Original Article

Electrodiagnostic Evaluation of Prognostic Factors Influencing the Surgical Outcomes of Upper Extremity Nerve Injuries Caused by Penetrating Trauma: A Cross-sectional Study

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ABSTRACT

Background: Peripheral nerve damage is a major cause of disability, which can lead to serious limitations in daily and occupational activities. Although primary repair can restore the function of the damaged organ remarkably, factors predicting the prognosis of nerve repair are a topic of constant debate. We aimed to investigate the factors affecting the outcomes of primary nerve repair in patients afflicted by upper extremity nerve injuries following penetrating trauma.

Methods: This cross-sectional study was conducted on 51 patients referred to Shohada-ye Ashayer Hospital in Khorramabad, Iran, from 2016 to 2021. Data including the patient's age, gender, education, type, severity, and mechanism of injury, the damaged nerve, time and of method repair, the surgeon's specialty, as well as the electrodiagnostic findings, were collected and analyzed using SPSS software version 22.

Results: The mean age of the patients was 30.41 ± 12.63 years, and the majority of them (84.3%) were men. A significant relationship was found between the sensory amplitude with education (P=0.002), the type of damaged nerve (P=0.048), and the severity of injury (P=0.012). The positive sharp wave was significantly associated with the surgeon's specialty (P=0.034). Besides, the motor amplitude was considerably related to the patient's age (P=0.040) and the surgeon's specialty (P=0.035).

Conclusion: Factors determining the outcome of peripheral nerve repair following penetrating trauma to the upper extremity include age, education, the type of damaged nerve, the severity of the injury, and the surgeon's specialty.

KEYWORDS
Peripheral nerve; Upper extremity; Electrodiagnosis; Penetrating trauma

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INTRODUCTION

Peripheral nerve injuries are a common neurosurgical condition that can attenuate motor and sensory functions, resulting in physical disability [1]. About 20 million Americans are afflicted by peripheral nerve injuries each year, resulting in an annual cost of 150 billion dollars [2, 3]. Peripheral nerve injuries can be caused by different mechanisms such as trauma and iatrogenic interventions. However, most cases of nerve damage in the upper limbs are caused by trauma [1, 4]. These injuries occur mostly in young active individuals and diminish their quality of life [1, 5]. The impaired nerve fibers can regenerate spontaneously, however, this ability is limited by the size of the nerve defect, as well as the formation of neuroma and scar, denoting the importance of early nerve reconstruction[6, 7].

The reconstruction of impaired peripheral nerves is critical for the achievement of a decent regeneration. Nevertheless, recovery from the injuries is usually dissatisfying. Besides the complications of reconstruction, ambiguity in the prognostic factors is a substantial challenge. Early surgical intervention in affected individuals based on their profile of prognostic factors can ameliorate the outcomes of peripheral nerve injury [8]. Some modifiable and unmodifiable factors such as age, gender, educational level, type of damaged nerve, and site of the injury have been attributed to the success rate of nerve repair [8, 9]. However, the outcomes of nerve reconstruction have been seldom examined using valid and reliable tools [10].

Electrodiagnostic studies, including electromyography (EMG) and nerve conduction velocity (NCV), are considered the gold standard for detecting nerve injuries and predicting the outcomes of their reconstruction [11]. Given the infrequent use of valid and reliable tools to determine the factors affecting the outcomes of primary nerve repair in previous studies, we aimed to design to examine the prognostic factors for the outcomes of primary nerve repair in patients afflicted by upper extremity nerve injuries following penetrating trauma.

METHOD AND MATERIALS

Study design and participants

This was a descriptive cross-sectional study conducted at the Shohada-ye Ashayer Hospital in Khorramabad, Iran, from 2016 to 2021. The inclusion criteria were undergoing primary nerve repair following upper extremity nerve injuries caused by penetrating trauma. The patients were excluded if their medical files were incomplete. The sampling method was census and 51 patients who met the inclusion criteria were included.

