



FUNCTIONAL OUTCOMES AFTER SINGLE VS. DOUBLE NERVE LACERATIONS IN THE DISTAL VOLAR FOREARM

Ryan Bucknam, MD^{1,2}; John C. Dunn, MD²; Isaac Fernandez, MD¹; Gilberto Gonzalez, MD¹

¹Department of Orthopaedic Surgery, Texas Tech University Health Sciences Center El Paso, Paul L. Foster School of Medicine

²Department of Orthopaedic Surgery, William Beaumont Army Medical Center, El Paso, TX



William Beaumont Army Medical Center

TEXAS TECH UNIVERSITY HEALTH SCIENCES CENTER EL PASO

Introduction

- Despite a meticulous microsurgical nerve repair the results can be disappointing in terms of return to work on manual workers to their pre-injury work and it depends on what nerve or nerves are involved and the level of injury.
- The purpose of this study was to determine the differences in functional scores and return to work between patients who sustain injury to single major nerve (Median or Ulnar) versus a combined injury to those two major nerves

Methods

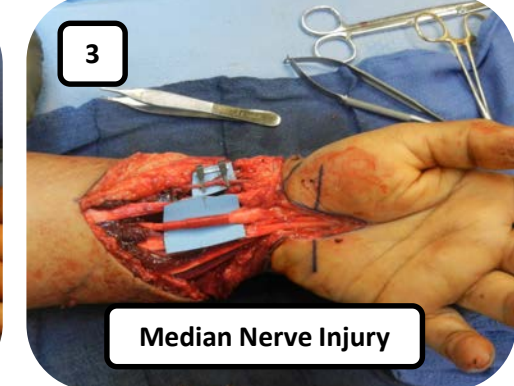
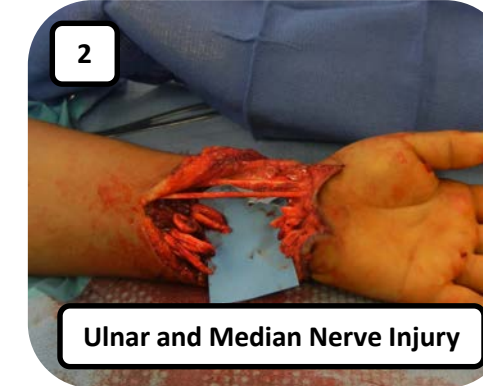
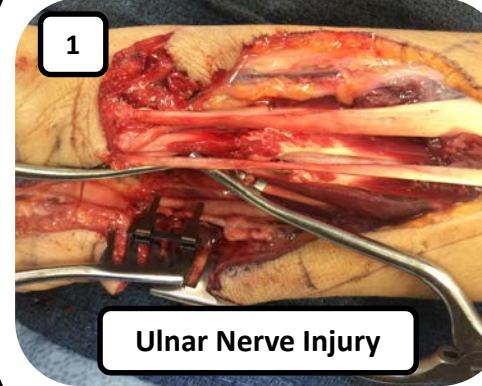
- IRB approved, retrospective review of 93 patients who were treated for an acute, sharp and complete distal forearm laceration of the median, ulnar, or combined median and ulnar nerves
- Inclusion criteria:**
 - Female or male patients between the ages of 18-45 years old with a minimum 1 year follow up
- Exclusion criteria:**
 - Patients with comorbidities, concomitant fractures, skin coverage deficit, drug abuse history, previous injuries on the same site, radial nerve injuries, or other injuries besides the forearm were excluded.
- Groups** were divided into **Ulnar**, **Median** or combined **Ulnar and Median** nerve injury.
- Patients were evaluated at 6 and 12 months to determine if they returned to work without restrictions.
- Primary outcomes:**
 - Return to work (RTW), QuickDash, VAS scores, grip strength, pinch strength
- Secondary outcomes:**
 - 2-point discrimination, muscle strength rated using MRC, sensation rated using MSC, cold sensitivity, functional and RTW when controlling for certain demographic variables
- Multiple logistic regression was conducted to determine in any variables were predictive of RTW

