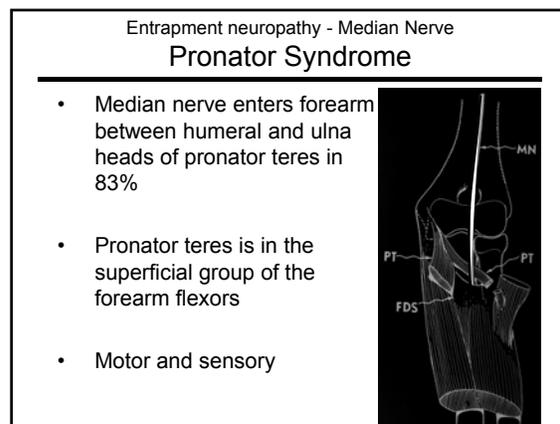
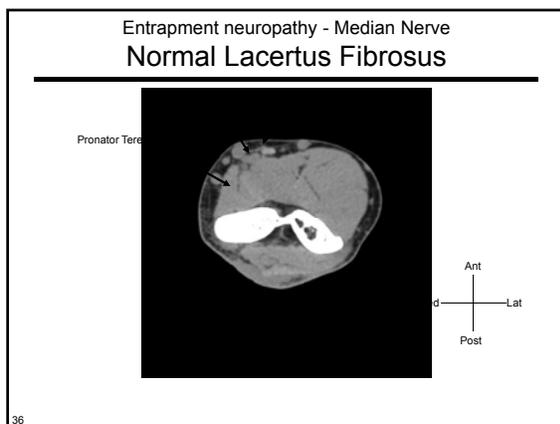
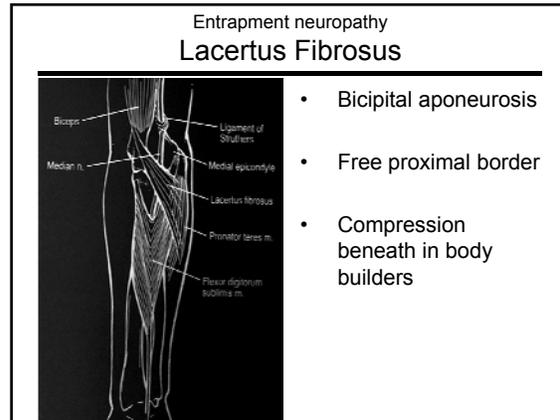
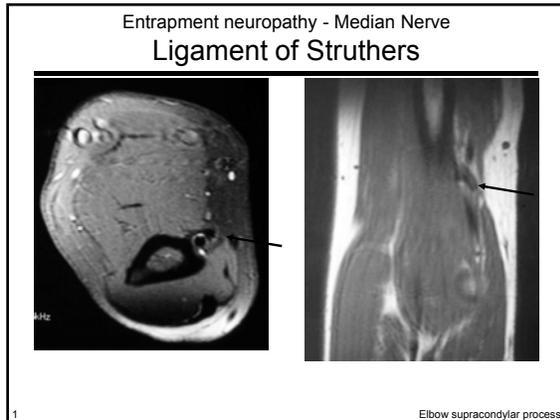




