

# Refinements of Adipofascial flap for Small Defects of Fingers and Toes: Indication and Surgical Tips

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**Purpose:** Reconstruction of small defects of the dorsal fingers and toes is a challenging task. Although adipofascial flap is widely used for these areas, additional refinements are warranted. In this paper, we define the appropriate defect size in the finger and toes that can be treated with the adipofascial flap, refine its surgical indications and present a few surgical tips.

**Materials and Methods:** Twelve patients with dorsal defects of the fingers and toes were treated with a random-type adipofascial turn-over flap and skin graft. If the defect area exceeded the size that could be covered by a conventional design, the flap base was designed in oblique or curvilinear fashion to lengthen the flap. For accurate defect coverage, the width of the flap base was designed in an asymmetrical shape depending on the defect configuration, varying the width from 0.3 to 1.0 cm, as opposed to the standard 0.5 to 1.0 cm width. Moreover, the lateral limit of the flap was defined as the lateral axial line. The size of the defect ranged from 3.0×1.7 cm to 1.5×1.3 cm.

**Results:** All flaps survived completely. Gliding function of the hand was well preserved and there was no evidence of tendon adhesion.

**Conclusion:** The small defect in the dorsal finger and toe can be defined as less than one phalanx-length, measuring about 3.0×2.0 cm in size. If the defect exceeds this dimension, it is recommended that a different option be considered. We believe the adipofascial flap is an excellent option for treating small defects.

**Key Words:** Adipofascial, Surgical flaps, Fingers, Toes

## INTRODUCTION

Reconstruction of small defects of the fingers and toes is a difficult task. The soft tissues are relatively thin in the dorsum of fingers and toes, and therefore, joints, tendons and bones are easily exposed after injury. Various types of flaps have been used in the form of local, distant and free transfer to resurface these areas. In 1991, Lai et al.<sup>1</sup> reported random-type adipofascial flaps to cover dorsal finger defects. Several authors later reported similar flaps in axial pattern<sup>2,3</sup> and demonstrated

its usefulness. They described the flap base and length-to-width ratio was 0.5 cm and 1.0:1.5, respectively. Although the adipofascial tissues under the dorsal skin of fingers and toes are thin, it has sufficient thickness to cover exposed structures and its texture is smooth and pliable to enable the smooth excursion of tendon under the flap and maintain good contour of fingers and toes. Also, donor site morbidity is minimal and it can be used as a random or axial-type flap.

When using the adipofascial flap in the finger and toes, flap survival will not be reliable if the defect is larger than the digit

width or significantly longer than one phalanx-length because the width of the flap base cannot exceed that of each finger and toe.<sup>1</sup> Therefore, we believe that the adipofascial flap should be used in small defects of the digits. This study is to define the indications of this flap and present a few modifications of flap design.

## MATERIALS AND METHODS

From March 1991 to February 2011, 12 patients with soft tissue defects of dorsal fingers and toes were treated with a random-type adipofascial turn-over flap and skin grafting. Basically, my surgical methods are similar to others,<sup>1,2</sup> but a few factors were considered and modifications were made to improve the operative results.

Firstly, if the defect area exceeded the size that could be covered by a conventional design, the flap base was designed in oblique or curvilinear fashion to lengthen the flap (Fig. 1A, B). Secondly, the width of the flap base was designed in an asymmetrical shape depending on the defect configuration, varying the width from 0.3 cm to 1.0 cm, as opposed to the standard 0.5 cm width for more accurate defect coverage (Fig. 1C). Thirdly, the lateral limit of the flap was defined as the lateral axial line to avoid injuring the digital neurovascular bundle.<sup>4</sup>

## RESULTS

The patients were all male except one. Eleven cases resulted from acute injury. One patient with Boutonniere's deformity was insulted 2 months before presentation (Table 1, Fig. 2). All flaps survived completely. Partial skin graft loss and desquamation of donor site occurred in 2 cases each. The postoperative appearances of the resurfaced digits were excellent. During the follow-up period, the gliding function of the hand was excellently preserved and there was no evidence of tendon adhesion or contracture.

## DISCUSSION

The soft tissues are relatively thin in the dorsum of fingers and toes, and therefore, joints, tendons and bones are easily exposed after trauma or burn. Finding an appropriate method for treating small defects of the fingers and toes is not easy. When using the adipofascial flap in the finger and toes, a few points should take into consideration differently than compared to wound of other sites. Firstly, it is favorable to use the adipofascial flap in defect sizes that are within one phalanx dimension. In the middle finger of Koreans, the average dorsal length from the eponychium to the distal interphalangeal joint (DIPJ), from the DIPJ to the proximal interphalangeal joint (PIPJ), and PIPJ to the metacarpophalangeal joint is 1.2 cm, 3.0 cm, and 4.5 cm, respectively. The average phalanx width is about

