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Fingertip Amputations Repair with V-Y Flap and Polyethylene Nail

Bulent Ozdemir[1,a*], Tarık Elma[2,b]

[1] Special Clinic, Adana, Turkey, [2]Department of Orthopaedics and Traumatology, Medline Hospital Adana, Adana, Turkey

**Corresponding author*

Research Article

History

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ABSTRACT

Background: Finger amputations are the most commonly encountered amputation injury in the upper extremities. It is important to avoid shortening and to preserve the length of the finger in fingertip amputations in order not to lose the functions of the hand. The aim of this study was to evaluate the results of our patients who underwent reconstruction using V-Y pulp flap and artificial nail in order to avoid donor site morbidity in fingertip defects.

Methods: The results of patients who underwent reparation with V-Y flap and polyethylene nails for exposed distal phalanx and partial nail bed defect after fingertip amputation were evaluated in this retrospective study. The data of 44 patients who underwent 44 V-Y advancement flap between January 2016 and January 2021 were retrospectively analysed.

Results: A total of 44 patients, 5 females and 39 males, who were treated for fingertip amputation, with a mean follow-up period of 24.2 months (14-71) and a mean age of 34.75 (2-68) were included in the study. The mechanism of injury was guillotine-style, avulsion and crush injuries in 15 (34.1%), 11 (25%) and 18 (40.9%) patients, respectively. Among the patients, 25 (56.8%) had right hand injuries, while 19 (43.2%) had left hand injuries. The dominant hand was affected in 28 (63.6%) patients. In 5 patients, the distal phalanx was shortened to the level of the lost nail bed (shortening was maximum 5 mm). Nail formation had occurred in all patients and deformed nail structure was seen in 18 patients. Graft necrosis was seen in 2 patients.

Conclusion: It is difficult for surgeons to decide on the treatment method because of the fact that there are multiple surgical techniques in the literature and the results are reported differently. Success rates are high in our technique. Each technique has its own advantages and disadvantages.

Keywords: Amputation; Digit; Finger; V-Y Flap; Nail; Finger Tip.

Parmak Ucu Amputasyon Rekonstrüksiyonunun V-Y Flep ve Polietilen Tırnak ile Onarım Sonuçlarımız

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ÖZ

Giriş: Parmak amputasyonları, üst ekstremitelerde en sık karşılaşılan amputasyon yaralanmasıdır. Parmak ucu amputasyonlarında elin fonksiyonlarını kaybetmemesi için parmak boyunun korunması ve kısaltılmaması önemlidir. Bu çalışmanın amacı, parmak ucu defektlerinde verici alan morbiditesini önlemek amacıyla V-Y pulpa flebi ve yapay tırnak kullanılarak rekonstrüksiyon uygulanan hastalarımızın sonuçlarını değerlendirmektir.

Yöntemler: Bu retrospektif çalışmada, parmak ucu amputasyonu sonrası açığa çıkan distal falanks ve kısmi tırnak yatağı defekti için V-Y flebi ve polietilen çivi ile onarım uygulanan hastaların sonuçları değerlendirildi. Ocak 2016 ile Ocak 2021 tarihleri arasında 44 V-Y ilerletme flebi uygulanan 44 hastanın verileri retrospektif olarak incelendi.

Bulgular: Parmak ucu amputasyonu nedeniyle tedavi edilen, ortalama takip süresi 24,2 ay (14-71), yaş ortalaması 34,75 (2-68) olan 5'i kadın, 39'u erkek toplam 44 hasta çalışmaya dahil edildi. Yaralanma mekanizması sırasıyla 15 (%34,1), 11 (%25) hastada giyotin, avülsiyon ve ezilme yaralanmasıydı. Hastaların 25'inde (%56,8) sağ elde, 19'unda (%43,2) sol elde yaralanma mevcuttu. 28 (%63.6) hastada dominant el etkilenmişti. 5 hastada distal falanks kaybedilen tırnak yatağı hizasına kadar kısaltıldı (kısalma maksimum 5 mm idi). Tüm hastalarda tırnak oluşumu meydana geldi ve 18 hastada deforme tırnak yapısı görüldü. 2 hastada greft nekrozu görüldü.

