Original Article

Comparison of Functionality Level, Disability and Quality of Life in Subjects with Peripheral Nerve Repair in the Upper Extremity

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Received: 3/15/2024
Accepted: 6/24/2024

ABSTRACT

Background: Peripheral nerve damage is a very important factor in patients' quality of life and functionality for various reasons. We aimed to compare the functionality level, disability and quality of life in subjects with peripheral nerve repair in the upper extremity.

Methods: This cross-sectional study was conducted on patients with nerve injuries in 2019. Among those patients, Eighty-five were selected as the sample. The instruments used in this study included the health-related quality of life standard questionnaire (SF-36), and the disability of the arm, shoulder and hand questionnaire (DASH-38). Data were analyzed by SPSS software version 22 and one-way ANOVA and Kruskal-Wallis statistical tests.

Results: Results of the Kruskal-Wallis test showed that the disability score in the groups of patients was not significant. In addition, according to the results of the one-way ANOVA test, the quality of life score was not significant among the patient groups.

Conclusion: Considering that peripheral nerve damage has a significant impact on patients' quality of life and functionality, apart from more research on the subject, it is necessary to provide support for patients to improve their quality of life.

KEYWORDS
Peripheral Nerve Injury; Ulnar nerve; Median Nerve; Radial Nerve; Quality of Life; Functional Disability

Please cite this paper as:
Akbari H, Saraee A, Mirzaei L, Abolfazli M, Bagheri H, Akbari P. Comparison of Functionality Level, Disability and Quality of Life in Subjects with Peripheral Nerve Repair in the Upper Extremity. World J Plast Surg. 2024;13(2):68-73.
doi: 10.61186/wjps.13.2.68

INTRODUCTION

Peripheral nerve damage to the upper extremities often occurs[1]. The incidence of upper extremity lesions is increasing in industrial societies. On the other hand, most of these accidents cause damage to the peripheral nerves and the musculoskeletal system. The incidence of peripheral nerves injury in patients with upper extremity lesions is 96% prevalent[2]. Damage to the peripheral nerves of the upper extremities can lead to an inability to move, generate force and manipulate objects[3]. On the one hand, they have pain, cold sensitivity, and abnormal touch

[DOI: 10.61186/wjps.13.2.68]

sensations[4]. Pain caused by damage to the peripheral nerves can lead to levels of disability[5] that can have significant effects on the patient's life[6]. Many people with significant damage to the peripheral nerves of the upper extremities have significant problems in performing daily life activities, including self-care, family responsibilities, and social activities[7,8]. Many of these patients also suffer from depression, which is caused by their inability to perform their duties[9].

Damage to the peripheral nerves causes a variety of sensory and motor problems in patients, including damage to the median, ulnar, and radial nerves, leading to functional impairment and major problems in hand function. About 30% to 40% of traumatic lesions are related to peripheral nerves and hand injuries[10]. Each of the peripheral nerves is responsible for the sensation and movement of an area of the hand, so the outcome of every nerve injury differs from one nerve to the other.

In median nerve injury in the proximal forearm, the pronation and function of the thumb and Flexor digitorum are impaired, whereas injury to the wrist causes greater involvement of the thenar area and thumb function. This disorder causes the monkey hand deformity. Dysfunction of the median nerve causes numbness in the outer volar three and a half fingers of the hand and the dorsal and distal bands of index fingers and middle fingers. Ulnar nerve injury in the forearm area leads to dysfunction in flexor digitorum profundus and lumbrical muscles and hypothenar area, but in the wrist area, injury further involves hypothenar area and causes the claw hand deformity. Movement disorder in this nerve impairs delicate hand movements. The ulnar nerve provides the dorsal and volar sense of one and a half inside fingers. Damage to the radial nerve in the forearm disrupts the sensation of the back of the hand and affects the supination movement of the forearm and wrist, thumb, and finger extension. However, damage to the wrist area only disrupts the fingers and thumb extensions and sensation is less involved (11). Complete recovery of sensation, movement and strength after repair of these lesions is often difficult and affects hand function.

Previous studies have provided evidence suggesting that pain from neurological damage may be severe, which is often accompanied by disability[4,5,12], which can be a predictor of poor quality of life scores of these patients[13]. In recent years, studies in the field of quality of life[13,14], pain and sensitivity to cold[15] and disability level[6,10] have been conducted in people with peripheral nerve damage.

