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Mid-term results after isolated digital nerve repair in patients presenting with hand injury

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Abstract

Digital nerve lacerations are a common type of hand injury and one of the main causes of sensory impairment. The purpose of this study is to investigate the results of surgical treatment of traumatic digital nerve lesions in patient's hands. We evaluated 65 patients with digital nerve injury that occurred after digital trauma between 2015 and 2018. The participants' hypoesthesia scores on the numerical rating scale were greater than 5/10. Additionally, they felt hypoesthesia distally above the hand injury in their preliminary examinations at the emergency department. We analyzed the injuries of 65 patients (41 males, 24 females; mean age: 36 ± 2 years; age range: 19–56 years). Group 1 consisted of 26 patients who did not undergo surgery, whereas Group 2 consisted of 39 patients who underwent surgery. We conducted the Semmes–Weinstein monofilament test in Group 1. In total, 9 patients had normal sensations, 12 patients had light touch sensations; and 5 patients had protective sensations. We conducted nerve exploration surgery in Group 2. In total, the 12 patients who underwent this surgery were found to have no pathology in the digital nerve and identified to have neuropraxia. In the other 11 patients, the peripheral nerve was partially lacerated and it was repaired primarily, after performing the nerve exploration surgery on the remaining 16 patients. There wasn't statistically significant difference between the patients who underwent surgery and who did not undergo surgery in terms of hypoesthesia resulting from nerve laceration.

Keywords: Digital nerve, trauma, primary repair

Introduction

Digital nerve lacerations are a common type of hand injury and one of the primary causes of sensory impairment. The incidence of digital nerve injuries is 6.2 in 100.000 people in the European region [1]. It commonly occurs in the working population and is two to five times more common in men than in women. [2] Digital nerve injuries are often easily missed. Physicians firstly evaluate finger movements after a hand injury. Therefore, peripheral nerve laceration largely remains underdiagnosed. In addition, the diagnosis is difficult because the patients cannot exactly describe hypoesthesia caused by nerve injury or they cannot distinguish it from the pain caused by the injury. Surgical exploration can assist in making a definitive diagnosis. Despite the advances in surgical techniques and innovations in suture materials, the results of peripheral nerve repair are still unfavorable.

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The cost of digital nerve repair is estimated to be £10 million per year in the UK, and this cost does not include the loss of labor [3].

The purpose of this study is to investigate the results of surgical treatment in patients who described hypoesthesia on their fingers following hand laceration at the scores greater than 5/10 on the numerical rating scale (NRS).

Materials and Methods

This study represents a series of 65 patients who were evaluated for digital nerve injury following digital trauma in the Emergency Department of the University of Health Sciences Antalya Training and Research Hospital between 2015 and 2018. The scores of patients' hypoesthesia on their fingers were greater than 5/10 on the NRS. In addition, these participants felt hypoesthesia distally above the hand injury on their first examinations in the emergency department. The University of Health Sciences Antalya Training and Research Hospital granted the ethical approval for this study. The exclusion criteria of this study were: tendon injury, limb amputation, and multiple ipsilateral digital

injuries. We recommended the patients to undergo surgery. Thereafter, we divided the patients into two groups: patients who voluntarily refused surgery and patients who underwent surgery. İn the surgery ; nerves were repaired in the operating room with 8.0 ethilon suture . The digital nerves have been suture under a loop in the surgery. All patients had splints for 1 month. After 1-month splint was removed and physical therapy exercises were started.This study aimed to investigate the efficacy of surgery by comparing the patients who were treated and not treated surgically by administering the Semmes–Weinstein (SW) monofilament test in all patients for a sensory evaluation.

Statistical Analysis

The Windows SPSS 13.0 Analysis Package was used for analysing the data set. For comparisons, the Mann–Whitney U test was used for the variables having a normal distribution in the two-sample t-test.