Data collection

After obtaining written and informed consent, data including the patient's age, gender, educational level, type, severity, and mechanism of injury, type of damaged nerve, time and of method repair, and the surgeon's specialty were collected from the patient's medical files. All patients were examined using EMG and NCV tests by the same neurologist. Then, the findings were registered into a researcher-made checklist.

Data analysis

The collected data were analyzed using SPSS software version 22 (IBM Corp., Armonk, NY, USA). Descriptive statistics tools including contingency tables, frequency, and percentage as well as mean and standard deviation and were used to describe the data. Furthermore, the Chi-square test was used to examine the relationship between categorical variables. The significance level was considered <0.05 for all statistical tests.

Ethical considerations

This study was approved by the Research Ethics committee of Lorestan University of Medical Sciences with the ethical IR.LUMS.REC.1399.381. Written informed consent was obtained from all participants in this study. The checklists were designed anonymously and patients' personal information was kept confidential.

RESULTS

Fifty-one patients with upper limb nerve injuries due to penetrating trauma were studied. The mean age of the patients was 30.41 ± 12.63 with a minimum age of 11 and a maximum of 68 years. Other demographic characteristics are shown in Table 1.

The frequency distribution of EMG/NCV findings in patients is shown in Table 2. Motor amplitude was normal in 11 patients, while showed a ≤50%

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Table 1: Frequency distribution of demographic variables in patients with the upper limb nerve injury

Variable		Frequency	Percentage
Gender	Female	8	15.7
	Male	43	84.3
Age (years)	≤30	29	56.9
	30<	22	43.1
Underlying diseases	Yes	6	11.8
	No	45	88.2
Educational level	Lower than a high school diploma	31	60.8
	High school diploma	15	29.4
	College or university degree	5	9.8
Place of residence	Urban	41	80.4
	Rural	10	19.6

Table 2: Frequency distribution of EMG/NCV findings in patients with the upper limb nerve injury

Variable		Frequency	Percentage
Motor amplitude	Normal	11	21.6
	≤50% decrease	7	13.7
	50%< decrease	8	15.7
	None	25	49.0
Sensory amplitude	Normal	7	13.7
	Decreased	5	9.8
	None	39	76.5
Positive sharp wave	No	22	43.1
	Yes	29	56.9
Polyphasic wave	No	26	51.0
	Yes	25	49.0

decrease in 7, and a 50%< decrease in 8 subjects. Sensory amplitude was normal in 7 patients and reduced in 5 patients.

As shown in Table 3, the frequency of patients with no motor amplitude was higher in those aged >30 years (n=13; 59.1%) The statistical analysis showed a significant relationship between motor amplitude and age (*P*=0.040). Besides, there was a significant association between motor amplitude and surgeon's specialty (*P*=0.035). As the patients operated by plastic surgeons had the highest frequency of normal motor amplitude (n=10; 34.5%).

However, there was no significant relationship between motor amplitude with gender (*P*=0.845), place of residence (*P*=0.347), educational level (*P*=0.604), damaged organ (*P*=0.111), the severity of nerve damage (*P*=0.295), mechanism of injury (*P*=0.727), damaged nerve (*P*=0.561), duration between injury and repair (*P*=0.357), and duration between repair and electrodiagnostic studies (*P*=0.097).

As shown in Table 4, three patients (7.1%) with complete nerve injury had normal sensory amplitude while four patients (44.4%) with partial injury showed normal amplitude. The analysis revealed a significant relationship between the severity of nerve damage (*P*=0.012). There was also a remarkable relationship between sensory amplitude and damaged nerve (*P*=0.048). As eleven patients with ulnar injuries (91.7%) showed no sensory amplitude. Patients with an educational level lower than a high school diploma had the lowest rate of normal sensory amplitude (n=2; 6.5%), and there was a significant relationship between sensory amplitude and educational level (*P*=0.002).

