Finger Tip injury: Comparison of 3 Treatment Techniques

Abstract

Background: Several studies have compared surgical and conservative methods for the treatment of fingertip injuries. However, there are few studies on the effect of phenytoin dressing and its efficiency in treating the fingertips compared to other common treatments. The aim of this study was to compare phenytoin dressing, surgical treatment with VY flap technique and conservative treatment with Vaseline in patients afflicted with fingertip injuries.

Methods: This prospective cohort research was conducted on all patients referred to the Emergency Department of Gorgan Hospital during 2016-17 who suffered from fingertip injuries. The eligible patients were selected for further intervention and follow up and were divided into three groups including phenytoin dressing, surgical treatment with VY flap technique and Vaseline conservative treatment. The collected Data was analyzed using Chi-squared test and independent sample t-test and the significance level was considered below 0.05.

Results: After 12 months, subjective, objective, and cosmetic complaints were evaluated based on the Allen Impairment Scale. According to the statistical evaluations, no significant difference was found between the three groups in subjective, objective, and cosmetic complaints after one year (P<0.05).

Conclusion: The results of this study for the first time showed that phenytoin dressing has a similar effect to Vaseline dressing for the treatment of fingertip injuries and is not superior to it. Furthermore, the findings of this study, in agreement with previous studies, showed that clinical results are similar to conservative and surgical treatments and are not superior to each other.

Keywords: Phenytoin, V-Y plasty, Conservative Treatment

Introduction

Traumatic fingertip injuries are one of the most common upper limb injuries and cause soft tissue damage to the fingertip (1). In a study in the United States, finger injuries and trauma were found to account for over 25% of emergency department workloads (1). In injuries to the fingertip, a suitable satisfactory treatment follows these objectives: 1. Finger length should be maintained, 2. finger pulp should be adequately covered with a soft tissue, 3. finger sensation should be as close as possible to the natural state, and 4. finger joints should be flexible (2).

So far, various methods have been proposed for the reconstruction and regeneration of fingertip lesions, including V-Y advancement flap and nonsurgical treatments (3). The conducted studies show that in the traumatic lesions of the fingertip, a softer tissue in the lesion site will result in a better subsequent functioning of the fingertip. Today, different types of flaps are mostly used instead of skin grafts to treat these lesions (4). Due to the fact that the flap, unlike the skin graft, has a certain source of blood supply at least until it is detached from its original base, it is thicker than the skin graft. Therefore, in addition to its better appearance and function, there is a higher possibility of returning sensation in this type of treatment (5).
In all types of flaps, which use the soft tissue of the finger to restore the fingertip lesions, the V-Y advancement flap has become very popular and it is older than the other methods\(^6\). Many sources have defined non-surgical treatment as lavage and debridement of the lesion site under local anesthesia\(^7\). Various methods have been suggested for the treatment of fingertip injuries with conservative treatment. One of the most effective methods is the use of Phenytoin dressing\(^8\). Topical phenytoin has been tested in a variety of wounds, such as skin ulcers, diabetic foot ulcers, bed sores, leprosy and periodontal diseases\(^8\).

So far, many studies have been carried out to compare surgical methods with non-surgical methods for the treatment of fingertip injuries, and as found in many of them, there are several benefits to the use of non-surgical methods\(^9\). However, no study has been conducted on the effects of phenytoin dressing, its efficacy on the treatment of fingertip and comparing it with other common treatments. The present study was designed as a prospective cohort which aimed to compare the clinical results obtained from the treatment of fingertip injuries using a conservative method and phenytoin dressing with one of the current surgical treatments called VY Advancement Flap.

### Methods

This study was carried out as a prospective cohort in the emergency department of the Shahid Bahonar hospital. The study population included all patients who referred to the emergency department of the Shahid Bahonar hospital afflicted with a fingertip injury (such as wounding or fracture in the distal finger joints). By observing the Declaration of Helsinki principles and after being confirmed in the Ethics Committee of the Kerman University of Medical Sciences (KMU - 96 - 451), those who referred to the Emergency Department of the Hospital during 2016-17 and met entrance criteria were selected for intervention and follow up.

