

Distal Phalanx Reconstruction with Bone Graft and Free SCIP Flap

Kemik Grefti ve Serbest SCIP Flep ile Distal Falanks Onarımı

 Mehmet Altıparmak¹

¹Bodrum Acıbadem Hospital, Muğla, Türkiye

ÖZET

Distal falanks, elin tutma ve kavrama fonksiyonlarının yerine getirilmesinde parmağın önemli bir parçasıdır. Yaralanma türü ne olursa olsun, distal falanks onarımları her zaman zorlayıcıdır. Distal falanks onarımında dikkat edilmesi gereken 4 unsur: Kemik greftinin oluşturulması, yaranın kapatılması, yara kapatılırken estetik kaygılara dikkat edilmesi ve parmağa hareket kazandırılması olarak özetlenebilir. Tarafımızdan onarılan distal falanks amputasyon defekti sunulmuştur. Sol el 2.parmağın elektrikli testere ile kesilmesi sonucu orta falankstan başlayıp distale oblik uzanımlı olarak uzanan bir amputasyon defekti mevcuttu. Orta falanksta yumuşak doku defekti varken, distalde ise sadece tırnak yer alıyordu. Kemik onarımı, orta falankstan alınan parsiyel 1,5cm uzunluğunda kemik greftinin mikroplak ve vida ile sabitlenmesi ile onarıldı. Fleksör tendon ise distaldeki vidanın ucuna dikildi. Parmak kenarları debridmanı sonrasında 3x4,5 cm boyutlarında bir defekt meydana geldi. Sol inguinal bölgeden kaldırılan 3,5x6,5 cm boyutlarındaki ince SCIP flep ile, radyal dijital artere uç-yan, konkomitan vene de uç-uca anastomoz yapılarak defektin kapatılması sağlandı. Bir haftalık takip sonrasında hasta taburcu edildi. Takiplerinde herhangi bir sorun görülmeyen hastanın flebinde inceleme ve hareket kabiliyeti kazandığı görüldü. Hem hareket kabiliyetinin kazandırılması hem de kemik onarımının yapılması için falankstan kısmi kemik grefti alınması, tendon onarımının yapılması ve serbest flep yapılarak diğer bölgesel flep seçeneklerinin aksine elin dorsal anatomisinin bozulmaması bir avantajdır. Ameliyat süresinin ve hastanede yatış sürelerinin uzunluğu ve yüksek maliyet, bu yöntemin dezavantajıdır.

Anahtar Kelimeler: SCIP flep, Distal falanks, Parmak, Rekonstrüksiyon, Kemik grefti

ABSTRACT

The distal phalanx plays a crucial role in gripping and grasping functions of the finger. Injuries, particularly those requiring distal phalanx repair, can be challenging. Four main factors to consider in this repair are: bone reconstruction, wound closure, aesthetic concerns during wound closure, and restoring finger movement. This report presents a case involving an amputation defect in the 2nd finger of the left hand due to a power saw injury. The injury resulted in an oblique amputation defect extending from the middle phalanx to the distal phalanx. While there was a soft tissue defect in the middle phalanx, the distal phalanx only included the nail. In the repair process, a 1.5 cm long partial bone graft taken from the middle phalanx was fixed with microplates and screws. The flexor tendon was sutured to the end of the distal screw. After debridement of the finger edges, a 3x4.5 cm defect was created. This defect was covered with a 3.5x6.5 cm thin SCIP flap taken from the left inguinal region. The flap was anastomosed end-to-side to the radial digital artery and end-to-end to the concomitant vein. The patient was discharged after a one-week follow-up. Subsequent follow-ups showed thinning of the flap and restoration of finger mobility. Using a partial bone graft from the phalanx, performing tendon repair, and applying a free flap helped preserve the dorsal anatomy of the hand, unlike other regional flap options. However, the length of the surgery, extended hospital stay, and high cost are disadvantages of this method.

Keywords: SCIP flap, distal phalanx, finger, Reconstruction, Bone graft

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Sorumlu Yazar/Corresponding Author: Mehmet Altıparmak, Bodrum Acıbadem Hospital, Muğla, Türkiye
e-mail: dr.maltiparmak@gmail.com

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INTRODUCTION

The hand's ability to grasp and pinch relies significantly on the distal phalanx. Most hand traumas occur at this level (1). Maintaining the length of the finger and preserving the range of motion in the joints are critical for functional recovery, particularly in the index and middle fingers. Replantation remains the optimal method for preserving both the aesthetic and functional aspects of a finger. However, replantation is not always feasible (2,3). In cases where replantation is not possible, a comprehensive approach is required. Four key considerations must be addressed: 1) bone reconstruction, 2) restoration of finger mobility, 3) wound closure, and 4) aesthetic outcomes. Even when replantation is not an option, focusing on these four aspects can facilitate the restoration of a pleasing extremity.

This report presents a case of distal phalanx reconstruction of the second finger, emphasizing these critical considerations.

CASE REPORT

A 69-year-old male patient was referred to our clinic with an amputated distal phalanx of the left index finger following a crush and avulsion injury; unfortunately, the amputated part could not be recovered. The distal phalanx was absent, though the nail was preserved (Fig. 1). The middle phalanx exhibited partial abrasion, with tendon insertions compromised. The four considerations were addressed as follows:

1. Bone Reconstruction: The distal phalanx was reconstructed using a bone graft harvested from the middle phalanx. A 7x15 mm bone graft was excised with an oscillating saw and fixed to the middle phalanx using an L-shaped, four-holed microplate. Following appropriate debridement, a 5x3 cm skin and soft tissue defect with bony exposure was noted (Fig. 2).