However, there was no significant relationship between sensory amplitude with gender (*P*=0.232), place of residence (*P*=0.813), damaged organ

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(P=0.679), mechanism of injury (P=0.199), age (P=0.886), duration between injury and repair (P=0.348), duration between repair and electrodiagnostic studies (P=0.870), and surgeon's specialty (P=0.400).

As shown in Table 5, there was a significant relationship between positive sharp waves with damaged organs (P=0.007). Arm and Forearm injuries were associated with the highest frequency of positive sharp waves. (n=1; 100% and n=12;

Table 3: Relationship between motor amplitude and patient's characteristics

Variable			Motor amplitude				*P*-value
			Normal	≤50% decrease	50%< decrease	None	
Gender	Male	Frequency	9	6	6	22	0.845
		Percentage	20.9	14.0	14.0	51.2	
	Female	Frequency	2	1	2	3	
		Percentage	25.0	12.5	25.0	37.5	
Place of residence	Urban	Frequency	9	5	5	22	0.347
		Percentage	22.0	12.2	12.2	53.7	
	Rural	Frequency	2	2	3	3	
		Percentage	20.0	20.0	30.0	30.0	
Educational level	College or university degree	Frequency	2	1	0	2	0.604
		Percentage	40.0	20.0	.0	40.0	
	High school diploma	Frequency	1	2	3	9	
		Percentage	6.7	13.3	20.0	60.0	
	Lower than a high school diploma	Frequency	8	4	5	14	
		Percentage	25.8	12.9	16.1	45.2	
Damaged organ	Wrist	Frequency	9	5	7	11	0.111
		Percentage	28.1	15.6	21.9	34.4	
	Forearm	Frequency	2	1	0	11	
		Percentage	14.3	7.1	.0	78.6	
	Elbow	Frequency	0	0	0	1	
		Percentage	.0	.0	.0	100.0	
	Arm	Frequency	0	1	0	0	
		Percentage	.0	100.0	.0	.0	
	Shoulder	Frequency	0	0	1	2	
		Percentage	.0	.0	33.3	66.7	
Severity of nerve damage	Complete	Frequency	7	5	7	23	0.295
		Percentage	16.7	11.9	16.7	54.8	
	Partial	Frequency	4	2	1	2	
		Percentage	44.4	22.2	11.1	22.2	
Mechanism of injury	Cut	Frequency	9	7	7	23	0.727
		Percentage	19.6	15.2	15.2	50.0	
	Crushing	Frequency	2	0	1	2	
		Percentage	40.0	.0	20.0	40.0	
The damaged nerve	Radial	Frequency	4	2	0	6	0.561
		Percentage	33.3	16.7	.0	50.0	
	Median	Frequency	5	4	5	13	
		Percentage	18.5	14.8	18.5	48.1	
	Ulnar	Frequency	2	1	3	6	
		Percentage	16.7	8.3	25.0	50.0	
Age (years)	≤30	Frequency	5	7	5	12	0.040
		Percentage	17.2	24.1	17.2	41.4	
	30<	Frequency	6	0	3	13	
		Percentage	27.3	.0	13.6	59.1	

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Variable			Motor amplitude				*P*-value
			Normal	≤50% decrease	50%< decrease	None	
Duration between injury and repair (days)	1	Frequency	8	4	4	8	0.357
		Percentage	33.3	16.7	16.7	33.3	
	2	Frequency	1	0	1	2	
		Percentage	25.0	.0	25.0	50.0	
	3	Frequency	2	2	1	6	
		Percentage	18.2	18.2	9.1	54.5	
	4≤	Frequency	0	1	2	9	
		Percentage	.0	8.3	16.7	75.0	
Duration between repair and electrodiagnostic studies (months)	≥2	Frequency	1	0	0	0	0.097
		Percentage	100.0	.0	.0	.0	
	2-4	Frequency	5	0	2	6	
		Percentage	38.5	.0	15.4	46.2	
	≥4	Frequency	5	7	6	19	
		Percentage	13.5	18.9	16.2	51.4	
Surgeon's specialty	General	Frequency	0	1	3	7	0.035
		Percentage	.0	9.1	27.3	63.6	
	Plastic	Frequency	10	5	5	9	
		Percentage	34.5	17.2	17.2	31.0	
	Orthopedics	Frequency	1	1	0	9	
		Percentage	9.1	9.1	.0	81.8	

