The Role of Patient Demographics and Diagnostic Testing in the Surgical Decision Making for Treatment of Mild and Moderate Cubital Tunnel Syndrome

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Disclosures

I have no financial interests or conflicts to declare regarding any topic in this presentation.

Background

CuTS Overview:

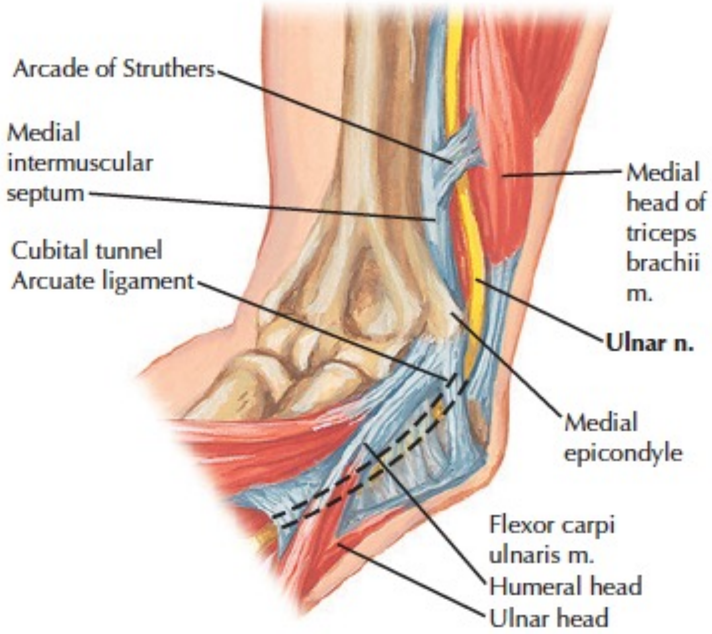
- Compression of the ulnar nerve (UN) at the elbow as it passes behind the medial epicondyle of the humerus
- Pain and loss of sensation in the distribution of the nerve at the ring and little fingers and atrophy in severe cases
- Diagnosed clinically based on the patient's history and physical exam

Treatment of CuTS:

- Non-operative: NSAIDs. Nighttime Elbow Splint, activity modification
- Operative: in-situ decompression, medial epicondylectomy, and anterior transposition

Indications for Surgery:

- PE ± McGowan ± US ± EMG[1,2]
- It depends on the surgeon[3]



Netter's Concise Orthopaedic Anatomy 2nd Ed

Study Overview

Question

- Is there anything that we have yet to recognize that can better guide surgeons on how to optimize treatment (surgical vs non-op)?

Significance

- Cubital tunnel syndrome is the second most common neuropathy of the upper extremity[4]
- There has been a consistent increase in surgical intervention for CuTS[5,6]
- The lack of diagnostic precision to determine who should have surgery has not been addressed in the literature.

Methodology

- **Design**
  - Retrospective Review of Prospectively collected data
  - Single-institution orthopedic practice
  - All patients who received evaluation for CuTS from December 2016 to October 2021
- **Inclusion Criteria**
  - Upper extremity EMG and US
- **Exclusion Criteria**
  - Trauma
  - Prior ulnar nerve surgery
  - Diabetes, hypothyroidism, brachial plexopathy, or C7-T1 cervical radiculopathy

Methodology

- **AIM and Hypothesis**
  - Test the null hypothesis that there is no difference in demographic or clinical characteristics between patients who received surgical and non-surgical treatment for cubital tunnel syndrome.
- **Analysis**
  - Variables of Interest
    - Demographics
    - Clinical findings
    - Diagnostic test findings (NCS, Ultrasound)
    - Co-existing carpal tunnel syndrome or radiculopathy
  - Student's t-test
  - Mann-Whitney U Test
  - Chi-Squared or Fisher's Exact Test
  - Logistic regression model was used to analyze the association between surgery and covariates of interest

Table 1A: Electrodiagnostic Severity Categorization (Padua)

	Motor nerve conduction velocity	Sensory nerve action potential
Normal	Normal (50+m/s)	Normal (10+µV)
Mild	Normal	Reduced (<10µV)
	Reduced (<50 m/s)	Normal
Moderate	Reduced	Reduced
Severe	Absent	Absent

Table 1B: McGowan Categorization

Mild	Parasthesias, No Muscle Weakness
Moderate	Muscle weakness, but no atrophy
Severe	Atrophy