2. Restoration of Finger Mobility: The mobility of the finger was restored by utilizing the flexor digitorum profundus (FDP) tendon, which was sutured to the bone graft using 4-0 Prolene sutures.



Figure 1. Three images of the amputated finger defect.

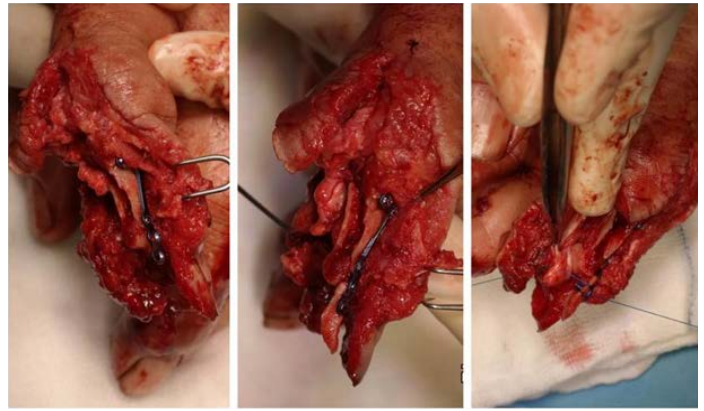


Figure 2. Bone and tendon reconstruction. Left: An L shaped microplate screwed to the middle phalanx where the bone graft is harvested. Middle: Bone graft fixed with 2 micro-screws to the middle phalanx. Right: FDP tendon sutured to the most distal screw to maintain mobility.

3. Wound Closure and 4. Aesthetic considerations: A thin superficial circumflex iliac artery perforator (SCIP) flap was used for wound closure and aesthetic considerations. A SCIP flap measuring 35x65 mm was harvested from the left groin area. Preoperative planning was conducted with a 20 MHz Clarius® ultrasound. Upon piercing the fascia, the artery was located just 2 mm beneath the skin, allowing for elevation of the flap to a maximum thickness of 5 mm with a 5 cm pedicle length. The pedicle contained one artery and two accompanying veins. The digital artery was dissected 3 cm proximally from the injury zone, and an end-to-side anastomosis was performed



Figure 3. Wound closure with thin SCIP flap. Upper left: Planning of the SCIP flap based on the superficial branch of superficial circumflex iliac artery. Upper right: The lateral view of the closed wound. Below left: Post-op 1 week the dorsal view of the closed wound. Note the thickness of the flap resembles the proximal part of the finger. Below right: X-ray image of the bony reconstruction.

with the digital artery. The two veins were also connected to regional veins in an end-to-end fashion using 9-0 polipropilen sutures. The defect was closed in a proximal-to-distal manner. The pulp of the finger, which presented a 4 cm² skin defect, was closed using a skin graft obtained from the distal excess portion of the flap (Fig. 3).

DISCUSSION

The functional integrity of the hand largely depends on the length and mobility of the fingers. Distal-level amputations of the upper extremity are common, and replantation remains the most effective method for achieving a functional and aesthetically pleasing result. However, in cases of crush injuries or lost amputates, replantation may not be possible (2,3). This case illustrates an avulsion-type amputation with no recoverable parts, resulting in an index finger with an exposed middle phalanx and a preserved nail but absent distal phalanx. The typical approach would involve debridement of bony fragments and coverage with remaining skin flaps. An alternative method to preserve the middle phalanx includes the use of an interpolation flap, wherein the finger is buried in the groin or the thenar area for three weeks. This approach may be enhanced with an iliac bone graft to replace the distal phalanx. However, the thick groin flap would not be aesthetically pleasing or comfortable for the patient (4). Transferring the fourth finger to the thumb or index finger is another option (5), but it poses significant psychological barriers for patients reluctant to lose another digit. Toe-to-finger transplantation is another complex option, but it comes with challenges such as potential disturbance to gait function and the need for dense skin coverage. Although some modifications have been presented, anatomical differences such as curvature discrepancies between toes and fingers are some of the limitations of toe-to-finger transplants (6). Local flaps such as first dorsal metacarpal artery flap could also be a choice for distal phalanx defect coverage. Donor site morbidities and venous congestion are the major concerns in local flaps (7). Especially in tense skinned patients, it is hard to avoid donor site complications.

In cases of traumatic injuries, it is essential to keep in mind the principles of bone reconstruction, restoration of finger mobility, wound closure, and aesthetic considerations. Achieving a restoration that resembles the original anatomy is a fundamental principle in reconstructive surgery. In this case, the distal phalanx was successfully replaced with a graft from the middle phalanx, and mobility was restored via tendon connection to the distal graft. Aesthetic closure of the wound was prioritized, as it significantly impacts the patient's acceptance of the procedure.

The choice of a SCIP flap, characterized by its thin and pliable nature, facilitated optimal wound coverage while allowing for finger mobility. The flap may need to be thinned if another flap is selected for reconstruction. It has been reported that flap thinning operation increases the number of operations, cost, and recovery period (8).

With an average pedicle length of 5.4 cm, the SCIP flap

typically extends beyond the injury zone, leaving a discreet scar on the groin. Patients generally accept this option more readily than alternatives such as toe-to-finger transplantation. In conclusion, while defect coverage is a primary concern in traumatic injuries, a thorough evaluation is essential to achieve both functional and aesthetic outcomes. The 4 aspects of distal phalanx reconstruction (bone replacement, restoration of finger mobility, wound closure with aesthetic considerations) should be kept in mind in planning.

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Address correspondence to: *Mehmet Altıparmak, Bodrum Acıbadem Hospital, Muğla, Türkiye*

e-mail: *dr.maltiparmak@gmail.com*

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