

# TRANSPOSITIONAL ADIPOFASCIAL FLAPS FOR COMPLICATED ACUTE FINGER INJURIES

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Seven patients who presented with complicated acute finger injuries were treated successfully with local transpositional adipofascial flaps. This is a one-stage procedure with advantages of simplicity and rapidity. This flap is thin with good pliability and provides a very versatile and reliable covering for soft-tissue defects of the fingers. Full-thickness skin grafts were applied to the raw surface of the adipofascial flaps in all patients. All cases had excellent wound healing and restored full range of motion. This procedure facilitates early wound healing and early range of motion for finger joints; it also reduces wound pain, minimizes scar formation, and eliminates the need for second-stage surgery.

**Key Words:** adipofascial flap, local flap, finger injuries  
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Power machines of industry often cause complicated finger injuries, with exposure of tendon, bone, or joint. Proper management of such injuries is vital to maintaining function of the finger and preventing permanent disability. Complicated finger injuries can be treated with a variety of procedures, including adipofascial turnover flap, cross-finger flap, thenar flap, abdominal flap, groin flap, and neurovascular island flap. All these procedures have limitations and disadvantages. We describe here a one-stage procedure in which a local transpositional adipofascial flap is used to provide immediate flap coverage of finger defects involving exposure of tendon and bone. The flaps survived completely in all patients with satisfactory esthetic and functional results.

## MATERIALS AND METHODS

The seven patients ranged in age from 19 to 47 years old; four males and three females presented with acute industrial injuries to the fingers. The full-thickness skin defect of the finger wounds was caused by cutting machine or power saw, with exposure of tendon, bone, or joint. There was one index finger, two middle fingers, and four thumbs (Table 1). The transpositional adipofascial flap was performed within 6 hours of injury. Full-thickness skin grafts were used to cover the raw surface of the transpositional adipofascial flaps in all patients at the same time.

### *Surgical technique*

Wounds were carefully debrided and irrigated with copious amounts of normal saline. A thin layer of adipofascial flap was transplanted directly from either the dorsal side or palmar side of the finger to cover the defect, according to the location of the wound. The adipofascial flap, which has a random type of vascularity, was meticulously taken deep to the dermis and superficial to the paratenon with a

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**Table 1.** Clinical data of the patients

Case No.	Age/Sex	Affected Digit	Location	Complication	Return to Work (weeks)
1	42/M	Right thumb	Distal phalanx	None	2
2	33/M	Right thumb	Distal phalanx	None	2
3	27/F	Right index	Middle and distal phalanx	DIPJ ulnar deviation	4
4	31/F	Left thumb	Distal phalanx	None	3
5	47/F	Left thumb	Distal phalanx	None	3
6	25/M	Left middle	Middle and distal phalanx	None	4
7	18/M	Left middle	Distal phalanx	None	3

base-to-length ratio of not more than 1:1.5. A full-thickness skin graft was taken from the antecubital fossa of the ipsilateral elbow to cover the raw surface of the adipofascial flap. An elastic bandage with slight pressure was applied snugly on the wet dressing gauze to cover the skin graft. No splinting of wounds was needed after grafting. The dressing was opened on the fifth day after the operation, and early finger range of motion was begun. This procedure can be done in the emergency room, and the dressing can be removed on an outpatient basis.

## RESULTS

All adipofascial flaps survived completely and provided excellent soft-tissue coverage without loss of the overlying skin graft. Early active motion of the finger was started on the fifth postoperative day. There were no hypertrophic scars, and all patients were pleased with the esthetic outcome. At follow-up, one patient with an index finger injury developed distal interphalangeal joint ulnar deviation and distal interphalangeal joint stiffness. The other patients demonstrated satisfactory function of the fingers with no pain or discomfort. All patients returned to their manual work within an average of 3 weeks (Table 1).

### Case Reports

#### Case 1 (Figure 1)

A 42-year-old man injured his right thumb with a planing machine, sustaining a skin and nail defect on the thumb tip with exposure of the distal phalanx. The defect was covered with an adipofascial flap transplanted from the palmar side of the thumb tip. A full-thickness skin graft harvested from the ipsilateral antecubital fossa was used to cover the adipofascial flap. The patient had an uneventful recovery,