Entrapment neuropathy - Median Nerve
Ligament of Struthers

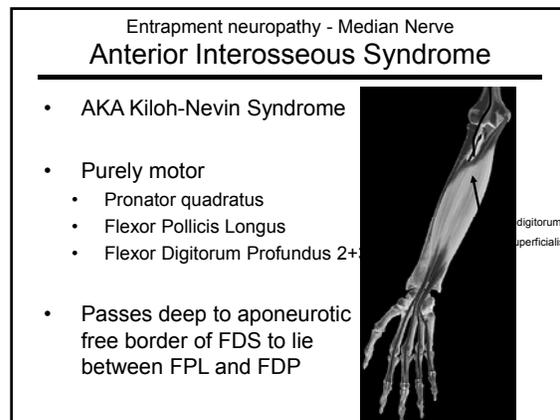
- Supracondylar process present in 1%

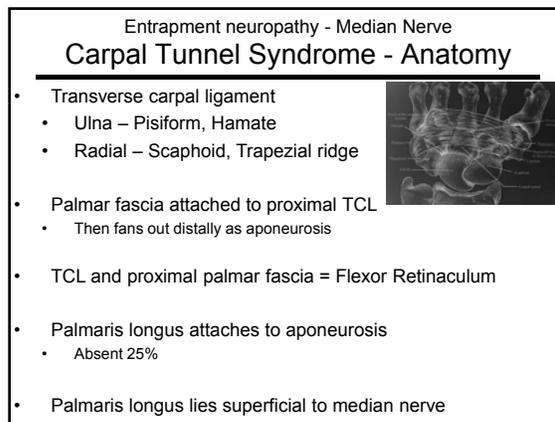
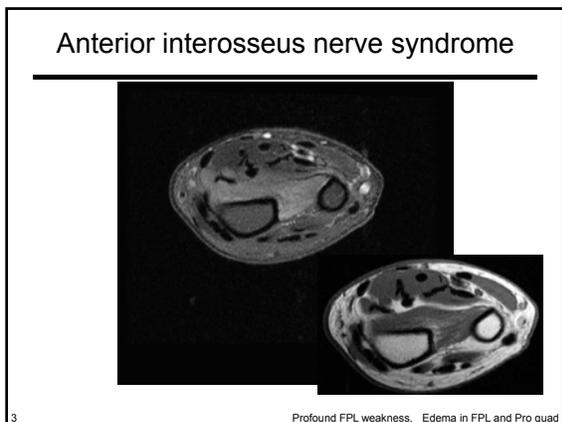
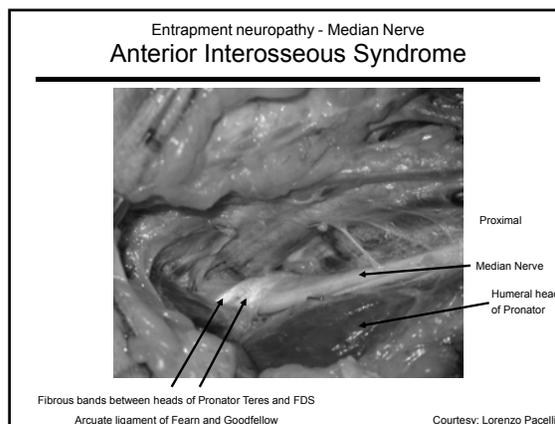
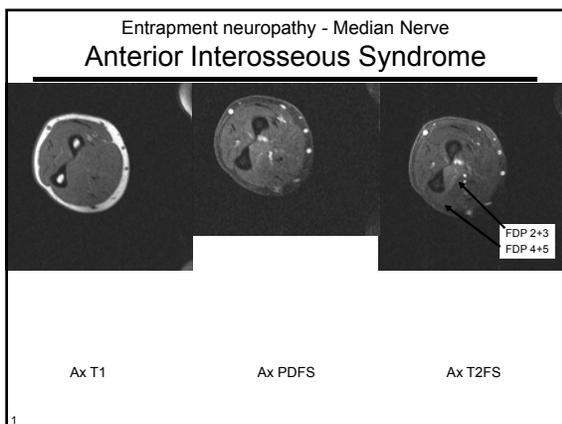
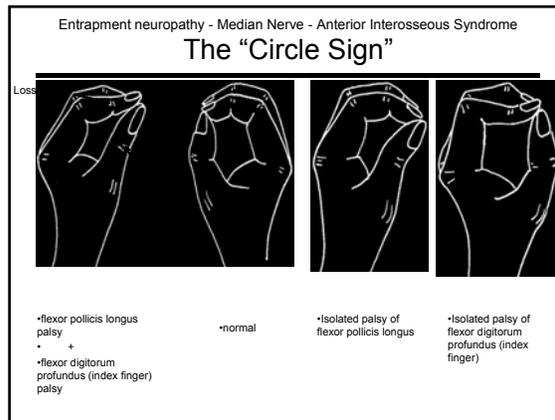
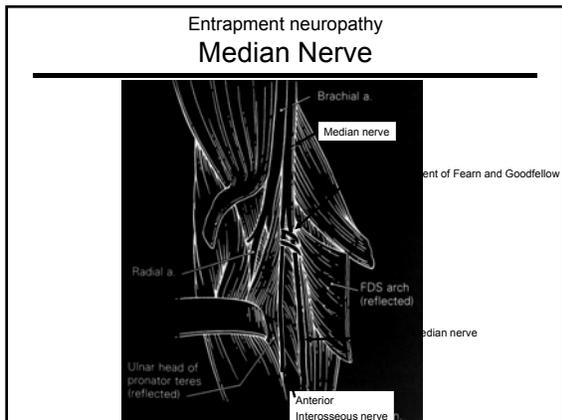




Median nerve Innervation

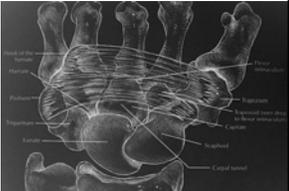
- Median nerve:
 - Supplies pronator teres, FCR, palmaris longus, FDS
 - Both motor and sensory
 - Pronator syndrome: compression of median nerve at the proximal forearm, can occur at multiple sites
- Anterior Interosseous Nerve
 - Largest Branch of median nerve
 - 5-8 cm distal to epicondyle, at level of pronator dives deep to run along anterior aspect of interosseous membrane
 - Motor only, no sensory (Kiloh-Nevin Syndrome)
 - Supplies
 - Pronator quadratus,
 - FPL
 - Radial aspect 2nd and 3rd FDP (4th-5th FDP supplied by ulnar n)



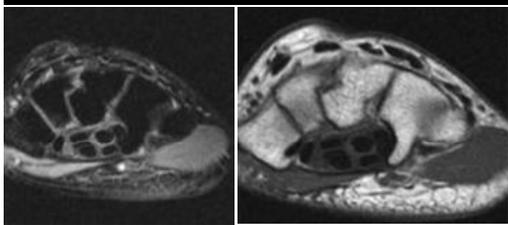


Entrapment neuropathy - Median Nerve
Carpal Tunnel Syndrome - Anatomy

- Sensory branch for thenar eminence leaves proximal to retinaculum
- Motor branch to thenar muscles leaves distal to retinaculum
- Much variance