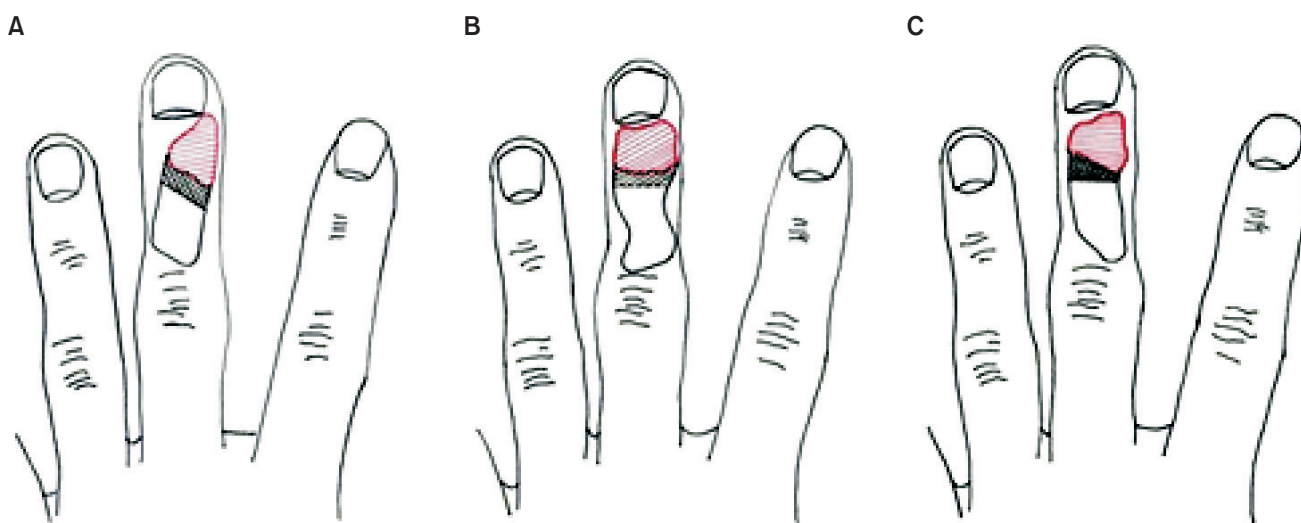
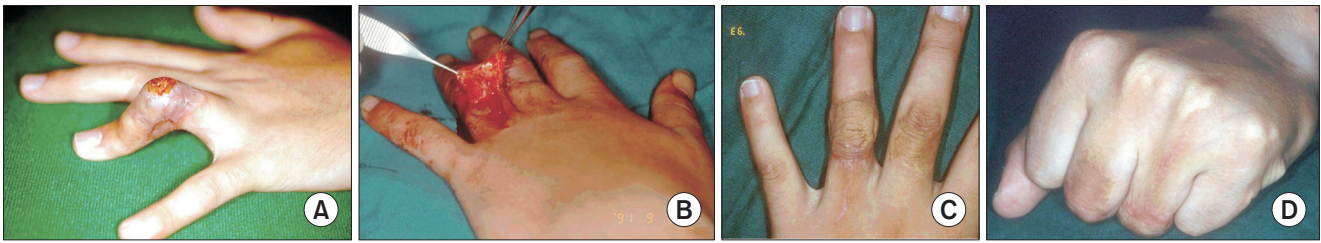


Fig. 1. (A) Oblique. (B) Curvilinear. (C) Asymmetrical.

**Table 1.** Demographics of patients

Patient No.	Sex	Age (yr)	Etiology	Location	Defect size (cm)	Complications
1	Male	24	Boutonnier deformity	4th finger, left	2.0×1.3	None
2	Male	42	Soft tissue defect	5th finger, left	1.3×1.5	None
3	Male	12	Soft tissue defect	Great toe, left	3.0×5.0	None
4	Male	67	Soft tissue defect	2nd finger, right	2.5×1.5	None
5	Male	7	Soft tissue defect	Dorsum of foot, left	2.5×6.0	Skin graft partial loss
6	Male	73	Soft tissue defect	3rd & 4th finger, right	1.5×3.0/1.5×3.0	None
7	Male	46	Soft tissue defect	Thumb, left	2.5×3.0	None
8	Female	53	Soft tissue defect	2nd toe, right	1.0×1.0	None
9	Male	71	Soft tissue defect	Thumb, left	2.0×3.5	None
10	Male	32	Soft tissue defect	3rd & 4th finger, right	2.0×2.0/2.0×1.5	None
11	Male	15	Soft tissue defect	Middle finger, left	2.0×1.0	None
12	Male	29	Soft tissue defect	3rd finger, right	1.5×2.0	None