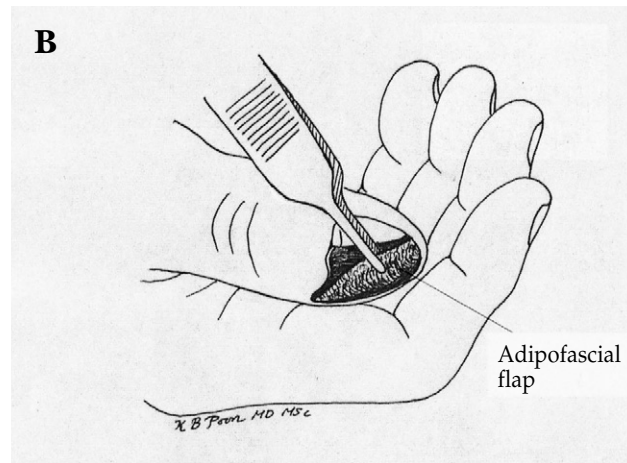
with complete survival of the flap and skin graft. At follow-up, the right thumb showed excellent esthetic and functional results.

#### Case 2 (Figure 2)

A 33-year-old man sustained a power saw injury of his right thumb resulting in a large skin defect on the palmar side of the pulp. A transpositional adipofascial flap was used to reconstruct the pulp of the thumb successfully. The defect was covered completely and showed excellent esthetic and functional results. The thumb showed full range of motion without any contracture.

## DISCUSSION

The golden rule to manage complicated finger injury is to restore the function of the finger and prevent disability. Flap selection for soft-tissue coverage of skin defects of the fingers is an example of the ingenuity necessary for hand reconstruction. Various procedures involving local flaps, regional flaps, and distant flaps have been described to cover the soft-tissue defect of the fingers. Local flaps such as V-Y advancement flaps are useful in fingertip amputations but are inadequate to cover large soft-tissue defects of the fingers, and excessive stretch may result in painful palmar scars. Regional flaps such as cross-finger flaps are useful for reconstruction of fingertip amputation and skin defect on the palmar surface of the fingers [1]. These flaps are best avoided when there is a risk of joint stiffness, especially in older patients or when it is preferable to limit cosmetic damage to only one finger [2]. Cross-finger flaps are not always possible when two or more adjacent fingers are injured simultaneously [1], and they require a second-stage procedure to detach the flaps. Skin grafts are necessary to cover the donor site as well as the recipient site, and there is a potential for epidermal cysts to form [3]. Distant flaps are

