Nerve Entrapment Syndromes
Nerve entrapment syndromes
Introduction

- Chronic entrapment

- Commonly as the nerve passes through an osseoligamentous tunnel, or between aponeurotic edges

- One side fixed, one moves -> friction

- May see mass pressing on nerve

- Secondary changes in muscles of nerve distribution

- Inflamed or thickened nerve
Nerve entrapment syndromes

History

• Initially described by:
  – Astley Cooper 1820
  – James Paget 1850

• First surgical decompression
  – Learmonth 1930

• Common types
  – Carpal tunnel syndrome
  – Ulnar nerve at the elbow
  – Guyon’s canal
  – 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
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

- Most peripheral entrapped nerves Sens. and Motor
  - Except – deep ulnar (motor), Lateral femoral cutaneous (sensory)
Neurologic Thoracic Outlet Syndrome

• Brachial plexus compression
  – True (Classic)
    • Congenital band or Cx rib - rare
  – Nonspecific
    • Compression or traction in cervicoaxiallary canal

• Can have combined neurovascular
  – Usually traumatic
Neurologic Thoracic Outlet Syndrome

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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

L cervical rib
Neurologic Thoracic Outlet Syndrome

Radiology

- Bony abnormalities
  - Cx rib
  - Elongated C7 transverse process
  - Pancoast tumor
  - Arteriography – aneurysm
  - MRI – Cord lesion
    - Radiculopathy
    - Plexus distortion
Entrapment syndromes

Suprascapular nerve

- Upper limb athletes
- Deep dull aching pain – sensory fibers to joint
- Weakness Abd and ER
- Hollow infraspinatus fossae
Entrapment syndromes

Suprascapular nerve

- C5-6 roots, arises off superior trunk
- Supplies supra and infraspinatus
- Compressed in
  - Suprascapular notch - Supra and Infra
  - Spinoglenoid notch – Infra only
Suprascapular notch ganglion

- Suprascapular nerve entrapment relating to a ganglion cyst

- Commonly superior labral tear

- Affects supra and infraspinatus
Entrapment neuropathy

**Median Nerve**

- **C5-T1**
  - Ligament of Struthers
  - Lacertus fibrosus
  - Pronator Syndrome
    - Between heads of pronator teres
  - Anterior Interosseous Syndrome
    - Within forearm
  - Carpal Tunnel Syndrome
Entrapment neuropathy - Median Nerve

Ligament of Struthers

- Supracondyloid foramen present in 1%
Entrapment neuropathy - Median Nerve

Carpal Tunnel Syndrome

• Dull ache at wrist extending up to elbow
• Worse at night
• Paresthesia median finger 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

- Tenosynovitis
- Osseous spur
- Mass
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
Entrapment neuropathy

Ulnar Nerve – Sites of Compression

• C7-T1
Entrapment neuropathy

Ulnar Nerve – Sites of Compression

- 1\textsuperscript{st} 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
  - Guyons canal
  - Ulnar tunnel syndrome
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

Cubital tunnel syndrome - Anatomy

- Ulnar nerve compressed in cubital tunnel
  - Anterior – medial epicondyle
  - Lateral – Olecranon
  - Posteromedial –
    - Cubital tunnel retinaculum
    - AKA - Osbornes ligament or fascia
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

• Spontaneous subluxation of ulnar nerve from the cubital tunnel (15% of population) may exaggerate symptoms
Entrapment neuropathy - Ulnar Nerve

Cubital tunnel syndrome

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

Cubital tunnel syndrome - Causes

- Masses in cubital tunnel
  - Muscles
    - Anconeus epitrochlearis
    - Prominent medial head of triceps
  - Ganglion
  - Osteophytes
Anconeus epitrochlearis

- Cubital tunnel retinaculum - 27 cadavers
  - Absent (1)
    - Allows subluxation
  - 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
Entrapment neuropathy - Ulna Nerve

