



# Our Experiences about Reconstruction of the Tip Amputations

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## Abstract

**Introduction:** Hand injuries typically need reconstruction in plastic surgery practice. (1) Tip region is the most injured area. Hand injuries mostly arise from traumas.

**Methods:** In this study, the retrospective analysis of the 625 patients, who were operated because of tip amputation in our clinic between the years of 2013-2017, was carried out. The patients were not eligible for replantation.

**Results:** The cause of the traumas was mostly industrial injuries. Finger jam was the common cause in the pediatric population. Composite grafts were used in cases with torn fingers (60%). Locoregional flaps and free flaps were applied in cases which had no torn fingers.

**Discussion and Conclusion:** Reconstruction of hand injuries is very important because of the feeling, touching, grasping and holding functions of the hand. Functional reconstruction should be performed in such tip amputation injuries.

**Keywords:** Fingertip; reconstruction; tip amputation.

Hand injuries often require reconstruction in plastic surgery [1]. Fingertip is the most commonly injured area of the hand. In the etiology, traumas are frequently seen. Amputated limbs can be successfully replanted with developing microsurgical facilities. In non-replantable cases, we have many treatment options in accordance with the reconstructive ladder [2]. Depending on the type of injury, functional and aesthetic results should be prioritized, and adaptation of the amputate as a composite graft, a suitable reconstructive method should be chosen from the regional flap and free flap.

## Materials and Methods

The records of 625 patients who were operated for tip amputation in our clinic between 2013 and 2017 that were not eligible for replantation were analyzed retrospectively. The

analysis was carried out according to age, gender, localization, size and characteristics of the defect, mechanism of injury, tendons, vessels, nerves and other pathologies. Tamai classification was used for the localization of the injuries. The Tamai classification is a simple and practical classification dividing the distal phalanx into two anatomical regions. This classification is generally used in distal phalanx amputations. The distal phalanx is divided into zone1 and zone2. Zone 1 is the distal part of the nail bed and zone 2 is the part between the distal interphalangeal joint and the nail bed.

## Results

Of the patients evaluated, 590 were male and 35 were female. The mean age of the patients was 34 (1-90) and 65% of the patients were smokers. Although the etiology of

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trauma was the most common occupational accident, the most frequent etiologic cause was finger jam in the pediatric age group. A total of 162 patients in the pediatric age group was followed. When the female patient group was examined, home accidents in the kitchen were determined as the second cause after work accidents. In male patients, accidents related to motor vehicles and accidents while cutting wood with spirals were the most common causes after workplace accidents. One hundred eighty-four patients presented to our clinic with tissue defect due to fingertip amputation (Tamai type 2). Total amputation was identified in 52 patients. However, amputate was non-replantable due to the etiology of the injury and was adapted as a composite graft (60%) in appropriate cases. There was no amputate in 21 amputation cases. Therefore, reconstruction with locoregional flaps (95%) and free flaps (5%) was performed. Reconstruction was performed for 420 cases with (Tamai type 1) grafts, locoregional flaps and free flaps, while 54% of these patients were reconstructed with grafts, 45% with locoregional flaps and 1% with free flaps. When all local flaps were evaluated; Atasoy flap (60%), cross finger flap (15%), thenar flap (5%), homodigital island flaps (anterograde-retrograde) (15%) and heterodigital flaps (5%) were used. The free flap was dorsoulnar free flap and lateral arm flap (1%). The composite graft was obtained from 95% amputate in patients with graft, and remaining patients got a delayed reconstruction (after dressing for a period of time) with a full-thickness skin graft taken from the wrist volar in 3% and with the full-thickness skin graft taken from the arm medial in 2%.

## Discussion

Fingertip is the most commonly injured area of the hand. Amputations are mostly seen in this region. Fingertip amputations have been tried to be treated by various methods so far, which include primary stump repair (with or without shortening of bone), repair of existing amputated composite grafts, secondary healing, skin grafts and local, remote and free flaps.