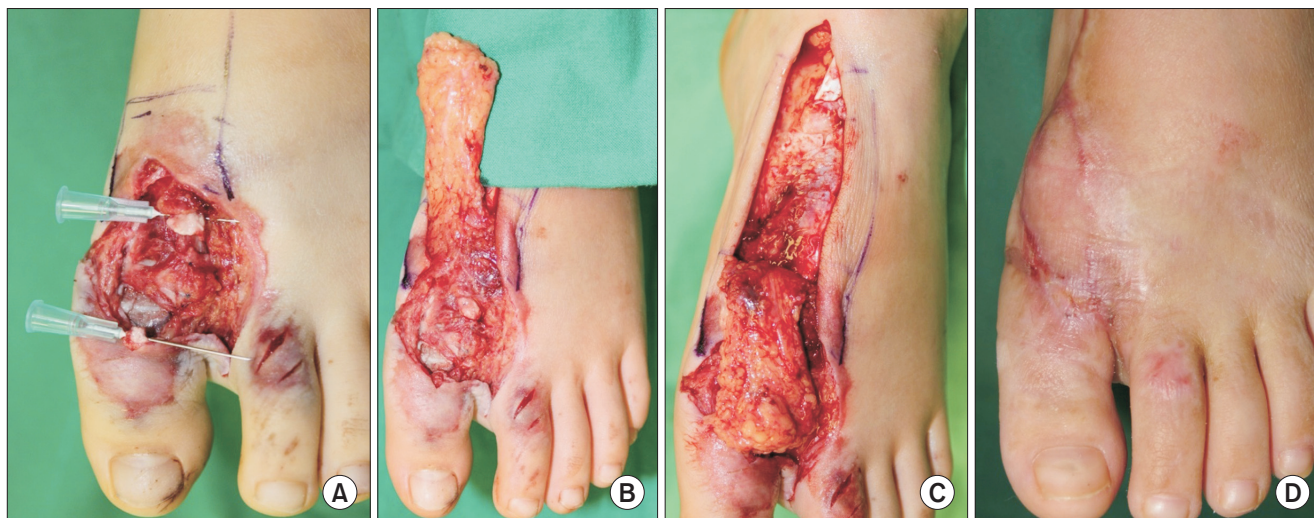


**Fig. 2.** (A) The patient had a Boutonnier deformity of his left ring finger with soft tissue defect due to crushing injury. (B) A 2.0×1.3 cm sized adipofascial flap was elevated. Centralization of lateral slip of the extensor tendon was done simultaneously. (C, D) Extension and flexion at 22 months postoperatively.

2 cm. Therefore, if a defect size is 3.0×2.0 cm, the base should be 0.5 to 1.0 cm and theoretically the length should be from 3.5 cm to 4.0 cm to ensure flap survival. If the defect size is larger than this, a larger flap is needed and thus the adipofascial flap should not be used. Secondly, elevating a flap over a proximal joint should be avoided.<sup>5</sup> If the soft tissues covering a joint is included in the flap, only skin will cover the joint and later may result in chronic pain. To avoid this, the base of the flap can be designed in oblique or curvilinear fashion to lengthen the flap. Thirdly, instead of strictly designing the flap base from 0.5 cm or 1 cm, adjusting to the configuration of the defect will allow for more flexibility. Fourthly, limiting the lateral limit of the flap to the lateral axial line of the finger will avoid injuring the digital neurovascular bundle. Use of the adipofascial turn-over flap in a fingers and toes should be confined to small defects, more specifically within two joint spaces.<sup>6</sup> Reconstructing larger defects than mentioned above is possible using an adipofascial flap, but will result in increased morbidity of the donor site.

Lastly, we found no problems with flap survival as a random-type flap. An axial-type will provide a more reliable vascular supply, but in our experience wounds of less than 3.0×2.0 cm treated with a flap without perforator healed successfully.<sup>4,6</sup> Also, it was safe to perform an extensor tenorrhaphy and tendon graft at the time of adipofascial flap coverage (Fig. 2, 3). Since preservation of finger and toe sensation is critical, using the ventral or plantar surface of the finger and toe, respectively as a flap donor site for treating dorsal area wounds should be strictly avoided. The adipofascial tissues of the finger and toes is distinct than other adipofascial flaps in that it is thin and maintains its thickness after reconstruction.<sup>7</sup> The adipofascial flap offers the advantages of a relative simple operative procedure with shorter operation time, flap reliability, and minimal donor morbidity.

The adipofascial flap should be used in the finger and toes with small defects of less than 3.0×2.0 cm in size. Versatility of the flap can be increased by designing the flap base with an oblique or curvilinear shape for a longer flap length and an



**Fig. 3.** A 12-year-old boy injured by a car. (A) 3.0x2.5 cm soft tissue defect on his left great toe. (B) 5.0x2.5 cm flap was elevated with an symmetric flap base from 0.5 to 1.0 cm. A tendon graft was also done. (C) The flap was turned-over into the defect. (D) Three months after surgery.

asymmetrical flap shape allows for accurate defect coverage. There were no problems with flap survival as a random-type flap. Using the ventral or plantar surface of the finger and toe, respectively as a flap donor site for treating dorsal area wounds should be strictly avoided and the adipofascial flap is not appropriate for pulp reconstruction.

### CONCLUSION

We believe the adipofascial flap is an excellent option for treating small defects in dorsal sides of fingers and toes. With relatively easy flap elevation and small donor site morbidity, this flap can offer the excellent gliding plane for dorsal tendons and adequate aesthetic results with thin volumes. With an appropriate choice in indication, it can provide satisfactory results in reconstruction of fingers and toes.

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