Cubital Tunnel Syndrome and Failed Cubital Tunnel Syndrome

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History

✓ **Cubit**

Ancient unit based on the forearm length from the middle finger tip to the elbow bottom
History

✓ 1878, Panas

Ulnar neuropathy across the elbow in a patient who had sustained an elbow fracture as a child and developed a tardy ulnar nerve palsy

✓ 1949, Magee and Phalen

First case of a spontaneous presentation of ulnar nerve symptoms across the elbow

✓ 1957, Osborne

A fibrous band bridging the 2 heads of the flexor carpi ulnaris (FCU) as a site of compression,

First to recommend a release of the cubital tunnel and anterior transposition of the nerve
Epidemiology

2nd most common entrapment neuropathy

Incidence: 25 per 100,000 person years
  ◦ USA: 75,000 cases annually
  ◦ World-wide: 1.5 million cases
Course of the Ulnar Nerve

1. Medial cord of the brachial plexus (C8-T1)
2. Traverse arcade of Struthers
3. Postcondylar groove, cubital tunnel
4. Between 2 head of Flexor carpi ulnaris
5. Muscular br. to medial 2 FDP
6. Guyon canal at the wrist
7. Palmar cutaneous br. : distal ulnar aspect of forearm
8. Dorsal cutaneous br: dorsal ulnar portion of hand
Anatomy of Cubital tunnel

- Roof: Cubital tunnel retinaculum (arcuate lig of Osborne), Taut on elbow flexion
- Floor: Capsule of elbow joint, Med. collateral ligament
- Osborne’s fascia:
  Common aponeurosis of FCL, fused with retinaculum
Site of compression of the Ulnar n.

1. Arcade of Struthers
2. Medial intermuscular septum
3. Medical epicondyle
4. Cubital tunnel; Osborne Lig.
5. Anconeus epitrochlearis
6. Fibrous band within FCL
7. Aponeurosis FDS
Blood supply of the Ulnar nerve

- Superior ulnar collateral a.
- Posterior ulnar collateral a.
- Inferior ulnar collateral a.

Fig. 3. Extrinsic blood supply to the ulnar nerve. IUCA, inferior ulnar collateral artery; PURA, posterior ulnar recurrent artery; SUCA, superior ulnar collateral artery. (From Prevel CD, Matloub HS, Ye Z, et al. The
Clinical findings

1. Numbness, tingling, and pain in the 4th and 5th fingers
2. Elbow pain and hand weakness
3. Motor Sx. may precede sensory Sx.
4. Loss of hand dexterity, a feeling of hand clumsiness, and frequent dropping of objects
5. Job: carpentry, painting
6. Sports: baseball, cycling, weightlifting, karate, cross-country skiing, and wrestling

Box 1

McGowan classification of ulnar nerve dysfunction

- Grade I: Sensory neuropathy only
- Grade II: Sensory and motor neuropathy, without muscle atrophy
- Grade III: Sensory and motor neuropathy, muscle atrophy present
Clinical findings

- ↓ sensation in the ulnar distribution of the hand (palmar and dorsal surfaces of the 5th finger)
- Muscle weakness
- Wartenberg sign: abduction of 5th finger at MP
- Elbow palpation: tenderness over ulnar nerve
Clinical findings

- Motor Strength Test
- Froment sign
Clinical findings

✔ Tinel sign: tapping over cubital tunnel provokes paresthesia in 5th finger (70% sensitivity)

✔ Pressure flexion test: paresthesia in 30sec (91% sensitivity)

✔ Check for ulnar nerve subluxation

✔ DDx
Imaging Studies

1. Plain radiograph
   - Fracture, deformity, osteophyte

2. MRI
   - Round hypointense structure surrounded by fat in T1WI, posterior to the medial epicondyle
   - Increased signal intensity on T2WI or STIR
   - Ulnar nerve subluxation/dislocation

3. USG
   - Cross sectional area \(0.10 \text{cm}^2\) or higher (93% sensitivity, 98% specificity)
- Osteophyte formation
- joint space reduction
- Ossified bodies (changes of degenerative disease)
• Ulnar nerve compression noted.
• Proximal odematous hypoechoic nerve segment is seen.
• Distal to site of compression nerve shows normal diameter and echopattern.
• Cross sectional area of nerve:
  Proximal to compression 1.2 mm, At compression site - 0.7 mm
• Asymptomatic ulnar nerve shows normal appearance.
Electrodiagnostics

✓ Confirm the diagnosis and to assess the severity of CuTS.