85.7%, respectively). Moreover, patients operated by plastic surgeons showed the lowest frequency of positive sharp waves (n=12; 41.4%). The statistical analysis demonstrated a significant relationship between positive sharp waves and the surgeon's specialty (*P*=0.034).

However, there was no significant relationship between positive sharp waves with gender (*P*=0.713), place of residence (*P*=0.556), educational level (*P*=0.544), the severity of nerve damage (*P*=0.150), mechanism of injury (*P*=0.641), damaged nerve (*P*=0.559), age (*P*=0.503), duration between injury and repair (*P*=0.516), and duration between repair and electrodiagnostic studies (*P*=0.727).

As shown in Table 6, patients with forearm injury had the lowest frequency of polyphasic waves (n=3;21.4%). There was a significant relationship between polyphasic waves with damaged organs (*P*=0.014).

However, there was no significant relationship between polyphasic waves with gender (*P*=0.626), place of residence (*P*=0.725), educational level (*P*=0.836), the severity of nerve damage (*P*=0.075), mechanism of injury (*P*=0.668), damaged nerve (*P*=0.404), age (*P*=0.779), duration between injury and repair (*P*=0.710), duration between repair and electrodiagnostic studies (*P*=0.523), and surgeon's specialty (*P*=0.091).

DISCUSSION

We investigated the factors affecting the outcomes of primary nerve repair in 51 patients afflicted by upper extremity nerve injuries following penetrating trauma. Prognostic factors of the outcomes of nerve repair following penetrating trauma to the upper extremity included age, education, the type of damaged nerve, the severity of the injury, and the surgeon's specialty. In our study, most of the patients aged ≤30 years. Previous studies have widely demonstrated the highest proportion of peripheral nerve injuries in young people, especially in the age group of 20 to 30 years, who comprise the most active members of societies [12-14]. In the studied population, the frequency of men was about 5 times that of women. The male predominance among patients afflicted by peripheral nerve injuries is widely reported in the literature [15, 16]. In most societies, men are more involved in occupational activities compared to women. In addition, most of the victims of accidents are reported to be young men, which leads to an increased risk of trauma and

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subsequent nerve injury [17]. However, except for an association between older age and higher frequency of lack of motor amplitude, the present study showed no significant relationship between electrodiagnostic findings with gender and age. Where physical examination and questionnaires have been used to evaluate postoperative neurological function, women and younger individuals have shown a better recovery from peripheral nerve injuries [8]. However, few studies that have utilized electrodiagnostic tests