Entrapment neuropathy - Median Nerve
Normal Carpal tunnel



Ax STIR Ax T1

Entrapment neuropathy - Median Nerve
Carpal Tunnel Syndrome - Clinical

- Dull ache at wrist extending up to elbow
- Worse at night
- Paresthesia radial fingers and thumb
- AbPB weak, OPB later, FPB spared
- Phalen sign – Worse on forced flexion
- Tinel sign – Paresthesia on tapping

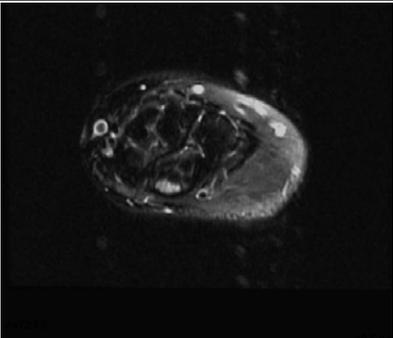


Entrapment neuropathy - Median Nerve
Carpal Tunnel Syndrome - MRI

- Increased signal intensity of median nerve
- Swelling of median nerve proximally
- Flattening of median nerve distally
- Bowing of flexor retinaculum

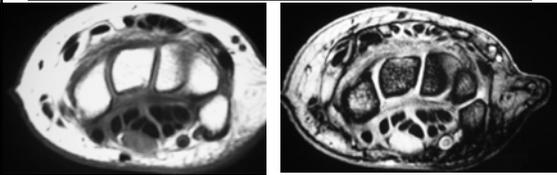
Resnick, D. Bone & Joint Disorders 4th ed. pp 3047-9

Entrapment neuropathy - Median Nerve
Carpal Tunnel Syndrome



4 © 2004 wrist pain for years

Entrapment neuropathy - Median Nerve - CTS
Thickened Inflamed Nerve



Ax T1 Ax T2

- Increased signal intensity of median nerve
- Swelling of median nerve proximally
- Flattening of median nerve distally
- Bowing of flexor retinaculum

Entrapment neuropathy - Median Nerve Carpal Tunnel Syndrome - Causes

- Bursitis
- Osseous spur
- Mass

Robert Margulies

Entrapment neuropathy Ulnar Nerve

- C8-T1

Entrapment neuropathy Ulnar Nerve - Anatomy

- Upper arm, Medial side of brachial artery
- Pierces intermuscular septum mid arm
- Lies on distal medial head of Triceps
- Passes through Cubital Tunnel
- Passes under the strong aponeurotic arcade between the humeral and ulna heads of FCU
- Along forearm between superficial and deep finger flexors

Entrapment neuropathy Ulnar Nerve – Sites of Compression

- 1st rib
 - Klumpke
- Axilla
 - Crutches
- Humerus
 - Arcade of Struthers, 70% of pop.
 - Medial triceps to medial intermuscular septum
 - Medial intermuscular septum – following anterior transposition
- Elbow
 - Cubital tunnel syndrome
 - FCU aponeurosis of Osborne
- Forearm
 - Aponeurosis between FDS and FDP
- Hand
 - Guyon's canal
 - Ulnar tunnel syndrome

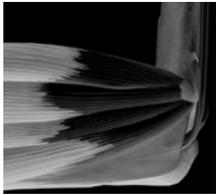
Entrapment neuropathy - Ulnar Nerve Cubital tunnel syndrome - Anatomy

- Cubital tunnel anatomy
 - Anterior – medial epicondyle
 - Lateral – Olecranon
 - Floor – Posterior band of UCL
 - Posteromedial –
 - Cubital tunnel retinaculum
 - AKA Arcuate ligament
- Osborne's ligament of the elbow

Entrapment neuropathy - Ulna Nerve - Cubital TS Ulnar Neuritis

Entrapment neuropathy - Ulnar Nerve
Cubital tunnel syndrome

- Traumatic
 - Single event or chronic repetition
- Nontraumatic
 - Work related
 - Rest on elbows
 - Elbow flexion/extension
 - Concert pianists Slammed by aponeurotic arch of FCU
- Scarring and adhesion
 - Cubital tunnel
 - Under Flexor carpi ulnaris aponeurosis



Entrapment neuropathy - Ulnar Nerve
Cubital tunnel syndrome - Clinical

- Ring and little finger paresthesia
- Discomfort medial forearm
- Pain medial elbow
- Tapping nerve causes distress
- Occ. Weak finger add/abd
- Ulnar claw hand

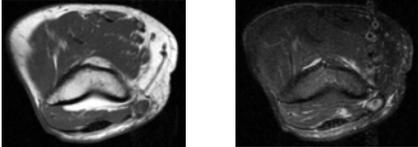


Area of Pain

Paralysis – AddPol, Interossei, ulnar lumbricals

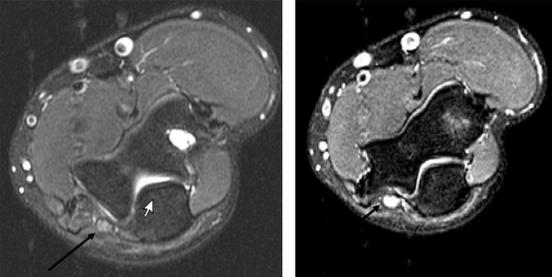
Entrapment neuropathy - Ulna Nerve
Cubital tunnel syndrome - MRI