(1) Concomitant neuropathy of metabolic or nutritional origin
   ; Diabetic polyneuropathy

(2) Secondary sites of entrapment, such as C8 nerve root impingement
   ("double-crush synd.")

✓ Nerve conduction velocity (NCV) of the ulnar nerve ranges
   ; 47-65 m/sec (55 m/sec.)

✓ A reduction in velocity of less than 25% is probably insignificant.

✓ Greater than a 33% reduction in velocity certainly indicates a neuropathic process at the elbow
Differential Diagnosis

- **Spinal cord**
  - Cervical spondylotic myelopathy
  - Cervical syrinx
  - Cervical spinal cord tumor

- **Nerve root**
  - Motor neuron disease
  - C8 or T1 radiculopathy

- **Peripheral nerve**
  - Brachial plexus neuropathy ; **Thoracic outlet syndrome**
  - Ulnar nerve sheath tumor
  - Ulnar nerve entrapment ; Guyon’s canal,
    - Arcade of Struthers

- **Other**
  - Peripheral neuropathy
  - Medial epicondylitis
Treatment

1. Conservative Tx ; 50%
   ◦ Mild Sx, no motor weakness ; NASADS, Vit B6
   ◦ Avoid provoking activity (flexion, pressure)
   ◦ Splint for limit flexion

2. Operative Tx
   ◦ Simple decompression (w/wo epicondylectomy)
   ◦ Transposition (subcutaneous, submuscular, intramuscular)
Surface Surgical Anatomy

medial epicondyle, inferior ulnar collateral vessels (IUCA)

posterior branches of the medial antebrachial cutaneous nerve
In Situ Decompression

1. Unroofing of cubital tunnel
2. Shoulder 90° abduction, arm extension, forearm supination
3. 6-8 cm skin incision over ulnar nerve
4. Preserve br. of antebrachial cutaneous nerve
5. Identification of ulnar nerve, distal tracing with decompression (arcade of Struthers, med intermuscular septum – proximal edge of Flexor carpi ulnaris)
Endoscopic Cubital Tunnel Release
Medial Epicondylectomy

1. Total or subtotal medial epicondyle osteotomy

2. Ulnar nerve to move anterior to the axis of rotation of the elbow

Merit: remove possible source of nerve irritation

Cx: medial elbow stiffness or instability (overzealous resection)
Anterior Transposition

1. Complete ext. neurolysis (circumferential dissection)
2. Excision of distal medial intermuscular septum
3. Partial division of Flexor carpi ulnaris
4. Transposition: **Subcutaneous, Submuscular, Intramuscular**
   Fascial sling for subcut. transposition
   Isolation & division of flexor-pronator origin suture
   after nerve transposition
5. Arm sling for 3 weeks
Anterior Transposition ; Subcutaneous

Subcutaneous transposition:
The ulnar nerve is seen coursing under a sling that has been constructed from the fascia of the flexor-pronator mass.
Anterior Transposition; Submuscular

Submuscular transposition:

The z lengthening is planned with a marking pen.
The ulnar nerve can be seen coursing under the z-lengthened flexor-pronator mass

Immobilization; +
Anterior Transposition ; Intramuscular
The most prevalent factors that influence the decision to operate include evidence of **muscle atrophy (84%)**, **abnormal nerve conduction studies (51%)**, and **failed non-operative treatment (49%)**. Most surgeons (n=133) reported using more than one operative procedure for their patients with cubital tunnel syndrome. Factors that influenced the operative procedure selected included the **degree of nerve compression (60%)**, **medical comorbidities (30%)**, **patient’s occupation (28%)**, and **obesity (22%)**. Following carpal tunnel surgery, 88% of the surgeons were “very satisfied” with their patient outcome and following surgery for cubital tunnel syndrome, **only 44% were “very satisfied”** with their patient outcome. Most surgeons use more than one operative procedure in their treatment of patients with cubital tunnel syndrome and the selection of the operative procedure is influenced by patient factors and surgeon preference.
Results: Ten studies involving a total of 449 simple decompressions, 342 subcutaneous transpositions, and 115 submuscular transpositions were included.