Table 4: Relationship between sensory amplitude and patient's characteristics

Variable			Sensory amplitude			*P*-value
			Normal	Decreased	None	
Gender	Male	Frequency	6	3	34	0.232
		Percentage	14.0	7.0	79.1	
	Female	Frequency	1	2	5	
		Percentage	12.5	25.0	62.5	
Place of residence	Urban	Frequency	6	4	31	0.813
		Percentage	14.6	9.8	75.6	
	Rural	Frequency	1	1	8	
		Percentage	10.0	10.0	80.0	
Educational level	College or university degree	Frequency	1	3	1	0.002
		Percentage	20.0	60.0	20.0	
	High school diploma	Frequency	4	0	11	
		Percentage	26.7	.0	73.3	
	Lower than a high school diploma	Frequency	2	2	27	
		Percentage	6.5	6.5	87.1	
Damaged organ	Wrist	Frequency	5	2	25	0.679
		Percentage	15.6	6.3	78.1	
	Forearm	Frequency	2	3	9	
		Percentage	14.3	21.4	64.3	
	Elbow	Frequency	0	0	1	
		Percentage	.0	.0	100.0	
	Arm	Frequency	0	0	1	
		Percentage	.0	.0	100.0	
	Shoulder	Frequency	0	0	3	
		Percentage	.0	.0	100.0	
Severity of nerve damage	Complete	Frequency	3	5	34	0.012
		Percentage	7.1	11.9	81.0	
	Partial	Frequency	4	0	5	
		Percentage	44.4	.0	55.6	
Mechanism of injury	Cut	Frequency	5	5	36	0.199
		Percentage	10.9	10.9	78.3	
	Crushing	Frequency	2	0	3	
		Percentage	40.0	.0	60.0	
The damaged nerve	Radial	Frequency	4	0	8	0.048
		Percentage	33.3	.0	66.7	
	Median	Frequency	2	5	20	
		Percentage	7.4	18.5	74.1	
	Ulnar	Frequency	1	0	11	
		Percentage	8.3	.0	91.7	
Age (years)	≥30	Frequency	3	3	23	0.886
		Percentage	10.3	10.3	79.3	
	30<	Frequency	4	2	16	
		Percentage	18.2	9.1	72.7	
		Frequency	6	2	16	0.348

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to determine the prognostic factors of peripheral nerve injury confirm our findings [18].

In patients with low-level nerve injuries (forearm and wrist), the frequency of polyphasic waves was lower than in those with high-level injuries. Nerve regeneration occurs at a rate of 1 mm per day while muscle atrophy initiates immediately after denervation. Owing to the longer time needed for the motor endplate to be reinnervated in traumas to the proximal parts of the extremities; it is not

Table 5: Relationship between the presence of positive sharp waves and patient's characteristics

Variable			Positive sharp wave No	Positive sharp wave Yes	*P*-value
Gender	**Male**	Frequency	18	25	0.713
		Percentage	41.9	58.1	
	Female	Frequency	4	4	
		Percentage	50.0	50.0	
Place of residence	**Urban**	Frequency	18	23	0.556
		Percentage	43.9	56.1	
	Rural	Frequency	4	6	
		Percentage	40.0	60.0	
Educational level	**College or university degree**	Frequency	2	3	0.544
		Percentage	40.0	60.0	
	High school diploma	Frequency	7	8	
		Percentage	46.7	53.3	
	Lower than a high school diploma	Frequency	13	18	
		Percentage	41.9	58.1	
Damaged organ	**Wrist**	Frequency	16	16	0.007
		Percentage	50.0	50.0	
	Forearm	Frequency	2	12	
		Percentage	14.3	85.7	
	Elbow	Frequency	1	0	
		Percentage	100.0	.0	
	Arm	Frequency	0	1	
		Percentage	.0	100.0	
	Shoulder	Frequency	3	0	
		Percentage	100.0	.0	
Severity of nerve damage	**Complete**	Frequency	16	26	0.150
		Percentage	38.1	61.9	
	Partial	Frequency	6	3	
		Percentage	66.7	33.3	

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Variable			Positive sharp wave		*P*-value
			No	Yes	
Mechanism of injury	**Cut**	Frequency	9	7	0.641
		Percentage	19.6	15.2	
	Crushing	Frequency	2	0	
		Percentage	40.0	.0	
The damaged nerve	**Radial**	Frequency	7	5	0.559
		Percentage	58.3	41.7	
	Median	Frequency	10	17	
		Percentage	37.0	63.0	
	Ulnar	Frequency	5	7	
		Percentage	41.7	58.3	
Age (years)	**≤30**	Frequency	13	16	0.503
		Percentage	44.8	55.2	
	30<	Frequency	9	13	
		Percentage	40.9	59.1	
Duration between injury and repair (days)	**1**	Frequency	13	11	0.516
		Percentage	54.2	45.8	
	2	Frequency	1	3	
		Percentage	25.0	75.0	
	3	Frequency	4	7	
		Percentage	36.4	63.6	
	4≤	Frequency	4	8	
		Percentage	33.3	66.7	
Duration between repair and electrodiagnostic studies (months)	**≥2**	Frequency	1	0	0.727
		Percentage	100.0	.0	
	2-4	Frequency	5	8	
		Percentage	38.5	61.5	
	≥4	Frequency	16	21	
		Percentage	43.2	56.8	
Surgeon's specialty	**General**	Frequency	3	8	0.034
		Percentage	27.3	72.7	
	Plastic	Frequency	17	12	
		Percentage	58.6	41.4	
	Orthopedics	Frequency	2	9	
		Percentage	18.2	81.8	

