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## Cubital Tunnel Syndrome

### Introduction [1]

- Symptomatic ulnar nerve dysfunction at the level of the elbow
- Results from a combination of compression, traction, and friction
- Second most common peripheral nerve compression syndrome after carpal tunnel
- Four times more likely to present with advanced disease, i.e., muscle atrophy and diminished sensation

### Anatomy [1]

- Roof of cubital tunnel formed by Osborne's ligament.
- Medial collateral ligament, elbow joint capsule, and olecranon form the floor.
- Most common site of compression is directly beneath Osborne's ligament.
- Other sites of compression:
  - Arcade of Struthers proximally
  - Medial epicondyle
  - Deep flexor pronator aponeurosis distally

- Intraneural pressure is lowest at 40–50° elbow flexion and increases dramatically when the elbow flexes past 90°.
- It is important to identify and protect branches of the medial antebrachial cutaneous nerve at the time of operative nerve decompression.

### Presentation [1]

- Combination of history, physical exam, electromyogram and nerve conduction testing.
- Paresthesia in little finger and ulnar half of ring finger.
- Sensory disturbance on the dorsal ulnar hand confirms compression proximal to Guyon's canal.
- Weakness of various muscles occurs with advanced disease and may cause characteristic hand posture:
  - Interossei – Wartenberg sign
  - Adductor pollicis – Froment sign
  - Ulnar lumbrical muscles – claw hand deformity
- Clinical provocative testing includes:
  - Ulnar nerve percussion at the retrocondylar groove
  - Elbow flexion test
  - Stability of ulnar nerve assessed posterior to medial epicondyle
- Nerve conduction studies used to confirm clinical diagnosis:

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- Possible false negatives because of variable compression of fascicles
- Categorized as mild, moderate, or severe disease:
  - Common grading systems:
    - McGowan
    - Dellon
  - Mild disease patients report:
    - Subjective sensory symptoms without objective loss of 2-point sensibility or muscular atrophy
      - McGowan and Dellon I
  - Moderate disease:
    - Imparts weakness on pinch and grip without atrophy
      - McGowan 2A, Dellon 2
    - Presence of atrophy and intrinsic muscle strength of only 3/5
      - McGowan 2B
  - Severe disease:
    - Profound muscular atrophy and sensory disturbance
      - McGowan 3
    - Weakness that inhibits active finger crossing
      - Dellon 3

## Studies

### Surgical Treatment Types [2]

- 2005 to 2012 study cohort 26,164 patients:
  - 80% underwent in situ decompression, increased throughout the study period
  - 16% underwent transposition
  - 4% underwent other surgical treatment
- Surgeon characteristics were associated with the type of procedure selected:
  - Case volume
  - Number of types of procedure performed

### Comparison of Surgical Treatment [3]

- Extensive dissection is needed for nerve transposition and this may compromise its vascularity.
- A recent meta-analysis of four randomized trials showed no differences in motor nerve conduction velocities or clinical outcome scores

for either simple decompression or ulnar nerve transposition.

- Two out of the four studies excluded patients with nerve subluxation.
- The optimal surgical treatment is unclear.

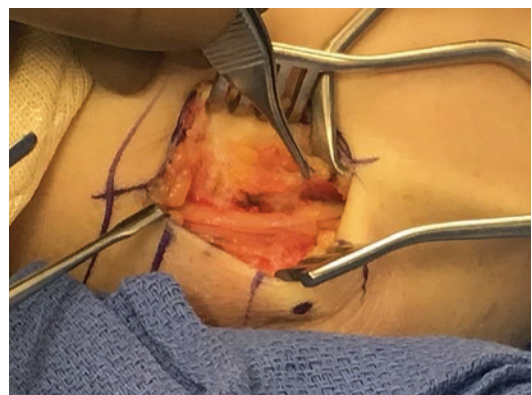
## Treatment [1]

### Nonoperative

- Commonly prescribed nonsurgical measures
  - Discontinuing triceps strengthening exercises
  - Avoiding applying direct pressure to medial aspect of elbow on firm surfaces
  - Maintaining a resting elbow position of 45–50 degrees flexion
  - Using a nighttime elbow towel orthosis to prevent elbow flexion beyond 50°

### Operative

- Commonly employed operative approaches:
  - Simple decompression
    - Releasing fascial structures superficial to the ulnar nerve along the medial aspect of the elbow – can be performed endoscopically or open (Fig. 54.1)
  - Medial epicondylectomy
    - Allows for anterior translation of ulnar nerve over the medial aspect of the elbow
    - Limited nerve dissection required
  - Transpositions



**Fig. 54.1** Simple decompression of the cubital tunnel



**Fig. 54.2** Ulnar nerve transposition with sling

- Place ulnar nerve anterior to ulnohumeral axis of rotation.
- Ulnar nerve is stabilized in its anterior position over the flexor pronator mass with either a fascial sling or subcutaneous tissue (Fig. 54.2).