Results: Our Cohort

- Majority male
- Right-hand dominant
- Unilateral symptoms
- Mean age was 51 years old

Table 2: Demographic Characteristics of 73 Patients Presenting with Cubital Tunnel Syndrome (2016-2022)

Sex		
	Female	35 (48)
	Male	38 (52.1)
Side Dominant		
	Left	10 (13.7)
	Right	63 (86.3)
Dominant Affected		
	No	28 (38.4)
	Yes	45 (61.6)
Bilateral		
	No	41 (56.2)
	Yes	32 (43.8)
Cervical		
	No	66 (90.4)
	Yes	7 (9.6)
Age (years; mean (SD))		50.6 (14.3)
Height (cm; mean (SD))		78.2 (16.2)
Weight (kg; mean (SD))		170.4 (9.9)
Body Mass Index (kg/m^2; mean (SD))		26.9 (4.7)

Results: Bivariable analysis by Surgical treatment

Surgical patient more often had:

- Positive electrodiagnostic findings
  - CVm <50m/s
  - CVm difference >10m/s
- Abnormalities on US
  - Described as segmental thickening or nerve enlargement
- Higher body weight than non-surgical patients

Table 3 : Clinical Characteristics of Cases with Mild and Moderate Cubital Tunnel Syndrome by Surgical Treatment

	Surgical Treatment, n (%)			
	No	**Yes**	**Total**	**P-Value**
Sex				0.126
Female	40 (51.9)	9 (34.6)	49 (47.6)	
Male	37 (48.1)	17 (65.4)	54 (52.4)	
Dominant Affected				0.177
No	27 (35.1)	13 (50)	40 (38.8)	
Yes	50 (64.9)	13 (50)	63 (61.2)	
McGowan Grade				1
Mild	68 (88.3)	23 (88.5)	91 (88.3)	
Moderate	9 (11.7)	3 (11.5)	12 (11.7)	
Two- Point Discrimination				0.068
<=5mm	42 (54.5)	12 (46.2)	54 (52.4)	
5+mm	11 (14.3)	9 (34.6)	20 (19.4)	
UN Hypermobility				0.216
No	32 (42.1)	5 (19.2)	37 (36.3)	
Yes	44 (57.9)	21 (80.8)	65 (63.7)	
US Abnormality				0.036
No	32 (42.1)	5 (19.2)	37 (36.3)	
Yes	44 (57.9)	21 (80.8)	65 (63.7)	
Positive Electrodiagnostic Findings				0.011
No	54 (70.1)	11 (42.3)	65 (63.1)	
Yes	23 (29.9)	15 (57.7)	38 (36.9)	
CV Nerve <50m/s				0.011
No	56 (76.7)	12 (48)	68 (69.4)	
Yes	17 (23.3)	13 (52)	30 (30.6)	
CV Different Forearm-Elb> 10m/s				0.03
No	53 (72.6)	12 (48)	65 (66.3)	
Yes	20 (27.4)	13 (52)	33 (33.7)	
CSA at CuT Inlet				0.335
4.9-9.7	28 (46.7)	7 (31.8)	35 (42.7)	
10-14	19 (31.7)	7 (31.8)	26 (31.7)	
14.4-34	13 (21.7)	8 (36.4)	21 (25.6)	
Electrodiagnostic Severity				0.1
Normal	48 (62.3)	11 (42.3)	59 (57.3)	
Mild-Moderate	22 (28.6)	9 (34.6)	31 (30.1)	
Severe	7 (9.1)	6 (23.1)	13 (12.6)	
Age (years; mean (SD))	51.1 (13.6)	51.7 (17.5)	6.7 (1.8)	0.71
Weight (kg; mean (SD))	76.4 (16.4)	83.3 (15.2)	13.1 (6.2)	0.043
Body Mass Index (kg/m^2; mean (SD))	26.6 (4.7)	27.9 (4.5)	7.3 (2.9)	0.181

Results: Bivariable analysis by Electrodiagnostic Severity

- 59 cases were electrodiagnostically normal, 31 mild-moderate, and 13 severe.
- 29 electrodiagnostically normal cases had positive findings of CuTS on US.
- Males more commonly presented as mild-moderate or severe while
- Cases involving the dominant hand were more often electrodiagnostically normal or mild-moderate while the those involving the non-dominant hand were more often severe.
- Abnormalities on US were more often noted among mild-moderate and severe cases and equally in normal cases.
- Most mild-moderate and severe cases had slowing of CVm across the elbow.
- CVm difference was apparent in 87% of severe, 52% of mild-moderate, and 17% of normal cases.
- Normal cases were mostly found with UN CSA of 4.9-9.7mm^2 while severe cases were mostly found with UN CSA of 14-34mm^2.
- Patients with severe cases were older and taller than patients than those who were electrodiagnostically normal and only taller than those with mild-moderate cases