surprising that they are associated with poorer motor recovery [8, 19].

Consistent with the prior assumptions, patients with partial injury showed a higher chance of presenting normal sensory amplitude than those with complete injury. In severe limb trauma, which leads to complete nerve injury, multiple tissues are usually damaged. Peripheral nerve components of this mixed injury type are often the most difficult to diagnose and treat. This fact is justified by the difficulty in differentiating partial from complete damages without surgical exploration and the

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dubious nature of nerve healing [20, 21].
In the current study, the majority of patients with ulnar nerve injury showed no sensory amplitude. A vast body of evidence indicates that the outcome of radial nerve injuries is better than the median nerve and the ulnar nerve has the poorest prognosis. However, the existing data are mostly focused on the motor component of the nerves, and there is a lack of data on factors affecting the rate of recovery of peripheral nerve function after primary repair due

Table 6: Relationship between the presence of polyphasic waves and patient's characteristics

Variable			Polyphasic wave		*P*-value
			Yes	No	
Gender	Male	Frequency	21	22	0.626
		Percentage	48.8	51.2	
	Female	Frequency	4	4	
		Percentage	50.0	50.0	
Place of residence	Urban	Frequency	21	20	0.725
		Percentage	51.2	48.8	
	Rural	Frequency	4	6	
		Percentage	40.0	60.0	
Educational level	College or university degree	Frequency	3	2	0.836
		Percentage	60.0	40.0	
	High school diploma	Frequency	7	8	
		Percentage	46.7	53.3	
	Lower than a high school diploma	Frequency	15	16	
		Percentage	48.4	51.6	
Damaged organ	Wrist	Frequency	17	15	0.014
		Percentage	53.1	46.9	
	Forearm	Frequency	3	11	
		Percentage	21.4	78.6	
	Elbow	Frequency	1	0	
		Percentage	100.0	.0	
	Arm	Frequency	1	0	
		Percentage	100.0	.0	
	Shoulder	Frequency	3	0	
		Percentage	100.0	.0	
Severity of nerve damage	Complete	Frequency	18	24	0.075
		Percentage	42.9	57.1	
	Partial	Frequency	7	2	
		Percentage	77.8	22.2	
Mechanism of injury	Cut	Frequency	22	24	0.668
		Percentage	47.8	52.2	
	Crushing	Frequency	3	2	
		Percentage	60.0	40.0	
The damaged nerve	Radial	Frequency	8	4	0.404
		Percentage	66.7	33.3	
	Median	Frequency	12	15	
		Percentage	44.4	55.6	
	Ulnar	Frequency	5	7	
		Percentage	41.7	58.3	
Age (years)	≥30	Frequency	15	14	0.779
		Percentage	51.7	48.3	
	30<	Frequency	10	12	
		Percentage	45.5	54.5	
		Frequency	13	11	0.710

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Variable			Polyphasic wave		P-value
			Yes	No	
Duration between injury and repair (days)	1	Percentage	54.2	45.8	
	2	Frequency	2	2	
		Percentage	50.0	50.0	
	3	Frequency	6	5	
		Percentage	54.5	45.5	
	4≤	Frequency	4	8	
		Percentage	33.3	66.7	
Duration between repair and electrodiagnostic studies (months)	≥2	Frequency	1	0	0.523
		Percentage	100.0	.0	
	2-4	Frequency	5	8	
		Percentage	38.5	61.5	
	≥4	Frequency	19	18	
		Percentage	51.4	48.6	
Surgeon's specialty	General	Frequency	3	8	0.091
		Percentage	27.3	72.7	
	Plastic	Frequency	18	11	
		Percentage	62.1	37.9	
	Orthopedics	Frequency	4	7	
		Percentage	36.4	63.6	

to penetrating trauma of the upper limb [22, 23].