Sonuç: Literatürde birden fazla cerrahi tekniğin olması ve sonuçların farklı bildirilmesi nedeniyle cerrahların tedavi yöntemine karar vermeleri zordur. Tekniğimizde başarı oranları yüksektir. Her tekniğin kendi avantajları ve dezavantajları vardır.

Anahtar sözcükler: Amputasyon; Digit; Parmak; V-Y Flep; Tırnak; Parmak Ucu.

[a] *bulent0116@hotmail.com* *https://orcid.org/0000-0003-2829-7849* | [b] *drtarikelma@gmail.com* *https://orcid.org/0000-0003-4800-3983*

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Introduction

Finger amputations are the most commonly encountered amputation injury in the upper extremities. The incidence of finger amputations has increased in parallel with the increase in industrialization. It is important to avoid shortening and to preserve the length of the finger in fingertip amputations in order not to lose the functions of the hand. Replantation (especially in the case of sharp body injuries) should be performed, if possible. Replantation in thumb amputations is important in terms of preserving functions [1]. Although replantation surgery is a frequently used method, it can be impossible for a variety of reasons, including excessive crushing, contamination, multilevel injury, or other associated injuries [2]. Besides, the failure rates due to venous congestion are high in distal amputations, due to the lack of suitable veins for anastomosis [3]. Since replantation is often difficult in fingertip amputations, it is known that other reconstructive methods for fingertip amputation such as Moberg flap, volar V-Y advancement flap, thenar flap and small free flap are good treatment options; but these options cannot recreate the nail bed [4]. However, reconstruction of the volar pulp defect is difficult when the nail bed is lost [4]. The aim in all these treatments are the preservation of function, the restoration of sensation and durability at the fingertip, and the provision of proper bone support to allow nail growth [5]. These results can be achieved through careful soft tissue coating and, if possible, the protection of the nail bed [6]. Since the fingertip has high concentration of sensory receptors, the preservation of the sense of touch is vital for the patient; therefore, the restoration of the sense is the primary focus of treatment [7]. In addition, achieving nail growth is a key factor in maintaining appearance [7]. The ultimate goal is to restore function and contour as close as possible to the natural anatomy [8].

We treated our patients by creating a nail from a nelaton cathater in order to provide the feeling at the fingertip, because the V-Y advancement flap to the nail bed could not be stitched. The aim of this study was to evaluate the results of our patients who underwent reconstruction using V-Y pulp flap and artificial nail in order to avoid donor site morbidity in fingertip defects.

Material Method

The results of patients who underwent reparation with V-Y flap and polyethylene nails for exposed distal phalanx and partial nail bed defect after fingertip amputation were evaluated in this retrospective study. The data of the V-Y advancement flap performed between January 2016 and January 2021 in Medline Adana hospital were retrospectively evaluated after the approval was obtained by the July 06, 2020 dated, and 0.2 numbered decision of the hospital ethics committee. Patients with traumatic total finger amputation were included in the study. Patients with total excised nail beds and patients with skin defects where V-Y advancement flap were to be made, were excluded from the study. Patients were discharged on the same day.

Surgical Technique

Digital block was used to numb the finger in all patients. The size of the patients' nail bed was determined and a nail-shaped piece was cut from the appropriate nelaton cathater. After the created nail was sewn, the V-Y advancement flap and sewn to the sides of the fingertip and the nelaton cathater distal (Figure 1). The created nail was taken after 1.5 months.