## Complications

### Surgical Failure [4]

- Incorrect diagnosis, incomplete decompression, persistent traction on the nerve, postoperative compression secondary to scar or new areas of compression, and recalcitrant advanced disease

### Persistent or Recurrent Symptoms Can Lead to Revision Surgery

- Subcutaneous or submuscular transposition is recommended for revision.

### Possible Symptomatic Complications

- Loss of elbow extension, smaller total arc of active elbow motion, residual ulnar nerve tenderness, weaker key pinch, increased 2-point discrimination in the ring and little fingers, a more frequent Wartenberg sign, and persistent claw posturing

## Causes of Failed Surgery

- Incorrect diagnosis
- Improper release of ulnar nerve

## Guyon's Canal Syndrome

### Introduction

- Also called ulnar tunnel syndrome [5].
- Diagnosis can be difficult [5].
  - Paresthesias may be nonspecific or related to coexisting pathologies
  - Accuracy has increased with advances in electrodiagnosis
- True incidence and prevalence are not clear [5].
- Leading causes vary [5].
  - Ganglia, occupational neuritis, chronic repetitive trauma, and compression over hypothenar eminence [5]
  - Benign lesions, hook of hamate fractures, ulnar artery pathology, etc. [5]

### Anatomy

- Guyon's canal is potential but not exclusive site for ulnar nerve compression [5].
  - Guyon's canal is a space at the base of the hypothenar eminence where the ulnar nerve bifurcates [5].
- Ulnar nerve continues into the forearm between the flexor carpi ulnaris and flexor digitorum profundus and innervates the flexor carpi ulnaris and flexor digitorum profundus of the ring and small fingers [5].
- Ulnar tunnel originates at the proximal edge of the palmar carpal ligament and extends distally to the fibrous arch of the hypothenar muscles at the level of the hook of the hamate [5].
  - The boundaries vary and cannot be distinguished throughout the course.
  - Roof – palmar aponeurosis, palmaris brevis, and hypothenar fibroadipose tissue
  - Floor – flexor digitorum profundus tendons, transverse carpal ligament, pisohamate ligament, pisometacarpal ligament, and opponens digiti minimi

- Medial wall – flexor carpi ulnaris tendon, pisiform, and abductor digiti minimi
- Lateral wall – extrinsic flexor tendons, hook of hamate, and transverse carpal ligament
- Within the canal – ulnar nerve, ulnar artery, concomitant veins, and connective fatty tissue [5].
- Superficial branch innervates the palmaris brevis and provides sensation to the hypothenar eminence, small finger, and ulnar aspect of ring finger [5].
- Sites of compression [5]:
  - Zone I: begins from proximal edge of palmar carpal ligament and ends distally at bifurcation of the nerve [6].
    - Manifests as motor weakness of all the ulnar-innervated intrinsic muscles and sensory deficits over hypothenar eminence and the small and ring fingers [5]
  - Zone II: from just distal to bifurcation to fibrous arch of hypothenar muscles [6].
    - Manifests as motor weakness of ulnar-innervated intrinsic muscles with intact sensation along the nerve distribution [5]
  - Zone III: just distal to bifurcation and contains superficial branch of ulnar nerve [6].
    - Manifests as sensory loss without hypothenar and interosseous weakness [5]
    - Most commonly caused by anomalous muscles or thrombosis of ulnar artery [5]

### Presentation

- Depends on anatomical zone of compression and may be purely motor, sensory, or both [5].
- Usually complaints of numbness and tingling in the small and ring fingers [5].
- Weakness of grip strength, ulnar-sided pain [5].
- Look for hypothenar or interossei wasting, clawing for inability to cross fingers, mass over dorsal, or volar wrist [5].
- Positive Phalen's test may be more accurate than positive Tinel sign [5].
- Objective sensory tests provide baseline information and severity [5].
  - Semmes-Weinstein monofilament test
  - 2-point discrimination test
- Vascular examination of the wrist can be useful [5].
  - Radial and ulnar pulses
  - Allen's test

- Radiographic views to rule out fracture [5].
- Electromyography and nerve conduction tests are used as confirmatory studies [5].

### Treatment

#### Nonsurgical

- Protective braces [5]
- NSAIDs [5]
- Discontinuation of provocative activities [5]

#### Surgical

- Indicated in cases of a motor deficit, compressive lesion, or failure of conservative treatment [5]
- Standard treatment involves: [5]
  - Surgical exploration
  - Removal of lesion
  - Decompression of ulnar tunnel

### Complications

- Mostly from surgery approach
- Injury to the motor or sensory ulnar nerve branches
- Injury to the ulnar artery and its branches

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