- Nerve
 - Compressed, Thickened, Displaced
 - Inflamed and enhancing
- Cause
 - OA, Ganglion, Synovitis, Muscle



Ax T1 Ax PDFS

Entrapment neuropathy - Ulna Nerve - Cubital TS
Ulnar Neuropathy

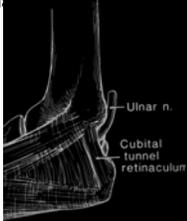


Ax T2FS Ax STIR

1+2

Entrapment neuropathy - Ulna Nerve - Cubital Tunnel Syndrome
Anconeus epitrochlearis

- Cubital tunnel retinaculum - 27 cad
 - Absent (1)
 - Allows subluxation on flexion
 - Type 1a (17)
 - Taut in full flexion
 - Normal
 - Type 1b (6)
 - Taut in partial flexion
 - Causes dynamic nerve compression
 - Type 2 (3)
 - Replaced by Anconeus epitrochlearis
 - Static compression
- Cubital tunnel retinaculum probably a remnant of the anconeus epitrochlearis

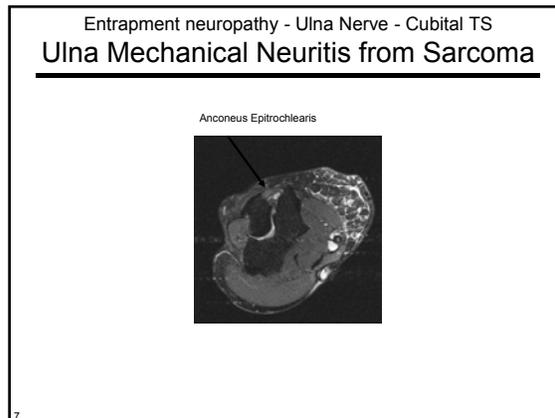
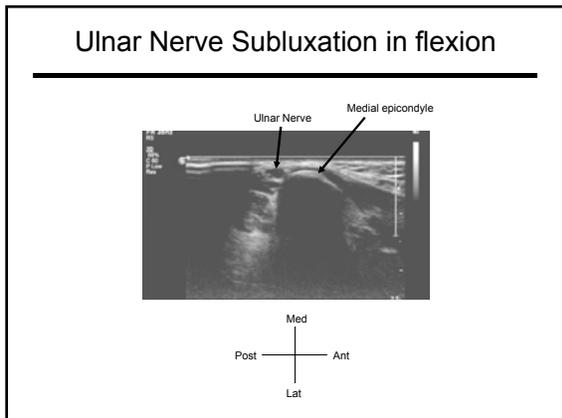


Ulnar n.
Cubital tunnel retinaculum

JBJS Br. 1991 Jul;73(4):613-7

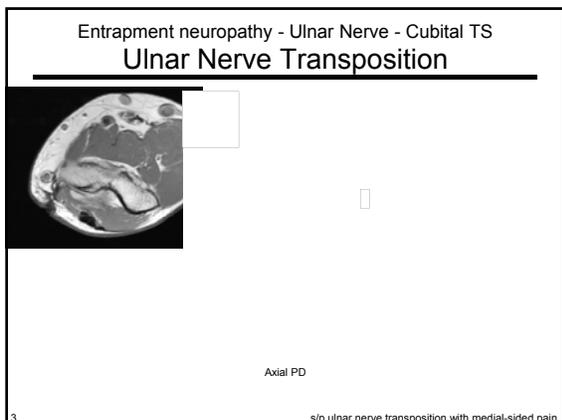
Entrapment neuropathy - Ulnar Nerve
Cubital tunnel syndrome

- Spontaneous subluxation of ulnar nerve from the cubital tunnel (15% of population) may exaggerate symptoms



- ### Entrapment neuropathy - Ulnar Nerve - Cubital TS Ulnar Nerve Transposition
- Decompression In Situ
 - Medial Epicondylectomy, with or without decompression
 - Anterior Transposition

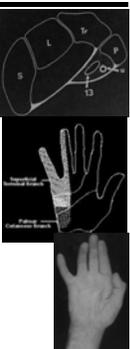
- ### Ulnar nerve transposition
- Resection of retinaculum
 - Detachment of common flexor tendon
 - Division of medial intermuscular septum
 - Creation of anterior tunnel for ulnar nerve
-



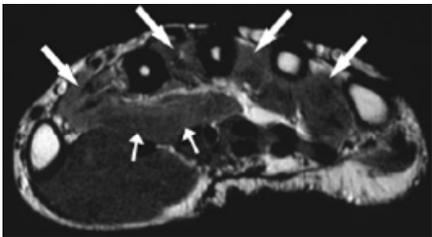
- ### Entrapment neuropathy - Ulna Nerve Ulnar Tunnel Syndrome
- **Guyon's canal syndrome**
 - Superficial to flexor retinaculum
 - Lateral to pisiform/flexor carpi ulnaris
 - Medial to ulnar artery
 - Roofed by transverse carpal lig
 - Superficial sensory hypothenar branch
 - Proximal to canal 65% - silent paralysis
 - In canal 35% - additional pain and numbness
 - Deep motor branch
 - Paralysis – AddPol, Interossei, ulnar lumbricals
 - OpDM > FDM > AbDM
-

Entrapment neuropathy - Ulna Nerve Ulnar Tunnel Syndrome

- Causes
 - Pressure
 - Tools, Bicycle, Crutches
 - Fracture hook of Hamate
 - Baseball, Golf
- Features
 - Compression or enlargement of nerve
 - Inflamed and enhancing



Muscle signal intensity with entrapment/denervation



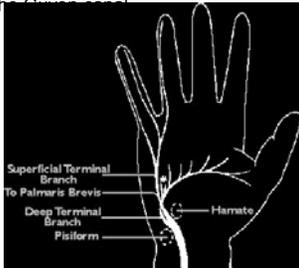
*Increased signal adductor pollicis and interosseus mm.