Results

We analyzed the injuries of 65 patients (41 males, 24 females; mean age: 36 ± 2 years; age range: 19–56 years) (Table 1). Group 1 consisted of 26 patients who did not undergo surgery. Of the injuries, 9 of them occurred due to the breakage of glass products such as glass in the hand, whereas 17 of them occurred due to sharp objects. The mean hospitalisation duration was 2.2 ± 1.3 (range: 2–5) days in Group II. The mean follow-up was four months (two to five months). Group 2 consisted of 39 patients who underwent surgery. 4 of the patients in group 1 and 6 of the patients in group 2 smoke. None of the patients have a history of diabetes or vascular diseases. Of the injuries, 24 of them occurred due to the breakage of glass products such as glass, in the hand, whereas 15 of them occurred due to sharp objects. In total, nine patients of Group 1 had a score in the range between 1.65 and 2.83 in the SW monofilament test, and these patients were identified to have a normal sensation. In 12 patients, the score ranged between 3.22 and 3.61, and these patients were identified to have a diminished light touch sensation. In 5 patients, the score was between 3.84 and 4.31, and these patients were identified to have a diminished protective sensation. In Group 2, 12 of the patients who underwent nerve exploration surgery were found to have no pathology in the digital nerve and were identified to have neuropraxia. In 11 patients, the partially lacerated peripheral nerve was repaired primarily. After performing nerve exploration surgery on the remaining 16 patients, we detected a total nerve laceration (transection), and primarily repaired the peripheral nerve (Figure 1). In Group 2, 16 patients had a score in the range between 1.65 and 2.83 in the SW monofilament test, and these patients were identified to have a normal sensation. In 11 patients, the score ranged between 3.22 and 3.61, and these patients were identified to have a diminished light touch sensation. In 9 patients, the score was between 3.84 and 4.31, and these patients were identified to have a diminished protective sensation. In three patients, the score was between 4.56 and 6.65, and the patients had a loss of sensory protection (Table 2). There was no statistically significant difference between the two groups ($p \leq 0.525$). Postsurgical infections, or rupture and other complications were not observed.

Table 1. Distribution of casesbyageandgender

Year	Man	Woman	Total
19-30 year	13	8	21
30-40 year	18	11	29
40-50 year	7	4	11
50-56 year	3	1	4
Total	41	24	65

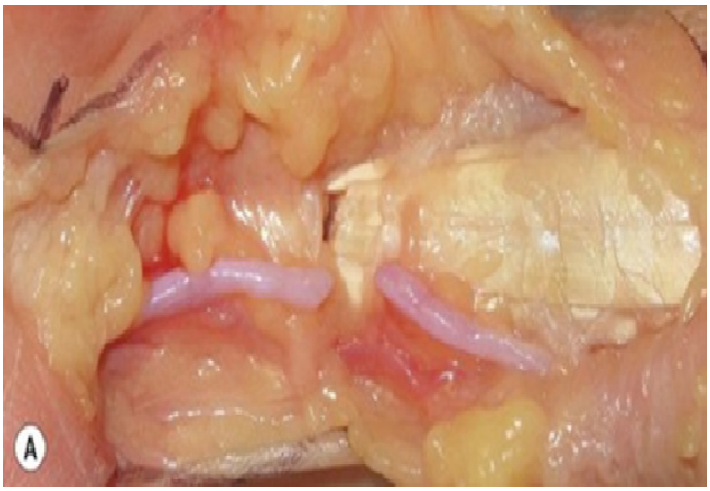

Figure 1. alt yazı ekleyiniz.

Table 2. Theresults of Semmes-Weinstein (S-W) monofilaman test

Semmes-Weinstein (S-W) monofilamant test			Gruop 1	Gruop2
1.65–2.83	(green)	normal	9	16
3.22–3.61	(blue)	diminished light-touch sensation	12	11
3.84–4.31	(purple)	diminished protective sensation	5	9
4.56–6.65	(red)	loss of protective sensory	0	3
Total			26	39

Discussion

Nerve injuries can occur at both work or home. A majority of these injuries are caused by glass cuts. Moreover, sharp metal objects, machine-related injuries, and firearm injuries are also some of the causes of nerve injuries. [4] Digital nerve injuries are generally accompanied by sharp object injuries [5]. In our study, 50% of the injuries were also caused by sharp objects, whereas other injuries were caused by the breakage of glass products such as glass in the hand.