Regarding the importance of quality of life in patients with peripheral nerve damage such as hand, we aimed to compare the functionality level, disability and quality of life in subjects with peripheral nerve repair in upper extremities.

MATERIALS AND METHODS

The present study was a descriptive-analytical and cross-sectional study conducted in Tehran, Iran in 2019. The study population consisted of patients who had suffered from severe peripheral nerves (Median, Ulnar and Radial) from the forearm and underwent surgery at the Fatemeh (P) Training and Research Center. Sampling was done after explaining the research stages, the required concepts and after obtaining written informed consent from patients.

Inclusion criteria included patients who had passed a maximum of 10 days after their peripheral nerve injury and repair, ages 18 to 65 years, no congenital Neuromusculoskeletal deformities and disorders, no fractures, no rheumatoid arthritis, no hereditary and systemic neuropathies such as diabetic neuropathy and able to read and write. Exclusion criteria were secondary injury after surgical treatment and failure to attend evaluation periods. According to the inclusion and exclusion criteria and patient consent, 85 patients were included in the study.

This study was approved by the Ethics Committee of Iran University of Medical Sciences under the code of ethics IR.IUMS.RES1396.31477. In addition, the individuals under study were also assured of their anonymity, confidentiality of the results and respecting their privacy.

METHOD OF INTERVENTION

Patients after 3 to 4 weeks of immobilization were referred to the occupational therapy unit by the surgeon after surgery. In the first step, the purpose of patients' entry into the plan and the goals of the plan were clearly explained to them, and after their agreement, according to the inclusion and exclusion criteria, the individuals were divided into four groups according to the type of nerve damage. Subjects' background information was collected using a demographic questionnaire. After gathering the required information from the patient treatment

[DOI: 10.61186/wjps.13.2.68]

started. This treatment, in addition to reconstructive surgery, included physiotherapy and occupational therapy services. Rehabilitation interventions for the groups included: wound care and swelling control, active and passive controlled movements of joints, sensory re-training techniques and desensitization, and counselling to improve ADL (activities of daily living) and electrotherapy. It should be noted that splints needed to prevent possible deformities based on the type of nerve damage were given to the subjects in the study.

The required splints for patients with ulnar nerve injury were a dynamic MP flexor splint that takes metacarpophalangeal joints to flexion and prevents claw hand deformity. This splint was used daily. The splint used for median nerve injury was a web spacer that prevents the deformity of the monkey hand. For people with radial nerve damage, a dynamic MP extensor splint was given, extending wrist, fingers and thumb and preventing wrist drop.

Progressive static night splints were also given to all those with nerve damage and these splints progressively prevented adhesions and deformities and took the limbs to rest positions.

Because rehabilitation and restorative surgery interventions were offered to patients at the same time as treatment interventions, the purpose of this study was to compare the functionality status and disability of patients with peripheral nerve injury at different levels, hence one evaluation to obtain results and to compare these patients will be sufficient. Two months after surgery, the quality of life was assessed using the SF-36 questionnaire, disability assessment was performed by the DASH questionnaire from all patients in each group.

The SF-36 questionnaire is an international standard questionnaire translated by Montazeri et al. and its validity and reliability have been confirmed[16]. The questionnaire examines various aspects of quality of life such as physical functionality, limitations of playing a role with physical pain, general health, vitality, happiness, social functionality, and mental health.

The DASH-38 questionnaire is an international standard questionnaire that has been localized by Mahmoudi et al. and its validity and reliability have been confirmed[17]. This questionnaire contains 38 questions that identify functional impairments of the upper extremity (arm, shoulder and hand) from a functional point of view and classifies them into four sections: disability, motor restriction, and limitation in activities of daily life and motor restriction, and motor restriction and limitation in activities of daily life.

In this research, the data was analyzed by using SPSS software version 22 and descriptive statistics and Kruskal-Wallis test and one-way ANOVA.

FINDINGS

In table 1, information about patients' characteristics by gender is shown. In the median nerve injury, the highest frequency was in the male group, 16 individuals. This number was 23 in the ulnar nerve injury, 21 in the radian nerve and 17 in the more than two nerves injury.