Source www.statdx.com

Entrapment neuropathy - Ulna Nerve Ulnar Tunnel Syndrome

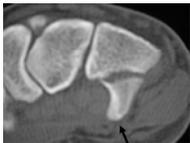
Variants

- 10% of ulnar nerves lie radial to the hook of hamate outside the Guyon's canal



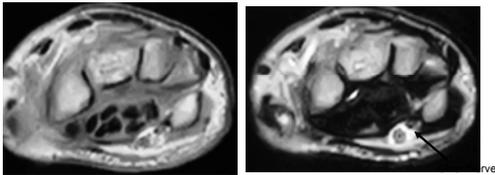
Entrapment neuropathy - Ulna Nerve Ulnar Tunnel Syndrome

- Masses
 - Ganglion
 - Lipoma
- Synovitis
- Fractures
 - Hook of hamate
- Accessory muscle
- Pisohamate coalition
- Aneurysm
 - Hypothenar hammer syndrome



Ulnar Nerve

Entrapment neuropathy - Ulnar nerve Guyon's Canal Syndrome

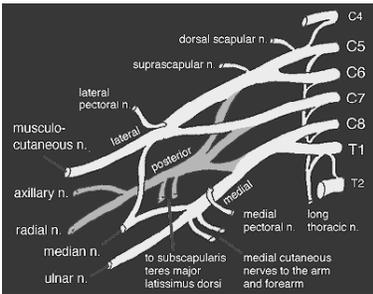


Ax T1 Ax T2

Guyon canal arteritis 63M

Entrapment neuropathy Radial Nerve

- C5-T1



Entrapment neuropathy Radial Nerve

- Axilla
 - Crutches, Saturday night palsy
- Passes laterally under long head of triceps
 - Fibrous arch
- Lies on humerus between medial and lateral heads of triceps
 - Fibrous arch of lateral head
 - Fractures Holstein-Lewis
 - Tourniquet
- Passes into anterior compartment through lateral intermuscular septum
 - Compression
- Lies between brachialis/biceps and ECRB/L, brachioradialis at cubital fossa
 - Body builders
- Intimate to anterior radiocapitellar joint
 - Synovial lesions
- Divides
 - Motor – PIN
 - Sensory – Superficial radial nerve
- PIN enters radial tunnel under arcade of Frohse
 - Leash of Henry (← recurrent radial artery) cross over just proximal to arcade
- Lies between deep and superficial heads
 - Supinator syndrome



Innervations

Radial nerve: <ul style="list-style-type: none"> • Triceps brachii • Anconeus • Brachioradialis • ECRL 	PIN: <ul style="list-style-type: none"> • ECRB • ECU • Supinator • Ext dig • Ext dig min • Ext ind • Ext poll brev • Abd poll long • Ext poll long
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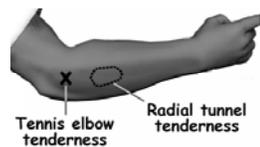
Radial tunnel syndrome – PIN syndrome

- Compression of the PIN within the radial tunnel yields two distinct clinical entities:
- **Posterior Interosseous Nerve syndrome** is characterized by **motor deficits** and +EMG of denervation.
- **Radial tunnel syndrome** manifests as **pain** over the proximal lateral forearm as the sole complaint. Motor deficits and EMG findings are typically absent. Delays diagnosis.
- How? Perhaps different nerve fibers are affected. Perhaps radial tunnel is an early manifestation of PIN.

Radiology 2006;240:161-168
Emedicine radial neuropathy

Radial tunnel syndrome?

- Radial tunnel syndrome can also present with inflammation of the posterior interosseous nerve.



Entrapment Syndromes - Radial Nerve - PIN Resistant Tennis Elbow

- DDx for lateral epicondylitis
 - Radial collateral ligament rupture.
- Radial tunnel syndrome
 - Lateral elbow pain from nerve



Radial neuritis

Entrapment Syndromes - Radial Nerve Posterior Interosseous Syndrome

- Motor nerve
- Occ. Dull ache lateral elbow
 - Nervi nervorum
- Fatigue of forearm extensors
- Weak forearm extensors
 - Weak MCPJ extension esp. 3-4
 - Preserved IPJ extension from lumbricals
- Radial wrist extensors preserved - ECRL
 - Origin proximal to radial tunnel



Entrapment Syndromes - Radial Nerve

Posterior Interosseous Syndrome - Causes



- Arcade of Frohse
 - it is the most common site for entrapment of the nerve
 - fibrotendinous structure at proximal origin of supinator.
 - Variant present in 30-50% of population
- Leash of Henry
 - small recurrent vessels that cross the PIN