Conclusion: In this study, we found no statistically significant difference, but rather a trend toward an improved clinical outcome with transposition of the ulnar nerve as opposed to simple decompression.
Complication and Failure

✓ Posterior br. of the medial antebrachial cutaneous nerve; endoscopic
  → painful scar or hyperesthesia in the medial forearm
✓ Persistent Sx; Incomplete release or Postoperative scarring
✓ Adhesion; Submuscular transposition because of m. detachment
✓ Subluxation of ulnar nerve; Simple decompression,
  Medial epicondylectomy
✓ Medial collateral ligament injury; Extensive Simple decompression,
  Medial epicondylectomy
Predictors of surgical revision after in situ decompression of the ulnar nerve

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Results: Revision surgery was required in 19% (44 of 231) of all in situ decompressions performed during the study period. Predictors of revision surgery included a history of elbow fracture or dislocation (odds ratio [OR], 7.1) and McGowan stage I disease (OR, 3.2). Concurrent surgery with in situ decompression was protective against revision surgery (OR, 0.19).

Discussion: The rate of revision cubital tunnel surgery after in situ nerve decompression should be weighed against the benefits of a less invasive procedure compared with transposition. When considering in situ ulnar nerve decompression, prior elbow fracture as well as patients requesting surgery for mild clinically graded disease should be viewed as risk factors for revision surgery. Patient factors often considered relevant to surgical outcomes, including age, sex, body mass index, tobacco use, and diabetes status, were not associated with a greater likelihood of revision cubital tunnel surgery.
Failed Surgery

- **Definition:** 1) Unchanged, 2) Recurred

- **Incidence:** Dellon; 20-35% -- severe compression
  - Bartels; simple decompression – 10.9%
  - subcutaneous transposition -14.6%
  - intramuscular – 10.0%, submuscular – 21%
- Mowlavi; recurrence – 4%, severe stage – 25%
Failed Ulnar Nerve Release at the Elbow

Table 1
Types of failure in primary ulnar nerve decompression with etiologies, work-up, and treatment options

<table>
<thead>
<tr>
<th>Patient Symptoms</th>
<th>Likely Etiologies</th>
<th>Workup</th>
<th>Treatment Options/Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>No change in symptoms</td>
<td>Incorrect diagnosis</td>
<td>History and physical examination, nerve study (if one had not been done) or repeat study, cervical and/or wrist magnetic resonance imaging</td>
<td>Treatment for secondary compression or alternative diagnosis</td>
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<tr>
<td>Incomplete decompression or new site of compression</td>
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<td>Consider repeat nerve study</td>
<td></td>
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<tr>
<td>Significant nerve damage before index procedure</td>
<td></td>
<td>Repeat nerve study to document nerve improvement</td>
<td></td>
</tr>
<tr>
<td>Resolved, then recurred</td>
<td>Perineural fibrosis</td>
<td>Repeat nerve study</td>
<td>Revision decompression</td>
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Table 2
Reasons for failure of primary ulnar nerve release at the elbow

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<tr>
<th>Diagnostic</th>
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<tbody>
<tr>
<td>Incorrect diagnosis</td>
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<td>Coexisting sites of compression</td>
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</table>

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<tr>
<th>Technical</th>
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<tbody>
<tr>
<td>Inadequate decompression</td>
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<tr>
<td>Creation of new sites of compression during transposition</td>
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<tr>
<td>Persistent or new ulnar nerve subluxation/instability</td>
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<tr>
<td>Injury to ulnar nerve or medial antebrachial cutaneous nerves</td>
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<th>Biologic</th>
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<tr>
<td>Perineural fibrosis/cicatrix</td>
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<tr>
<td>Chronic, severe distal sensory and motor changes</td>
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<td>Elbow stiffness</td>
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SUMMARY

✓ Cubital tunnel syndrome is common but not fully understood.
✓ Firstly Non surgical treatment
✓ Careful diagnosis : Differential DX ., Double crash syndr.
  ( Radiculopathy, Thoracic outlet synd., Guyan canal Dis.)
✓ Multiple sites of compression – Difficult to treat ;
✓ Complete decompression be performed
  from the arcade of Struthers to the flexor pronator aponeurosis
  and the nerve be placed in a compression-free.
Thank you !!