Cubital tunnel syndrome - MRI

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

Ulnar Tunnel Syndrome

- AKA - Guyon’s canal syndrome

- Superficial to flexor retinaculum
- Lateral to flexor carpi ulnaris
- Medial to ulnar artery
- Roofed by transverse carpal lig

- Superficial hypothenar branch
  - Proximal to canal 65% - silent paralysis
  - In canal 35% - additional pain and numbness

- Deep motor branch
  - Paralysis - AddPol, Interossei, ulnar lumbricals
    - ODM > FDM > AbDM
Entrapment neuropathy - Ulna Nerve

Ulnar Tunnel Syndrome

- Masses
  - Ganglion
  - Lipoma

- Synovitis

- Fractures
  - Hook of hamate

- Accessory muscle

- Aneurysm
  - Hypothenar hammer syndrome
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
Posterior Interosseous Syndrome

- Motor nerve
- Occ. Dull ache front 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
  - Origin proximal to radial tunnel
Entrapment Syndromes - Radial Nerve - PIN

Resistant Tennis Elbow

- Radial collateral ligament rupture.
- Radial tunnel syndrome
  - Posterior interosseous branch of radial n.
  - Fibrous arch of supinator (Arcade of Frohse)
  - Distally through supinator
Entrapment Neuropathy - Radial Nerve

Posterior Interosseous Nerve Syndrome

- 51 y.o. female with weakness of hand extensors and radial deviated wrist
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
• Common peroneal nerve
Entrapment syndromes

Common Peroneal Nerve

- L4-S2
  - Popliteal fossa
  - Fibular tunnel
Entrapment syndromes

Tibial Nerve

• L4-S1
  – Popliteal fossa
  – Tarsal tunnel syndrome
  – Plantar nerves
  – Digital nerves
  – Sural nerves
Entrapment Syndromes - Tibial nerve

Tarsal Tunnel Syndrome

• Roof – Flexor retinaculum
• Floor – Tarsal bones and muscles
• Contains
  – Flexor tendons
  – Artery and vein
  – Tibial nerve
Entrapment Syndromes - Tibial nerve

Tarsal Tunnel Syndrome

Tibial nerve

- Medial calcaneal branches
  - Perforate laciniate ligament
  - Sensory medial skin

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

- Lateral plantar nerve
  - Muscles – QP, AbDquinti
Tarsal Tunnel Syndrome

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

Tarsal Tunnel Syndrome - 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, PTN VB
- TN => MCN, LPN, MPN*
Entrapment Syndromes - Tibial nerve

Tarsal Tunnel Syndrome - Aetiology

• Compression of nerve

• Intrinsic
  – Ganglions, Varicosities, Lipomas
  – Neurilemomas, Neurofibromas
  – Synovial sarcoma, Tenosynovitis
  – Fibrosis from trauma, Rheumatoid arthritis

• Extrinsic
  – Trauma, Biomechanical - Jogger’s foot
Peripheral Neuritis

- Mechanical
- Radiation
- Post viral
  - Parsonage Turner Syndrome
  - Polio
- Ischemic neuropathy
  - Diabetic
- Polyneuropathy
Peripheral Neuritis

Parsonage Turner Syndrome

– AKA

  • Neuralgic amyotrophy
  • Acute brachial neuritis / radiculitis
  • Nontraumatic neuropathy
  • Shoulder girdle syndrome

– Idiopathic denervation syndrome of shoulder muscles
Peripheral Neuritis

Parsonage Turner Syndrome

– Pathology
  • Neuritis of lower motor neurons of brachial plexus
  • Probably post viral
  • Also follows trauma, surgery and immunization
Peripheral Neuritis

Parsonage Turner Syndrome

– Acute findings (after 2w symptoms)
  • Swollen muscles
  • ↓T1, ↑T2 / STIR, Enhance
  • No focal lesion on nerve

– Chronic findings
  • Fatty atrophy
  • ↑T1, ↑T2, ↓STIR
  • No focal tear