Wheeless' Textbook of Orthopedics

Entrapment Syndromes - Radial Nerve

Posterior Interosseous Syndrome - Causes

- Ganglions, synovitis and bursitis
 - at the radiocapitellar joint (#2) Often in annular peri-radial recess encircling neck/head
- Fibrous bands, thick tendons (commonly ECRB) – (#4)
- Radial head fx.
- Overuse (athletes or violinists)
- External compression (crutches)



Wheeless' Textbook of Orthopedics

Entrapment Syndromes - Radial Nerve

Posterior Interosseous Syndrome - Causes

- Injury
 - Penetrating or Fx
- Tumor
 - Direct compression
 - Entrapment between tumor and arcade of Frohse
 - Often in annular peri-radial recess encircling neck/head



Wheeless' Textbook of Orthopedics

Entrapment Neuropathy - Radial Nerve

Posterior Interosseous Nerve Syndrome

- 51 y.o. female with weakness of right hand extensors and radial deviated wrist



Wheeless' Textbook of Orthopedics

Entrapment Syndromes - Radial Nerve

Anterior Elbow Ganglion



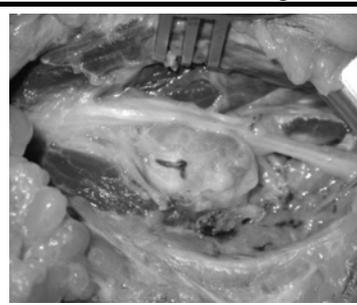
PIN

SagT1

Wheeless' Textbook of Orthopedics

Entrapment Syndromes - Radial Nerve

Anterior Elbow Ganglion



Courtesy, Lorenzo Pacelli

Entrapment Syndromes – Superficial Radial Nerve
Wartenberg's Syndrome

- Sensory (superficial) branch of radial nerve
- Lies beneath brachioradialis until wrist
- Usually affected at level of wrist
- “Handcuff neuropathy”
- Numbness dorsal aspect radial hand

Entrapment neuropathy
Anterior Thigh Nerves

Entrapment neuropathy
Femoral Nerve

- Causes of femoral nerve injury:
 - Following iliopsoas hematoma
 - Fracture of the acetabulum
 - Surgery

Entrapment neuropathy
Lateral Femoral Cutaneous Nerve

- Meralgia paresthetica L1-2
- Obesity, Pregnancy, Hyperextension
- Sensory changes lateral thigh
- Kinked under inguinal ligament

Entrapment neuropathy
Sciatic nerve

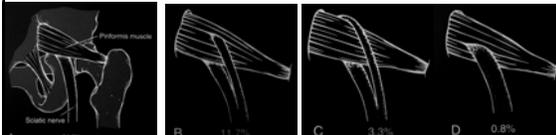
- Sciatic Nerve L4-S3
 - Piriformis Syndrome
 - Tumor
- Tibial nerve
 - Tarsal tunnel syndrome
- Common peroneal nerve
 - Fibula tunnel

Entrapment neuropathy - Sciatic nerve
Piriformis Syndrome

- Pyramidal shaped muscle
- Sacrum to greater trochanter
- Through greater sciatic notch
- Osseoligamentous channel
- May be split by peroneal portion

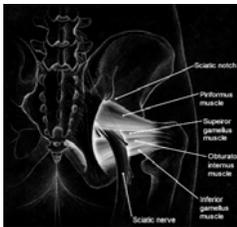
Entrapment neuropathy - Sciatic nerve Piriformis Syndrome

- Sciatic nerve compression below the sciatic foramen which clinically resembles disc extrusion.
- Pain without weakness
- Due to enlargement, inflammation or anatomical variations of the piriformis muscle and sciatic nerve relationship.

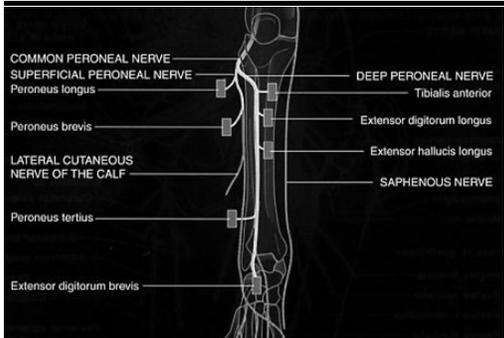


Entrapment neuropathy - Sciatic nerve Piriformis Syndrome - Causes

- Blunt injury – hematoma
- Prolonged pressure
- Nerve anomalies
- Morton foot
- Hyperlordosis

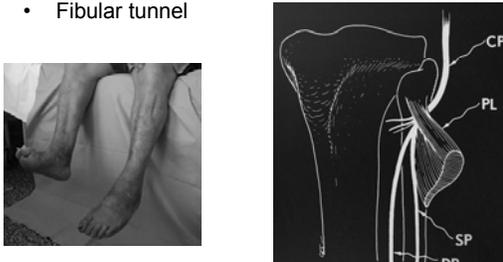


Entrapment syndromes Common Peroneal Nerve



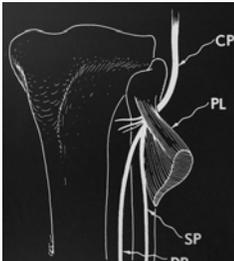
Entrapment syndromes Common Peroneal Nerve