Table 4 : Clinical Characteristics of Cases with Minimal and Intermediate Cubital Tunnel Syndrome by Electrodiagnostic Severity

	Electrodiagnostic Severity, n (%)				
	Normal	**Mild-Moderate**	**Severe**	**Total**	**P-Value**
Surgery					0.09
No	48 (81.4)	22 (71)	7 (53.8)	77 (74.8)	
Yes	11 (18.6)	9 (29)	6 (46.2)	26 (25.2)	
Sex					0.008
Female	35 (59.3)	12 (38.7)	2 (15.4)	49 (47.6)	
Male	24 (40.7)	19 (61.3)	11 (84.6)	54 (52.4)	
Dominant Affected					0.006
No	17 (28.8)	13 (41.9)	10 (76.9)	40 (38.8)	
Yes	42 (71.2)	18 (58.1)	3 (23.1)	63 (61.2)	
McGowan Grade					0.77
Mild	51 (86.4)	28 (90.3)	12 (92.3)	91 (88.3)	
Moderate	8 (13.6)	3 (9.7)	1 (7.7)	12 (11.7)	
Two-Point Discrimination					0.18
<=5mm	32 (54.2)	19 (61.3)	3 (23.1)	54 (52.4)	
5+mm	10 (16.9)	5 (16.1)	5 (38.5)	20 (19.4)	
US Abnormality					0.002
No	29 (50)	7 (22.6)	1 (7.7)	37 (36.3)	
Yes	29 (50)	24 (77.4)	12 (92.3)	65 (63.7)	
CV Nerve <50m/s					<0.001
No	59 (100)	8 (25.8)	1 (12.5)	68 (69.4)	
Yes	0 (0)	23 (74.2)	7 (87.5)	30 (30.6)	
CV Different Forearm-Elb> 10m/s					<0.001
No	49 (83.1)	15 (48.4)	1 (12.5)	65 (66.3)	
Yes	10 (16.9)	16 (51.6)	7 (87.5)	33 (33.7)	
CSA Cubital Tunnel>10mm					0.016
No	26 (57.8)	8 (30.8)	2 (18.2)	36 (43.9)	
Yes	19 (42.2)	18 (69.2)	9 (81.8)	46 (56.1)	
CSA at CuT Inlet					
4.9-9.7	26 (57.8)	7 (26.9)	2 (18.2)	35 (42.7)	0.03
10-14	12 (26.7)	10 (38.5)	4 (36.4)	26 (31.7)	
14.4-34	7 (15.6)	9 (34.6)	5 (45.5)	21 (25.6)	
Age (years; mean (SD))	49.1 (14.8)	51.2 (12.8)	61.2 (14.9)	51.3 (14.6)	Normal vs Mild:0.786 Normal vs Severe:0.019 Mild vs Severe:0.092
Height (cm; mean (SD))	169.9 (9)	168.2 (10.9)	174.5 (9.4)	170 (9.7)	Normal vs Mild :0.666 Normal vs Severe:0.002 Mild vs Severe:0.016

Results: Clinical Characteristics Associated with Surgery

- Final logistic regression model only included electrodiagnostic severity
- Electrodiagnostically **severe** cases had **3.7 times higher odds** of being surgically treated than those who were electrodiagnostically normal (OR: 3.7, 95%CI: 1.11-12.6; p=0.03).

Discussion

- **This analysis showed**
  - Logistic regression showed that electrodiagnostically severe cases had higher odds of being surgically treated than their electrodiagnostically normal counterparts
- **Rejected** the Null hypothesis that Neither clinical findings nor current diagnostic criteria would predict the decision for surgical or non-surgical treatment in patients with mild to moderate cubital tunnel syndrome
- **Appraisal of Methodology**
  - **Strengths**
    - Single-surgeon orthopedic practice
    - Variable Selection
  - **Limitations**
    - Retrospective Analysis
    - McGowan Grade
    - Sample size

Citations

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