Based on the findings of this study, the duration between injury and repair did not appear to have a significant influence on the surgical outcomes. However, it should be noted that the majority of our subjects had undergone nerve repair within days of injury, while many studies have demonstrated that delay of up to 6 months does not affect the repair outcomes [19].

The patients operated by plastic surgeons showed the highest frequency of normal motor amplitude and the lowest frequency of positive sharp waves. Peripheral nerve injury is a multi-disciplinary condition, which can be managed by several clinical disciplines, including plastic surgeons, orthopedic surgeons, and neurosurgeons. Although surgeon's experience can highly affect the surgical success rate, the surgeon's specialty has not been linked to the patient's outcomes previously [24, 25]. Hence, our finding may be due to the limited sample size in this study.

LIMITATIONS

The limitation of this study was the use of data from a single center and limited sample size. However, different demographic and clinical variables were investigated to aid in determining the prognostic factors of nerve injury in the studied population.

CONCLUSION

Factors affecting the outcome of peripheral nerve repair following penetrating trauma to the upper extremity include age, education, the type of damaged nerve, the severity of the injury, and the surgeon's specialty.

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CONFLICT OF INTEREST

The authors attest that they have no conflict of interest to declare.

REFERENCES

1. Lopes B, Sousa P, Alvites R, et al. Peripheral nerve injury treatments and advances: One Health perspective. *Int J Mol Sci* 2022;**23**(2):918.
2. Carter N, Towne J, Neivandt DJ. Finite element analysis of glucose diffusivity in cellulose nanofibril peripheral nerve conduits. *Cellulose* 2021;**28**(5):2791-803.
3. Bianchi S, Mauler F. Ultrasound Appearance of In Vitro Nerve Allografts and Conduits for Peripheral Nerve Reconstruction. *J Ultrasound Med* 2022;**41**(3):763-71.
4. Huckhagel T, Nüchtern J, Regelsberger J, Lefering R. Nerve injury in severe trauma with upper extremity

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[DOI: 10.61186/wjps.12.2.90]