Figure 1. Preoperative and postoperative images of the patient with thumb amputation, as well as the appearance of the patient 6 months later

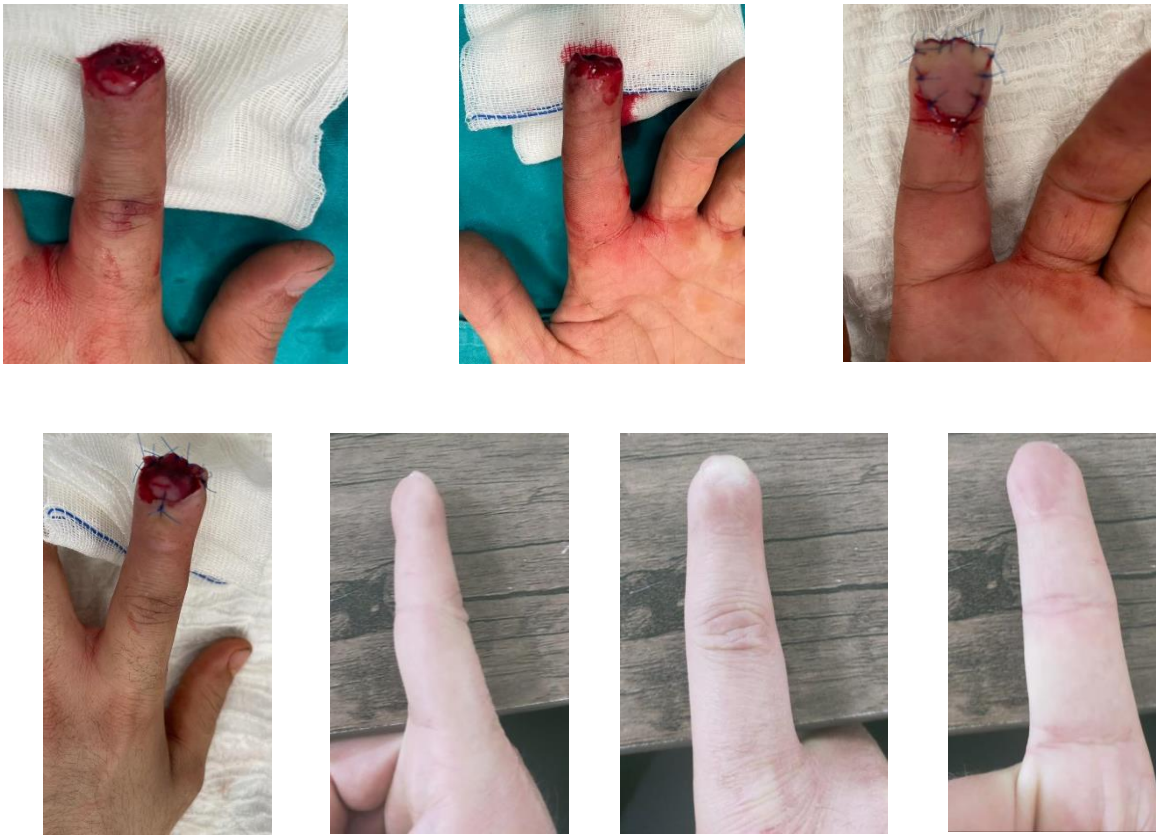

Figure 2. Preoperative and postoperative images of the patient with 2nd finger amputation, as well as the appearance of the patient 6 months later

Results

A total of 44 patients, 5 females and 39 males, who were treated for fingertip amputation, with a mean follow-up period of 24.2 months (14-71) and a mean age of 34.75 (2-68) were included in the study. The mechanism of injury was guillotine-style, avulsion and crush injuries in 15 (34.1%), 11 (25%) and 18 (40.9%) patients, respectively. Among the patients, 25 (56.8%) had right hand injuries, while 19 (43.2%) had left hand injuries. Of the patients, 40 (90.9%) used their right-hand and 4 (9.1%) used their left hand dominantly. The dominant hand was affected in 28 (63.6%) patients. Of the 44 fingers treated, 4 were the 1st finger, 16 were the 2nd finger, 12 were the 3rd finger, 9 were the 4th finger and 3 were the 5th finger. In 5 patients, the distal phalanx was shortened to the level of the lost nail bed (shortening was maximum 5 mm). Nail formation had occurred in all patients and deformed nail structure was seen in 18 patients (Table 1). Graft necrosis was seen in 2 patients.