Before conducting the study, the intervention methods were fully explained to the patients and they were asked to fill in the consent forms. The inclusion criteria of the study were:

1. The patient's fingertip must be injured in such a way that has the VY Flap surgery indication\(^10\).
2. The age of patients must be between 18 and 50.
3. Patients must cooperate in the intervention and post-treatment follow-up depending on the group.

The exclusion criteria of the study were:

- Injury to more than one finger, addiction and smoking, and other factors disrupting wound healing, the presence of another injury such as tendon rupture, bone fracture and nerve or artery perforation which requires reconstruction, except for injuries to the last part of the phalanx, a history of a disease that affects the quality and quantity of the fingertips sensation (such as diabetes and neuropathy), a history of finger surgery that requires the recovery of a traumatic lesion\(^11\).

Following the process of selecting the eligible patients, they were randomly divided into three groups based on the intended indication including conservative treatment with 1% phenytoin ointment (Droupakhsh Company), under treatment with VY flap and treated with Vaseline (Droupakhsh Company) ointment. The groups were studied until 20 people in each group reached a one-year follow-up.

In group 1, a non-surgical technique with phenytoin dressing was used to treat the fingertip injury. Afterward, the location of the lesion was washed with normal saline and a 1% Phenytoin impregnated dressing was used to cover the wound. After 5 days, the dressing was replaced and the wound was washed and evaluated weekly until reaching full recovery. In group 2, the VY Flap method was used to repair finger injuries. In the control group, the lesion area was washed with normal saline, and then the dressing impregnated with Vaseline (Droupakhsh Company) was used to
cover the wound. After 5 days, the dressing was changed and the wound was washed and evaluated weekly until reaching full recovery. After performing the above procedures in all three groups, the patients were examined in terms of the symptoms intensity and recovery rate three months, six months and a year after the treatment for evaluation and follow up. Objective, subjective and cosmetic features of fingertip lesions were evaluated in patients. The Allen questionnaire is a tool for evaluating the results of treatment in fingertip injuries and amputations. This 14-item scale is provided to measure the function and appearance of the damaged organ. The patient, with the help of a resident of the orthopedic section, gave a score of zero, 1, 2 or 3. The higher the number of these cases, the greater the defect in the injured finger\(^{11}\).

The Impairment Scale of Allen is a fingertip-injury questionnaire which includes several items that examine the damage to fingertips. It was used to score subjective complaints including feeling cold, pain, disability and patient satisfaction, and objective characteristics including surface touch, gaining strength, joint stiffness, tenderness and two-point differentiation. Moreover, cosmetic properties including pulp, skin, fisher, pigment and nail growth at the site of the lesion were scored by the patient and with the help of the corresponding resident, the given scores were added to determine the degree of impairment. After completing a one-year follow-up period, all of the results and side effects of treatment were recorded in the intervention and control groups. Finally, data analysis was performed in SPSS version 22 using Chi-squared test and Student’s t-test in order to compare the quantitative variables in the three groups. In addition, the significance level of less than 0.05 was considered significant.

Results

Totally, 75 eligible patients were examined, 15 of them were excluded due to lack of cooperation or meeting the exclusion criteria. The remaining patients were placed in 20-person groups including treatment with VY flap, phenytoin dressing and Vaseline dressing as the control group. In total, 48 patients (81.3%) were male and 12 (18.7%) were female.

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<tr>
<th>Table 1. Demographic data</th>
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<td>Gender</td>
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<tr>
<td>Male</td>
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<td>81.3% (48)</td>
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<th>Table 2. Mean scores of the studied samples according to the Allen questionnaire</th>
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<td>V-Y Plasty</td>
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In assessing subjective complaints of patients, there was no significant difference between the three groups in terms of subjective complaint after three, six and 12 months based on statistical evaluations (p> 0.05). There was also no significant difference between the three groups in terms of Objective complaint after three, six and 12 months (p> 0.05) based on the statistical evaluations.

Evaluation of cosmetic findings of patients based on statistical evaluations of this difference between the flap group and the other two groups was meaningful for Objective findings (P <0.05).