In Table 2, information on the specifications of the injured hand is shown. In the median nerve injury, the most frequent injury was in the right hand (11 cases) and this number in the ulnar nerve injury was 20. In the radian nerve and more than two nerve injuries, the highest frequency was in the left hand,

Table 1: Frequency distribution of the studied patients based on gender in different groups of nerve injury

Variable	Group	Frequency	Percent
	male	16	94.1
MED	female	1	5.9
	Total	17	100.0
	male	23	88.5
ULN	female	3	11.5
	Total	26	100.0
RAD	male	21	100.0
	male	17	81.0
MIX	female	4	19.0
	Total	21	100.0

[DOI: 10.61186/wjps.13.2.68]

with 21 cases and 13 cases, respectively.
As shown in Table 3, the results of nonparametric Kruskal-Wallis test showed that the mean age of patients in different groups of nerve damage was not statistically significant at 95% confidence level.
As can be seen in Table 4, one-way ANOVA showed that the mean score of functional disability in different groups of nerve injury was not statistically significant with 95% confidence level.
In addition, according to the results of Kruskal-Wallis test, mean score of quality of life in different groups of nerve injury was not statistically significant at 95% confidence level.

DISCUSSION

We aimed to compare the functionality level, disability and quality of life in patients with peripheral nerve repair in the upper extremities. In the group of patients participating in this study, for the 85 participants with peripheral nerve damage, there was no difference in the mean score of functional disability. Gender, higher age groups, and damage to more than two nerves were negatively correlated with improved functionality (10).
Nerve damage to the forearm or wrist can impair functionality and have negative social consequences,

Table 2: Frequency distribution of studied patients in different groups of nerve injury based on the injured hand

Variable	Injured Hand	Frequency	Percent
MED	R	11	64.7
	L	6	35.3
	Total	17	100.0
ULN	R	20	76.9
	L	6	23.1
	Total	26	100.0
RAD	R	9	42.9
	L	12	57.1
	Total	21	100.0
MIX	R	8	38.1
	L	13	61.9
	Total	21	100.0

Table 3: Frequency distribution and age differences of the studied groups

Group	Median	Interquartile Range	Result
MED	33.00	7.50	Kruskal-Wallis H=3.14 df=3 *P*-value= .369
ULN	28.00	13.75	
RAD	30.00	14.50	
MIX	29.00	12.50	

Table 4: Comparison of mean score of quality of life and functional disability score in groups of patients with different injuries

	Variable	Mean and standard deviation	Test statistic	*P*-value
Disability	Median	77/94±21/55	*1/36	0/261
	Ulnar	66/15±19/24		
	Radian	73/95±18/85		
	More than 2 nerves	76/09±25/47		
Quality of Life	Median	95/14±12/08	**3/11	0/374
	Ulnar	92/19±9/47		
	Radian	94/95±19/26		
	More than 2 nerves	91/10±17/81		

* One-way ANOVA test
** Kruskal-Wallis test

[DOI: 10.61186/wjps.13.2.68]

and compared to single nerve damage, concurrent damage to two nerves had less motor sensory improvement (6). Patients recovering from peripheral nerve damage to the upper extremities do not return to their previous levels of functionality. However, the repair time of the damaged ulnar nerve appears to be significantly longer than the median nerve. It is more likely that this affects the functionality of people with ulnar nerve damage (16).

The results of a study by Kovacs et al. on patients with hand injuries showed that the quality of life of these patients was significantly lower than that of healthy people, also the state of their quality of life was reported to be undesirable (17). However, in this study, performed between different groups struggling with peripheral nerve damage, there was no difference between the patient groups. The low quality of life of these patients seems to be due to the lack of post-surgery care and follow-up, inadequate post-surgery rehabilitation, the effects of the disease, disruption of daily activities, and so on.

We found that there was no difference between different groups of patients with peripheral nerve damage, regarding the quality of life and disability function. However, hand injuries due to low functionality and sensory problems can be accompanied by psychological disorders such as major depression, low self-esteem, low morale, and adjustment problems in patients who need special attention in this regard (18).

One of the limitations of this study is the sampling method, which is purposeful and not in random. In addition, the absence of a control group (healthy people) can be noted in this study to compare their performance and quality of life with the patient groups and the two-month follow-up period.

CONCLUSION

The quality of life and disability function did not differ in different groups of patients with different peripheral nerve damage, and with sustained injury to the hand for various reasons, their quality of life declined even after surgery. Therefore, it is necessary to have fundamental planning to improve the health and quality of life of patients with hand nerve damage, and to support them in preventing other side effects such as depression and to generally improve their quality of life of these patients during the recovery period.

FINANCIAL DISCLOSURE

The authors declare that there is no financial sources for this study.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interests.

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[DOI: 10.61186/wjps.13.2.68]

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[DOI: 10.61186/wjps.13.2.68]