ABSTRACT

Background: The aim of this study is to investigate the mid-term results of subdermal pocket replantation without vessel repair on fingertip amputation cases with bone fragments.

Methods: In 2018-2019, nine patients' eleven fingers whose fingertip amputation could not be repaired and be applied subdermal pocketing were included in the study. Satisfaction level, range of motion, length and survival rate, two-point static discrimination and Semmes Weinstein monofilament test were applied.

Results: All of the patients included in the study were male and the mean age was 35.2 ± 13.5 years. The mean time between insertion and removal of the finger in the pocket is 16.45 ± 2.42 (14-21) days. The median of SMWT was 2.83 (2.83 – 6.65) and the mean of S2PD was 3.62 ± 0.38 (2.00 – 6.00) mm. The mean score of satisfaction was 65.9 ± 27.9 (0 – 100) out of hundred. Three patients' three fingers survived and this patients were named as group A, and the other 6 patients (8 fingers) were named as group B. The average survival rate of three patients was 71.7 ± 33.2%. There was no statistically significant difference between groups in terms of age, waiting time in the pocket, SWMT, S2PD and satisfaction scores.

Conclusions: Although pocket replantation method is an easy method to apply, it does not show perfect results in cases with bone fragments. It seems to be a viable method for providing venous drainage in fingertip amputations where artery repair can be performed but vein repair cannot be performed.

Key words: Pulp defect, tamai zone I, subdermal pocket replantation, finger distal amputation

Introduction

Fingertip amputations are finger injuries that can be seen in all age groups, may cause cosmetic and functional problems. There are various causes of the fingertip amputation, including sharp and blunt (e.g. door squeezing) traumas [1]. Treatment varies according to the type and level of injury. Secondary healing, composite grafting, stump revision shortening the fingertip, homodigital or heterodigital flaps, supermicrosurgical methods and replantation can be applied [2]. It is divided into two groups by Tamai according to their amputation level. Amputations from the tip to the nail root are classified as zone I, and proximal from the nail root are classified as zone II [3].
Tension and shortness of the fingertip after the repair is undesirable [2]. Although the perfect treatment method is microsurgical replantation, vascular anastomosis may not be performed, especially in injuries caused by blunt instruments. In these cases, it may be necessary to shorten the finger or reconstructive methods may be tried. Another option is to repair the amputated part as a composite graft. Although composite grafting is recommended in the pediatric age group, the success of this method in adults is below 50% [4]. Alternatively, composite grafting with tissue cooling or with subdermal pocket method has been described to increase the success in finger tip amputations where vessel repair cannot be performed [5,6].

The aim of this study is to investigate the mid-term results of fingertip amputation cases with bone fragments and subdermal pocket replantation without vessel repair and the factors affecting the results.

Method

Patient Selection

Patients who underwent subdermal pocket method due to fingertip amputation in our hospital between June 2018 and December 2019 were included in the study. Patients with previous finger injuries, who did not agree to participate in the study, with large bone injuries in the same extremity, pediatric patients and thumb amputations (since it cannot be placed on the palm) were determined as exclusion criteria. In total, 11 fingers of nine patients were included in the study.

Surgical Procedure

Under peripheral block anesthesia, the amputated piece was evaluated with a microscope. The epidermis layer of the amputated fingers, which seemed to be unable to be repaired, was stripped with scissors, then they were placed on the stump with 1 Krishner wire. The skin was primarily repaired. The finger was flexed and a subdermal pocket was opened where the fingertip touched the thenar area. The finger was placed in the pocket so that the amputated part was completely buried. It was fixed with 2/0 prolene sutures to inflate the movement. Followed up with daily dressing in short arm splint for about 2 weeks. After 2 weeks, stitches were removed under sedation and the finger was removed from the pocket (Figure 1). All procedures applied by same surgical team.

Clinical Examination

The patients were called for the last control and evaluated by both authors.
1. Patients' satisfaction levels were evaluated with scoring over hundred.
2. Finger length and survival rate were found by marking the incision level in the contralateral synonymized finger with the replanted finger and by proportioning the lengths of the distal parts. After healing with secondary healing tissue in patients with complete necrosis in the distal part, the necrotic part was excised.
3. Sensory levels were measured by finger tip two-point static discrimination and the Semmes Weinstein monofilament test. cold intolerance and neuropathic pain questioned.
4. Bone union was evaluated by direct radiography.