Group Demographics

	Median Nerve (n=22)	Ulnar Nerve (n=27)	Combined Nerve Injury (n=12)	P-value
Age in years <i>Median [IQR*]</i>	35.5 ^A [27.5-40.8]	29.0 [24.0-36.0]	23.0 ^A [20.0-31.0]	0.037**
Gender				
Male	14	8	7	0.262
Female	8	19	5	
Mechanism of Injury				
Broken Glass	2 ^{A,δ}	15 ^δ	7 ^A	0.006**
Motor Vehicle Accident	2 ^{A,δ}	2 ^δ	2 ^A	
Work Accident	6 ^{A,δ}	3 ^δ	1 ^A	
Suicide Attempt	12 ^{A,δ}	7 ^δ	2 ^A	
Occupation				
Office	7	7	0	0.077
Manual Labor	15	20	12	
Worker's compensation				
Yes	4	5	2	0.990
No	18	22	10	
Time to surgery (hours) <i>Median [IQR]</i>	17.5 ^A [13.0-21.5]	12.0 ^δ [8.0-21.50]	6.0 ^{A,δ} [4.0-7.0]	<0.001**
Associated Vascular Injuries	10 ^A	15 ^δ	12 ^{A,δ}	0.003**
Tendons Lacerated^δ	FCU, FDP, FDS	FCR, FPL, PL	FCU, FDP, FDS, FCR, FPL, PL	
Injury and Hand dominance				
Dominant hand	17 ^A	24 ^δ	4 ^{A,δ}	0.002**
Non-dominant hand	5	3	8	

*IQR= interquartile range; §FCU= Flexor carpi ulnaris; FDP= Flexor digitorum profundus; FDS= Flexor digitorum superficialis; FCR= Flexor carpi radialis; FPL= Flexor Pollicis Longus; PL= Palmaris Longus; **indicates significant p-value according to α=0.05; Δ,δ indicate significant differences between corresponding groups for the given variable on post-hoc analysis

Figures 1-3



Functional outcomes

	Median Nerve (n=22)	Ulnar Nerve (n=27)	Combined Nerve Injury (n=12)	Median Nerve (n=22)	Ulnar Nerve (n=27)	Combined Nerve Injury (n=12)
	6 months			12 months		
Return to work						
Yes	19 (86%) ^A	21 (78%) ^δ	4 (33%) ^{A,δ}	21 (95%)	24 (89%)	9 (75%)
No	3 (14%) ^A	6 (22%) ^δ	8 (67%) ^{A,δ}	1 (5%)	3 (11%)	3 (25%)
	p = 0.005**			p = 0.208		
VAS scores						
<i>Median [IQR]</i>	2.5 ^A [2.0-3.0]	4.0 ^A [3.0-5.5]	3.5 [3.0-4.5]	1.0 ^δ [1.0-2.0]	2.0 ^δ [1.5-3.0]	2.0 [1.8-3.3]
	p = 0.009**			p = 0.022**		
QuickDASH						
<i>Mean (SD)^δ</i>	49.8 (3.8)	49.4 (4.2) ^δ	64.4 (2.9) ^{A,δ}	29.1 (5.0)	31.0 (5.6)	37.9 (2.8) ^{A,δ}
	p < 0.001**			p < 0.001**		
Grip Strength (psi)						
	67.5 ^A [51.3-75.0]	65.0 [45.0-77.5]	42.5 ^A [40.0-56.3]	100.0 ^A [75.0-108.8]	105.0 ^δ [67.5-115.0]	67.5 ^{A,δ} [63.8-83.8]
	p = 0.007**			p = 0.012**		
Pinch Strength (psi)						
	9.5 ^A [8.3-12.0]	11.0 ^δ [8.0-12.5]	6.50 ^{A,δ} [5.8-8.0]	16.5 ^A [11.0-18.0]	16.0 [10.0-17.0]	10.5 ^A [9.0-14.3]
	p < 0.001**			p = 0.024**		

**indicates significant p-value according to α=0.05; §SD= standard deviation; *IQR= interquartile range; Δ,δ,δ indicate significant differences between corresponding groups for the given variable in a given time frame on post-hoc analysis

Results

- 61 patients (N=32 Female) were included in the study
- Multiple Logistic regression did not identify age, nerve(s) injured, mechanism of injury, worker's compensation, associated vascular injuries as significant predictors of RTW
- When controlling for worker's compensation status, mechanism of action, or gender each group was similar in terms of QuickDASH, VAS, and RTW (p>0.05)
- Office workers RTW sooner and lower Quick DASH scores compared to their manual labor counterparts
- Injury to a dominant extremity appeared to influence 6 month QuickDASH scores, but not RTW or VAS at 6 or 12 months
- Patients with associated vascular injuries demonstrated a significantly lower RTW ---59% vs 92% and 81% vs 100% at 6 and 12 months, respectively (p=0.008, p=0.036)

Conclusions

- Functional recuperation appears to be similar after Ulnar nerve or Median Nerve Injury
- Patients with combined Nerve Injuries have significantly different early rates of RTW compared to single nerve injuries, but similar rates of RTW at final follow up
- Functional recuperation in terms of subjective and objective measures appears to be worse in patients suffering injury to both the Median and Ulnar nerves at early and final follow up
- Factors demonstrated to affect RTW include vascular injuries associated with the volar forearm lacerations and an office occupation