In Dadaci et al.'s [3] study in 2016, they stated that replantation, if doable, is superior to other alternative methods in the reconstruction of fingertip injuries. In the same study, the mechanism of injury was the determinant of a successful replantation procedure and the success rate was higher in non-crush injuries. In our study, we retrospectively reviewed the methods applied in patients that were not eligible for replantation.

Braun et al.,<sup>[4]</sup> in their retrospective study, compared 79 patients who underwent primary stump repair (with or without shortening of the bone) and partial thickness skin graft repair in 79 fingertip injuries and found no significant difference between the two, functionally. According to this study, the results were stabilized 6 to 42 weeks after the procedure, and no significant difference was found between the time they return to work, according to the applied method.

In Söderberg et al.'s [5] study, 36 patients with fingertip amputation got a surgical intervention, whereas 34 patients were followed up conservatively. Bone exposition was present in all patients and there was no significant difference between the functional and aesthetic results of the patients after a 1-year follow-up period.

In 2012, in Van den Berg et al.'s [6] study, none of the surgical methods applied for fingertip amputations (primary stump repair with or without shortening of bone, repair with a skin graft, pedicled flaps, distant or free flaps) provided functional superiority over one another. Thus, the surgical method should be chosen after these injuries showed uncertainty. They found no significant difference in patients between surgical reconstruction, bone shortening and conservative treatment methods in the long term.

In most studies of the fingertip injuries, it is suggested that microvascular replantation should be tried if amputate is present and is suitable for replantation. However, many factors, such as the age of the patient, number of fingers to be amputated, the desire of the patient, comorbid conditions affect the treatment method to be selected. In their study in 1977, Elshahy stated that adaptation of amputating as a composite graft was accepted as the standard procedure in patients who were not suitable for replantation [7]. In our retrospective study, we observed that composite grafting was successful, especially in pediatric patients.

Rose et al.<sup>[8]</sup> reported that bone excision in fingertip injuries increased the contact surface between the graft and the stump and achieved better results in patients who had undergone composite grafting. In our clinic, we do not routinely perform bone shortening in patients with composite grafts. However, if tension occurs between the two tissues or bone exposition is too much, we prefer it. We observed no differences in patients who underwent an operation with or without bone shortening.

In addition to replantation, composite graft application or conservative treatments related to fingertip injuries, many

homodigital, heterodigital and staged pedicled flaps have also been described and are frequently applied in today's practice. One of the most commonly used homodigital flaps is the VY advancement flap, defined by Kutler<sup>[9]</sup> and Atasoy<sup>[10]</sup>. Tupper and Miller compared the two-point discrimination of 16 patients who underwent placement of 20 volar VY flaps and concluded that it was normal as 73%. Likewise, Kartik said that the patient who was performed 29 volar VY flaps regained normal feeling function after three months <sup>[2]</sup>.

After Littler described the heterodigital flaps in 1953, they were also started to be used in fingertip injuries <sup>[2]</sup>. However, studies on these flaps have reported problems, such as hypersensitivity, joint stiffness and cold intolerance <sup>[2]</sup>. Compared to other methods in our clinic, we use heterodigital flaps less frequently. We also use pedicled flaps (such as thenar and hypothenar flaps) in some cases. However, the flaw of these flaps is that the injured finger is buried in the thenar or hypothenar or inguinal region for two to three weeks and then separated from the donor area by a second surgical intervention. However, we also use these flaps when necessary.

As a result, hand injuries are injuries that often require reconstruction in plastic surgery. As retention is important in sensation, touch and compression movements, reconstructions are characteristic. Reconstructive options are not always applied according to the reconstructive ladder. When evaluating the reconstruction options, the viability of the amputate, the comorbid status of the patient, performing the reconstruction immediately or late, the type of injury, the comorbid neurovascular and osseous structures, the suitability of the donor areas, the occupation and socioeconomic status of the patient should be evaluated <sup>[11]</sup>.

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