involvement: evaluation of 49,382 patients from the TraumaRegister DGU® between 2002 and 2015. *Scand J Trauma Resusc Emerg Med* 2018;**26**(1):1-8.
5. Fuller JB, Dunn JC, Kusnezov NA, Nesti LJ, Kilcoyne KG. Outcome measures after medial ulnar collateral ligament reconstructions in a military population. *J Shoulder Elbow Surg* 2019;**28**(2):317-23.
6. Riccio M, Marchesini A, Pugliese P, De Francesco F. Nerve repair and regeneration: Biological tubulization limits and future perspectives. *J Cell Physiol* 2019;**234**(4):3362-75.
7. Mayer JA, Hruby LA, Salminger S, Bodner G, Aszmann OC. Reconstruction of the spinal accessory nerve with selective fascicular nerve transfer of the upper trunk. *J Neurosurg Spine* 2019;**31**(1):133-8.
8. Hundepool CA, Ultee J, Nijhuis TH, et al. Prognostic factors for outcome after median, ulnar, and combined median–ulnar nerve injuries: A prospective study. *J Plast Reconstr Aesthet Surg* 2015;**68**(1):1-8.
9. Fleurette J, Gaume M, De Tienda M, Dana C, Pannier S. Peripheral nerve injuries of the upper extremity in a pediatric population: Outcomes and prognostic factors. *Hand Surg Rehabil* 2022.
10. Novak CB, Anastakis DJ, Beaton DE, Katz J. Patient-reported outcome after peripheral nerve injury. *J Hand Surg Am* 2009;**34**(2):281-7.
11. Pripotnev S, Bucelli RC, Patterson JMM, Yee A, Pet MA, Mackinnon S. Interpreting Electrodiagnostic Studies for the Management of Nerve Injury. *J Hand Surg Am* 2022 2022/09/01/;**47**(9):881-9.
12. Samadi Rad B, Babai Ghazani A, Eftekhar Sadat B, et al. Study of frequency of peripheral nerve injuries in traumatic patients referred to Eeast Azarbaijan legal medicine center in 2011. *Iranian Journal of Forensic Medicine* 2016;**21**(4):283-90.
13. Kouyoumdjian JA, Graça CR, Ferreira VF. Peripheral nerve injuries: A retrospective survey of 1124 cases. *Neurol India* 2017;**65**(3):551.
14. Yavari M, Shahraki SS, Mousavizadeh SM, Rouzbahani AK, Mahmoudvand G, Sedghi Asl H. Satisfaction and Functional Outcome of Surgical Treatment in Patients with Brachial Plexus Injury: A Decade of Retrospective Comparative Study. *World J Plast Surg* 2022;**11**(3):28-37.
15. Akhavan-Sigari R, Mielke D, Farhadi A, Rohde V. Study of radial nerve injury caused by gunshot wounds and explosive injuries among Iraqi soldiers. *Open Access Maced J Med Sci* 2018;**6**(9):1622.
16. Rostami HR, Akbarfahimi M, Hassani Mehraban A, Akbarinia AR, Samani S. Occupation-based intervention versus rote exercise in modified constraint-induced movement therapy for patients with median and ulnar nerve injuries: A randomized controlled trial. *Clin Rehabil* 2017;**31**(8):1087-97.
17. Ciaramitaro P, Mondelli M, Logullo F, et al. Traumatic peripheral nerve injuries: epidemiological findings, neuropathic pain and quality of life in 158 patients. *J Peripher Nerv Syst* 2010;**15**(2):120-7.
18. Zangiabadi N, Ahrari M. Electro-diagnostic and clinical changes of peripheral neuropathies in bam earthquake victims. *Am J Environ Sci* 2005;**1**(3):206-8.
19. Nouraei MH, Hosseini A, Salek S, Nouraei F, Bina R. Median and ulnar nerve injuries; what causes different repair outcomes? *Adv Biomed Res* 2015;**4**:215.
20. Noble M, Tseng K-C, Li H, Elfar JC. 4-Aminopyridine as a single agent diagnostic and treatment for severe nerve crush injury. *Mil Med* 2019;**184**(Supplement_1):379-85.
21. Vijayavenkataraman S. Nerve guide conduits for peripheral nerve injury repair: A review on design, materials and fabrication methods. *Acta biomaterialia* 2020;**106**:54-69.
22. Roganovic Z, Pavlicevic G. Difference in recovery potential of peripheral nerves after graft repairs. *Neurosurgery* 2006;**59**(3):621-33.
23. Vordemvenne T, Langer M, Ochman S, Raschke M, Schult M. Long-term results after primary microsurgical repair of ulnar and median nerve injuries: a comparison of common score systems. *Clin Neurol Neurosurg* 2007;**109**(3):263-71.
24. Pfister BJ, Gordon T, Loverde JR, Kochar AS, Mackinnon SE, Cullen DK. Biomedical engineering strategies for peripheral nerve repair: surgical applications, state of the art, and future challenges. *Crit Rev Biomed Eng* 2011;**39**(2).
25. Brooks DN, Weber RV, Chao JD, et al. Processed nerve allografts for peripheral nerve reconstruction: a multicenter study of utilization and outcomes in sensory, mixed, and motor nerve reconstructions. *Microsurgery* 2012;**32**(1):1-14.

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