In our study, all nerve injuries were repaired within the first 12 hours after injury to avoid Wallerian degeneration because Wallerian degeneration starts within 12–48 hours in an injured nerve[5].

A study evaluating 108 patients with digital nerve injury found that the rate of male patients was 83% with a mean age of 35 years [6]. Similarly, the mean age in our study was 36 years, with 64% male participants. As stated in other studies [7,8], the reason for this is that the working population predominantly consists of the male population because of the socio-cultural structure.

In addition to the type of repair, other factors such as the patient's age, type of injury, size of the defect between the nerve ends, levels of injury, and the time of repair also play a crucial role in the return

of nerve function [9].

In their study of 150 cases, Andelkovic et al. [10] stated that younger patients and patients with a limited injury site achieved a better sensory recovery with a significant correlation among age, mechanism of injury, and nerve recovery. Moreover, Vipond et al. [11] showed that neither the two-point discrimination test nor the SW monofilament test results showed a correlation with age. In our study, we found that age was a positive factor in nerve recovery, and recovery was better in younger patients.

Yildiran et al. [12] stated that the type of injury is very important because they believed that the damage to the blood supply will increase the development of scars, and there will an increasing number of dissections around a tissue, thereby impairing nerve healing.

We are aware that the main problem in nerve repair is centered on the connective tissue. Scars and intraneural fibrosis at the repair site not only prevent the axonal fibers from advancing distally but also damage the axons that would have reached the distal stump. It is stated that although epineurialneurorrhaphy does not cause internal fibrosis in the nerve, fascicular alignment cannot be achieved even in the most skilled hand [13].

In a retrospective case series of 63 patients, Bulut et al. [14] conducted the two-point discrimination test and the SW monofilament test in all the patients. In their study, the two-point discrimination test demonstrated excellent results in 26 nerves (27%), good results in 61 nerves (64%), and poor results in 9 nerves (9%). They interpreted the results of the SW monofilament test as normal sensation in 31 nerves (32%), diminished light touch sensation in 38 nerves (40%), diminished protective sensation in 17 nerves (18%), and a complete loss of sensation in 5 nerves (5%).

Dunlop et al. stated that the return of normal sensibility in the repaired digital nerves was uncommon, and unrepaired nerves usually regained a protective sensation within six months.

Wormald et al. distributed a questionnaire among 140 individuals consisting of hand surgeons and hand therapists (70% plastic surgeons, 13% orthopedic surgeons, and 15% hand therapists) and asked questions such as “Do you believe an explore, identify and non-repair approach could be a viable intervention for isolated digital nerve injuries?” In total, 42 participants (34%) agreed on the surgery, whereas the rest of the participants (66%) disagreed. When the participants were asked “Following the surgical exploration of a finger laceration, would you be willing to randomize a patient with an isolated digital nerve injury to either direct repair or no repair?” 50 participants (41%) agreed, whereas the rest of the participants (59%) disagreed. The participants who disagreed with this opinion were asked about their reasons, and the answers were as follows: risk of neuroma (n ¼ 22, 31%), unethical research questions (n ¼ 18, 25%), poor sensory recovery (n ¼ 13, 18%), unacceptable trial design or a lack of equipoise (n ¼ 11, 15%), insufficient data to randomize (n ¼ 3, 4%), and a loss of training opportunity (n ¼ 2, 3%).

In our study, the patients whom underwent surgery or not surgery, there was no statistically significant difference. Despite taking a detailed anamnesis and examination of the patients, 12 patients underwent neurosurgery even though they did not had a nerve laceration.

Conclusion:

Although traumatic peripheral nerve lacerations are very common, preservation of the sensation, minimizing the feeling of discomfort, and an early return to daily life and work life should be ensured. In our study, there was no statistically significant difference between the patients who underwent surgery and who did not undergo surgery. Despite taking a detailed anamnesis and examination of the patients, 12 patients underwent neurosurgery even though they did not have a nerve laceration. However, we recommend surgery because of the health law.

Conflict of interests
The authors declare that they have no competing interests.

Financial Disclosure
The financial support no have.

Ethical approval
This article contains studies with human participants and this article does not contain any studies or animal participants performed by any of the authors.

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