Statistical Analysis

The data obtained were transferred to the computer environment and analyzed in the SPSS 20.0 program. The mean and frequencies of demographic data and mean of the examination results (lysis rate, Semmes Weinstein Monofilament and static two point discrimination test) were evaluated. After evaluating the compliance of the data to normal distribution with the Shapiro Wilk test, Mann Whitney U test performed to analyse the difference between groups. Results with a p value of less than 0.05 were considered statistically significant.

Results

All of the patients included in the study were male and the mean age was 35.2 ± 13.5 years. While one of the fingers was amputated after a household accident due to jamming in the door, the other 10 fingers were amputated due to work accident. One of the nine patients is left hand dominant and 5 of the injuries oc-
Clinical result of pocket replantation

curred in the dominant hand (Table 1). The average follow-up time is 584.6 ± 13.6 (488 – 632) days. All injuries were distal to the nail bed germinal matrix (tamai zone 1). Third finger had been injured more frequently than the others (4/11) (Table 2).

Microscopic dissection was performed during surgery in all cases and it was concluded that artery anastomosis could not be performed. The mean time between insertion and removal of the finger in the pocket is 16.45 ± 2.42 (14-21) days. Two patient had PIP (proximal interphalangeal) joint stiffness.

Cold intolerance was observed in 5 of the fingers at the last control. The median of SMWT was 2.83 (2.83 – 6.65) and the mean of S2PD was 3.62 ± 0.38 (2.00 – 6.00) mm. The mean score of satisfaction was 65.9 ± 27.9 (0 – 100) out of hundred.

Three patients’ three fingers survived and this patients were named as group A, and the other 6 patients (8 fingers) were named as group B. There was no statistically significant difference between groups in terms of age, waiting time in the pocket, SWMT, S2PD and satisfaction scores (Table 3).

Figure 1. (A) Pre operative photo of the amputated finger (dorsal) (B) De-epithelialized finger intraoperative (volar) (C) Finger intraoperative (dorsal) (D) Finger after 2 weeks (dorsal) (E) finger after 3 weeks (dorsal) (F) after 2 weeks primary closed pocket (G) after two years dorsal photos of a patient with good outcome.
Discussion

After a fingertip amputation, artery, vein, and nerve repair may be challenging nearly impossible with standard microsurgical methods. In these cases, composite grafting, pocket method, replantation, flap applications or stump revision may be preferred. It is expected that atrophy does not develop at the end of surgical treatment, the patient is cosmetically pleased, the sensation is regained, the broken bone is healed, the joint range of motion is maintained, cold intolerance or pain does not persist in the long term. There are publications advocating that pocket replantation yields satisfactory functional results with minimal atrophy with good cosmetic results [6-8].

Yabe et al. [7] reported near complete survival in 91% of patients, but in our study, atrophy was observed with an average of 68.3% of the patients. The survival of the distal part over 50% was achieved in only two fingers in our study. This causes the shortness to be noticed from the outside, the nail bends towards the palmar and a bad appearance cosmetically [2]. And also all patients had a broken bone fragment but bone healing was not observed in any patient. Muneuchi et al [9] reported in their study that two of six finger survived more than half, like our study. In previous studies, no information was given about fracture union.

The chest, abdomen or palm may be chosen for pocket location. Thenar region was chosen in our study. And we believe that the pocket location doesn’t affect the finger survive because all of these regions have rich blood supply [9].

The development of senses in patients was gratifying. In the Semmes Weinstein test, results were found close to the same finger of the other hand. While five patients had cold intolerance, none of the patients had chronic pain.

The average level of satisfaction of the patients over a hundred from the procedure is 80.5. Although the satisfaction scores of the patients seems highly, pocket replantation cannot meet the high survival rate as expected, and it shows poor results cosmetically. Clubbing is one of the most important reasons for this.

As a result, although pocket replantation method is an easy method to apply, no great success should be expected. Due to the high lysis rate, it is thought that the amputated part is not fed by this method. It appears to be a viable method for providing venous drainage in fingertip amputations where artery repair can be performed but vein repair cannot be performed. Studies comparing fingertip flaps and replantation results are required to clarify the correct treatment option and clinical results in fingertip amputations.
Conflict of interest statement
The authors have no conflicts of interest to declare.

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