- L4-S2
- Popliteal fossa
- Fibular tunnel

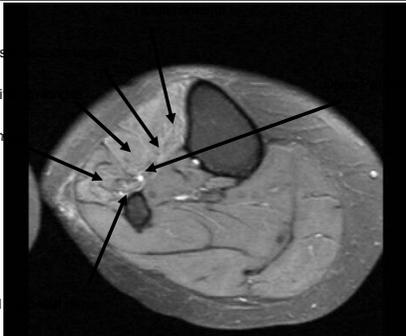


Entrapment syndromes Common Peroneal Nerve - Causes

- Habitual leg crossing
- Masses
 - Ganglia
- Fx
- Tight cast

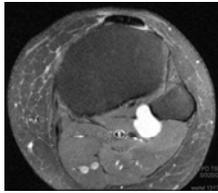


Entrapment syndromes Common Peroneal Nerve



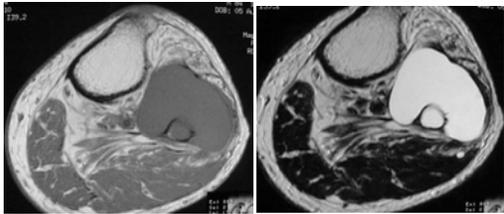
Entrapment syndromes
Tibial Nerve – Popliteal Fossa

- L4-S1
- Popliteal fossa
- Tarsal tunnel syndrome
- Plantar nerves
- Digital nerves
- Sural nerves



51F

Entrapment syndromes
Common Peroneal Nerve



Ax T1 Ax T2

Intraosseous ganglion proximal fib

Entrapment Syndromes - Tibial nerve
Tarsal Tunnel - Anatomy

- Floor - Talus, Calcaneus, QPM
- Roof - Flexor retinaculum, AbHM
- Anterior - FDL,
- Posterior FHL



- Divided into channels by septae
- 2 cm long, narrowest distally
- Contents - PTT, FDL, FHL, PTNVB
- TN => MCN, LPN, MPN*

Entrapment Syndromes - Tibial nerve
Tarsal Tunnel - Anatomy

Tibial nerve



- Medial calcaneal branches
 - Perforate lacinate ligament
 - Sensory medial skin
- Medial plantar nerve
 - Muscles – AbH, FHB, FDB, 1st lumbrical
- Lateral plantar nerve
 - Muscles – QP, AbDquinti, FDB

Entrapment Syndromes - Tibial nerve
Tarsal Tunnel Syndrome

- AKA - Posterior or Medial TTS, Tibial neuropathy
- Commonest nerve compression syndrome in foot
- Pain and paresthesia plantar foot and toes
- Tibial nerve or branch
- In fibroosseous tunnel
- Deep to flexor retinaculum –lacinate ligament

Entrapment Syndromes - Tibial nerve
Tarsal Tunnel Syndrome - Etiology

- Compression of nerve
 - Intrinsic
 - Ganglions, Varicosities, Lipomas
 - Neurilemmas, Neurofibromas
 - Synovial sarcoma, Tenosynovitis
 - Accessory muscles
 - Fibrosis from trauma, Rheumatoid arthritis
 - Extrinsic
 - Trauma - Cedell fracture
 - Biomechanical - Jogger's foot

Entrapment Syndromes - Tibial nerve – Tarsal Tunnel Syndrome

Neuroma



3 Neuroma Sag T1

Entrapment Syndromes - Tibial nerve – Tarsal Tunnel Syndrome

Posterior Process Medial tubercle (Cedell) fracture

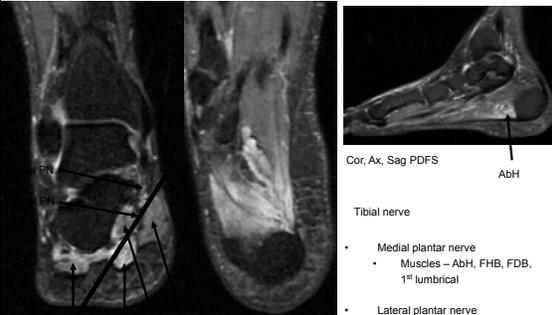
- Rare injury
- Dorsiflexion-Pronation-avulsion by deltoid lig
- Complications
 - FHL entrapment
 - Subtalar OA
 - Nonunion
 - Tarsal tunnel syndrome



-2

Entrapment Syndromes - Tibial nerve – Tarsal Tunnel Syndrome

Jogger's heel – Lateral Plantar Nerve



1

Cor, Ax, Sag PDFS

AbH

Tibial nerve

- Medial plantar nerve
 - Muscles – AbH, FHB, FDB, 1st lumbrical
- Lateral plantar nerve
 - Muscles – QP, AbDquinti, FDB

AbDM FDB QP AbH

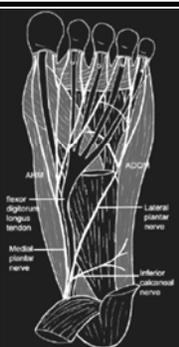
Entrapment Syndromes - Tibial nerve – Tarsal Tunnel Syndrome

