Trends and Outcomes Between Direct Nerve Repair and Nerve Graft for the Treatment of Upper Extremity Peripheral Nerve Injury: Nationwide Analysis between 2002 and 2014

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Introduction

- Improvements in operative technique, materials, and grafts over the past decade
- Purpose was to compare trends, demographics and outcomes of nerve graft and nerve suture procedures after upper extremity peripheral nerve injury.

Methods

- National Inpatient Sample (NIS) between 2002 and 2014
- ICD-9-CM Diagnosis Codes for Axillary (955.0), Median (955.1), Ulnar (955.2), RADIAL (955.3), Musculocutaneous (955.4), Cutaneous (955.5), Digital (955.6) Nerves

Methods

- ICD-9-CM Procedure codes for nerve graft (045) or nerve suture (043)
- Variables of age, sex, insurance, comorbidities, hospital setting, length of stay, total charges, complications
- Regression analyses performed with P Values <0.05 considered significant

Table 1

Table 1: Patient, Injury, and Hospital Variables Associated with Nerve Graft compared to Nerve Suture

	Odds Ratio†	95% Confidence Limits		P-Value
Demographics				
Private Insurance (vs. other)	1.27	1.08	1.50	0.004*
White (vs. Non-white)	1.17	1.00	1.37	0.045*
Age (<19 vs 19-64 vs ≥ 65	1.00	0.99	1.01	0.28
Female (vs. male)	0.77	0.63	0.95	0.013*
Injury Characteristics				
Sensory Nerve (vs. mixed)	0.79	0.67	0.92	0.003*
Year of Injury (2009-14 vs 2002-08)	1.10	1.07	1.12	<0.001*
Hospital Characteristics				
Teaching (vs. Non-Teaching)	2.02	1.63	2.49	<.0001*
Private (vs. Public)	0.95	0.84	1.08	0.46
Size	1.01	0.78	1.32	0.94

*p<0.05 considered to statistically significant
†Multivariable regression controlled for: nerve type, age, nerve type, sex, year of admission, insurance status, and hospital type.

Results

- 128,118 nerve injuries between 2002 and 2014
- Proportion of injuries undergoing surgery remained consistent (p=0.231)
- Suture repair decreased from 5,189 (94.7%) to 2,630 (85.4%) (p<0.001) (Figure 1)
- Graft repair increased from 288 (5.26%) to 450 (14.6%) (p<0.001) (Figure 1)
- Injuries in more recent years, private insurance, white, mixed nerve, and teaching hospitals more likely to undergo graft repair (p<0.001) (Table 1)
- Total charges, length of stay, and cost were significant greater with graft repair (p<0.001) (Table 2)

Table 2

Table 2: Comparison of Outcomes between Nerve Graft and Nerve Suture

	Graft (N=4,536)		Suture (N=52,780)		
	Mean	Std Error	Mean	Std Error	P-Value
Total Charges, $	$73,603	$4,057	$36,117	$1,820	<.0001*
Length of Stay, days	5.46	0.22	2.97	0.08	<.0001*
Complication Rate	11.52%	1.07%	3.64%	0.23%	<.0001*

Multivariable regression for Graft placement compared to Suture

	Estimate of Effect†	Standard Error	Odds Ratio†	95% Confidence Limits		P-Value
Total Charges	$33,708	$3,243				<.0001*
Length of Stay	2.51	0.24				<.0001*
Complication Rate			3.36	2.64	4.20	<.0001*

*p-value <0.05 considered statistically significant
† Controlled for graft placement, nerve type, age, nerve type, sex, year of admission, insurance status, and hospital type

Figure 1

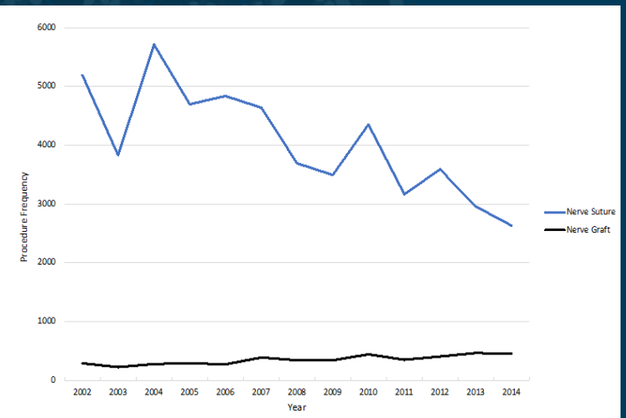

Figure 1. Trend of nerve suture and nerve graft procedures between 2002 and 2014.

Conclusion

- Upper extremity nerve injuries over 12 years saw a decrease in suture and increase in graft repair
- Increased graft placement in white, males, mixed nerve injury, private insurance, teaching hospitals, and more recent injuries
- Graft repair demonstrated increased complications, cost, and length of stay
- Further research and outcome studies needed in nerve repair for cost-effective options to be available to a wide demographic of patients in different healthcare settings