Table 1. Demographics

Number	44
Age (Range)	35 (2-68)
Male/Female	39/5
Dominant hand (Right/Left)	40/4
Right/Left	25/19
Affected finger	
1	4
2	16
3	12
4	9
5	3
Follow-up time in months (range)	24.2 (14-71)

Discussion

Since we constantly use our hands in daily activities and working life, finger amputations are encountered too much to be underestimated. The treatment method in fingertip amputations depends mainly on the shape of the fingertip defect and the level of amputation [9]. Bone tissue can be exposed after closure with flap applications and grafts due to nail loss, in fingertip amputations. In our study, we preferred to use nelaton cathater because of the difficulty in suturing the flap to the end of the nail bed in reconstruction with the V-Y advancement flap and also to form the nail bed. We achieved successful results after this application. If the severed part was brought with the patient and was intact, we used the nail taken from the severed part. We did not include these patients in our study. The aim in fingertip ruptures treatment should be to provide the formation of a nail bed as well as to cover the pulp with soft tissue and to restore the feeling.

Fingertip injuries are usually accompanied with nail bed injuries. If this condition is not treated, nail deformity may occur. In cases where replantation is not possible, performing local or regional flap surgery allows functional rehabilitation by ensuring soft tissue integrity in the early period. This suggests that these flaps may be an alternative to replantation [10]. The V-Y advancement flap, often used in transverse or oblique dorsal fingertip amputations, provides satisfactory contour and sensation without the need for postoperative immobilization [11]. The flap should not be stretched while closing to prevent necrosis that may otherwise occur with the flap [12]. In our study, necrosis developed in 2 patients' flaps which required more than 1 cm of advancement.

Minimizing nail bed abnormalities has advantages both functionally and aesthetically when reconstructing fingertip injuries [13]. Hook nail formation was seen in 7 patients, in our study. There were crush injuries with nail bed deformities in these patients. Hook nail formation is caused by the loss of volar bone and soft tissue support, so that the nail curls and forms a fragile tip [14-16]. This deformity is unsightly to the eye and can cause difficulties in grasping small objects and cutting nails [17]. Nail beds extending to the tip of the distal phalanx should be excised in order to prevent hook nail deformity [17]. We think that this result in our patients is due to the lack of our experience in V-Y advancement flap during the first years and due to defect in the nail bed combined with crushing. We think that such complications would not occur in reconstructions performed using the patient's own nail taken from the severed part.

While the V-Y advancement flaps locally maintain the sense, it is also cosmetically advantageous because flap application is not performed from another area. Lemsani et al. [9] applied thenar flaps to 32 patients, in their study. They found a statistically significant difference in the active movement of the distal interphalangeal joint compared to the other hand, but they did not find infection and donor site morbidity in any of their patients. All patients included in that study had defects larger than 1.5 cm. In our study, the size of defects in patients was less than 1 cm except for 2 patients. Since the defect size was small, we performed local v-y flap application and none of our patients had joint movement limitation. Therefore, selection of the appropriate treatment method in fingertip amputations is important to minimize complications. In addition, unlike thenar flaps, postoperative flexion contracture and finger stiffness did not occur in our patients due to the fact that we started early movement in all our patients [18]. In addition, one study argued the use of Kirschner wires to secure the flap directly to the distal phalanx instead of the suture [19]. In our study, we aimed to perform this process by using artificial nails instead of K-wire.

Conclusion

It is difficult for surgeons to decide on the treatment method because of the fact that there are multiple surgical techniques in the literature and the results are reported differently. Success rates are high in our technique. Each technique has its own advantages and disadvantages. When deciding on the surgical technique, all these factors should be considered properly and the surgical technique should be decided in a way to obtain the most appropriate aesthetic appearance, sensation and functional result for the patient.

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