Baxter's Neuropathy

- Aka=Inferior Calcaneal Nerve Compression
- Branch of lateral plantar nerve
- Supplies:
 - Sensory:
 - Lateral calcaneal periosteum
 - Long plantar ligament
 - Motor:
 - Quadratus Plantae
 - Abductor Digiti Quinti
 - Flexor Digitorum Brevis

Entrapment Syndromes - Tibial nerve – Tarsal Tunnel Syndrome

Baxter's Neuropathy



AbH

Recur digitorum ligament

Medial plantar nerve

Lateral plantar nerve

Inferior calcaneal nerve

Entrapment Syndromes - Tibial nerve – Tarsal Tunnel Syndrome

Baxter's Neuropathy

- Compression can be due to:
 - Microtrauma
 - Calcaneal spur
 - Internal foot derangement
 - Plantar fasciitis

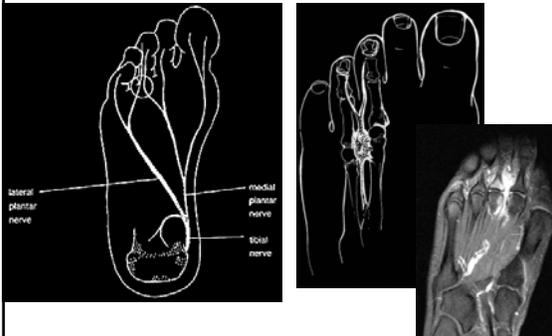


Entrapment Syndromes - Tibial nerve
Morton's Neuroma

- AKA - Interdigital Neuroma
- NOT a neoplasm
- Perineural fibrosis response in and about the plantar digital nerves
- Usually females 18:1, ? Shoes, ? Ischemia
- Most common between third and fourth toes
- Look for intermetatarsal bursitis....high SI on T2



Entrapment Syndromes - Tibial nerve
Morton's Neuroma - Anatomy



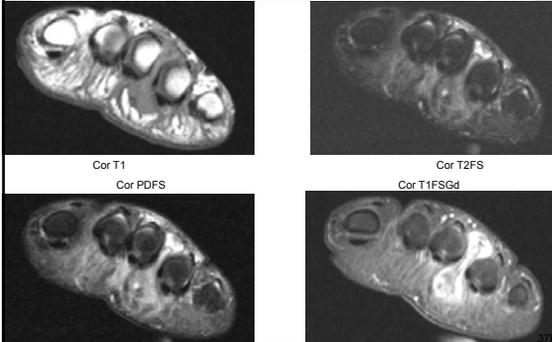
Entrapment Syndromes - Tibial nerve
Morton's Neuroma - Anatomy

Joplin Heuter Hauser Morton Iselin



Accurate Nomenclature for Foot Nerve Entrapment

Entrapment Syndromes - Tibial nerve
Morton's Neuroma

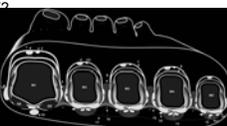


Entrapment Syndromes - Tibial nerve
Morton's Neuroma - MRI

- MR signal characteristics
 - Low signal on T1
 - Best seen on Cor T1
 - High signal on T2,
 - Isointense or mildly hypo to fat
 - Best seen with FS
- Post IV Gad images often demonstrate peripheral enhancement. May increase sensitivity over T2FS
 - Separate fibrosis from bursa
- Intermetatarsal bursitis often coexists with, or causes a Morton's neuroma
 - Can be normal <3mm 1-3 spaces

Entrapment Syndromes - Tibial nerve
Morton's Neuroma - MRI

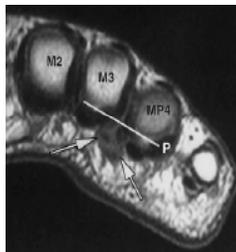
- 90% accurate, PPV 100%, NPV 60%
- Diagnostic criteria — Zanetti et al
 - a) Centered in NV bundle
 - Intermetatarsal space
 - Plantar side of intermetatarsal ligament
 - b) Well demarcated
 - c) SI = muscle on T1, =< fat on T2
- Intermetatarsal bursal fluid 67%
 - Erikson et al



Erikson et al. Radiology 1991;181:833
Zanetti et al. Radiology 1997;203:516

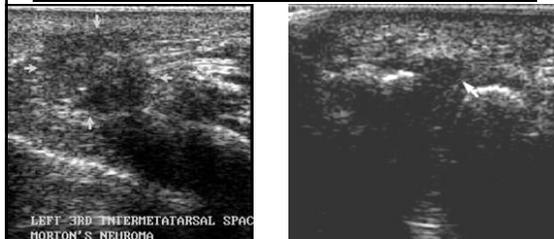
Entrapment Syndromes - Tibial nerve Morton's Neuroma - Effect of Foot Positioning

- With prone imaging the neuroma is plantar to "virtual plantar cortical line"
- With supine & weight bearing imaging the neuroma migrates dorsally
- The shape & transverse measurement change
- This is important since neuromas >5mm have a much better surgical outcome
- Neuromas are most conspicuous on prone images



Weisbaugl D, et al. "Morton Neuroma: MR Imaging in Prone, Supine, & Upright Weight-bearing Body Positions" Radiology (2003) 326:849-856.

Entrapment Syndromes - Tibial nerve Morton's Neuroma - Ultrasound



- Round or ovoid hypochoic mass
- Power Doppler for bursitis