Average scores of the samples studied can be seen in the table. According to the obtained data, the results were only significant in the cosmetic item. The results were significantly more favorable in the surgical group.

Discussion

The findings of this study showed that phenytoin was effective in wound healing and the average of complaints evaluation scores was lower in this group, compared to the Vaseline group. However, there was no statistically significant difference between them. Therefore, it can be concluded that the effect of these methods is approximately the same and one has no advantage over the other.

In a study carried out by Albsoul Younes et al., a wound was created at the back of the neck of the animals at an area of 4 cm in diameter and full thickness. In one group, the wound was dressed with phenytoin and in the other group it was dressed with Vaseline, and a week later skin graft was performed on them. Then, the rats were evaluated for the presence of granular tissue, reduction in the size of the wound and the time needed to complete the graft. The results showed that the use of phenytoin accelerated wound healing\(^{(12)}\). Our findings indicated that there was no difference between the use of Phenytoin cream and surgical procedures.

Also, according to a study by Chan et al.\(^{(13)}\), the rate of healing in the diabetic rats treated with phenytoin was faster than that of the control group. Weikman et al. investigated the effect of phenytoin on the healing of fractures was investigated by radiographic and histological studies indicated a better healing of the fracture in the phenytoin group\(^{(14)}\). The results of these studies contradicted our study which could be due to the type of procedure and the duration of the study.

In a study conducted by Shamsoddini, phenytoin had better effects on wound healing in male rats than in the control group, but this difference was not statistically significant. The finding was consistent with our study\(^{(15)}\).

Based on a study done by Subbanna et al., wound healing rates were faster in the group treated with topical phenytoin than in the control group (normal saline)\(^{(16)}\). Nahas-EL et al. investigated the effect of topical phenytoin (2% powder) on the healing of diabetic foot ulcer in subjects with resistant neuropathy. They found that phenytoin accelerated the wound healing process. Their findings opposed the results of our study\(^{(17)}\).

In a systematic review of 14 clinical trials, the use of topical phenytoin for Treatment for leprosy ulcer, chronic ulcers, and diabetic foot ulcer was emphasized, but there were limited reasons for using it for burn wounds and chemical ulcers\(^{(18)}\), which confirms our findings.

Mujeeb et al. selected patients with second-stage pressure ulcer and randomly dressed half of them with phenytoin and the rest were dressed with normal saline once a day for 15 days. The effect of these treatments was examined and compared by measuring the size of the wound, the reduction in scour and the size of the wound. Although measuring the phenotypic serum level showed that its systemic absorption was low and the phenytoin solution seemed safe in wound dressing, the investigation of the healing
process of the wound compared to normal saline indicated a small effect and no statistically significant difference could be found. This study was somewhat consistent with our results\(^{(19)}\).

Luo et al. compared non-surgical treatment with surgery for skin graft surgery and found that surgical treatment imposes more costs on the patient, but both methods are similar in terms of disability and impairment they cause for the patient after surgery, which confirms the results of our study\(^{(20)}\).

Elyasinia et al. compared the results of surgical and conservative methods. Despite the use of skilled surgeons, surgery did not lead to better results. Moreover, the benefits of the conservative method (use of zinc adhesive tape) were determined\(^{(21)}\). Weichman et al. (2013) conducted a review study regarding the treatment and outcomes of fingertip injuries. They found that the average time to return to work in patients undergoing surgery is longer than those treated with conservative methods. This research states that, regardless of the accepted algorithms for treatment, many fingertip injuries can be treated in a non-surgical way and achieve an acceptable sensation, proper movement control, and a less average time to return to work\(^{(14)}\). In our study, there was no significant difference between the groups. The limitations of our study included convincing the patients to participate, cooperate and receive various therapies. We attempted to convince them by explaining the objectives and methods of treatment.

### Conclusion

The results of this study for the first time showed that phenytoin dressing has the same effect as Vaseline dressing in treating fingertip injuries and is not superior in this regard. Furthermore, the findings confirmed the previous studies and showed that the results of the treatment are similar in surgical and non-surgical methods. It is recommended to conduct studies with higher sample size and more accurate statistical population to confirm or reject the results of this study.

### References