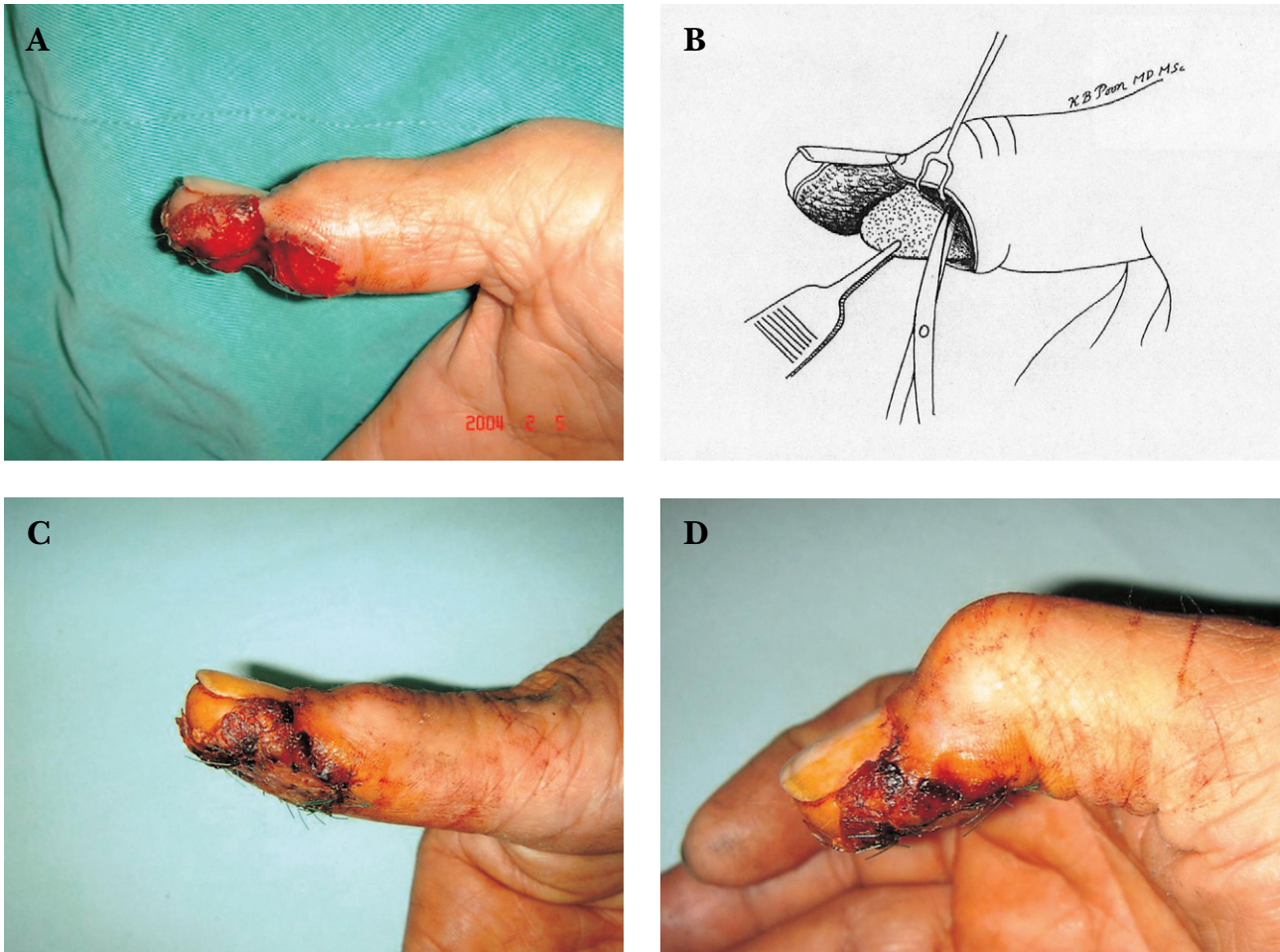


**Figure 1.** (A) The right thumb tip was sheared off, exposing the distal phalanx at the dorsal side. (B) The involved nail matrix was debrided and an adipofascial flap was transplanted from the palmar side of the thumb tip to cover the soft-tissue defect. (C) The wound healed esthetically without scar contracture at 2-week follow-up.

useful for coverage of acute hand injuries, but two stages are required for flap attachment and division. Distant flaps require a prolonged period of immobilization (about 2–3 weeks), which always causes inconvenience and discomfort to the patients, and is always associated with donor site morbidity. The groin flap is too bulky for finger wounds. The immobility and the dependent position associated with the pedicle groin flap also leads to edema and stiffness of the hand [4], and another procedure may be needed to trim the bulky soft tissue. The modified dorsal metacarpal artery flap has been developed to cover skin defects of the distal part of the fingers [5]. The flap requires careful division of the distal end of the dorsal metacarpal artery at the bifurcation and incorporation of two adjacent digital arteries into one, making it more technically demanding. Its use is limited to dorsal finger injuries at the level of the distal phalanx. The reverse dorsal digital island flap has been described to cover distal dorsal finger defects [6], but careful dissection is required and a skin flap is required for the donor site.

Local adipofascial turnover flaps for soft-tissue coverage in the hands are gaining in popularity, because they have the advantages of one-stage surgery, and simplicity and rapidity of the procedure. The flap is thin and pliable, does not require de-epithelialization, and results in only minimal donor site deformity [7]; however, extension of the wound must be done in a zigzag manner for turning over the adipofascial flap. Özdemir et al and Ünlü et al reported the dorsal adipofascial turnover flap for fingertip amputations [2,8]. Considerable wound extension is also needed on the dorsal finger for turning over the flap, and its use is limited to only fingertip amputations. Similarly, Al-Qattan reported use of the adipofascial turnover flap for coverage of the exposed distal interphalangeal joint of the fingers [9]. Wound extension is required, and its use is limited to dorsal finger defects.

Our method differs considerably from the previously described adipofascial turnover flap. No or minimal wound extension is required, depending on the flap design. The



**Figure 2.** (A) The right thumb with a large soft-tissue defect on the palmar side of the pulp. (B) A transpositional adipofascial flap was used to cover the defect. (C,D) One week after surgery the thumb pulp was well covered, with excellent esthetic and functional results with full range of motion of the distal interphalangeal joint.

adipofascial flap with randomized blood supply is dissected free from the overlying dermis by skin undermining at the subdermal plane and underlying paratenon. The flap is then transplanted directly from the palmar side or dorsal side of the finger to cover the soft tissue defects. In our third case (shown in Table 1), 5 degrees of distal interphalangeal joint ulnar deviation and distal interphalangeal joint stiffness were noted, which is the result of scar contracture because of the primary suture for the fingertip defect around the distal interphalangeal joint. On the contrary, excellent wound healing and satisfactory functional results were seen at the proximal interphalangeal joint, which was treated with adipofascial flap coverage. Indeed the distal phalanx soft-tissue defect of this patient could have been treated with a transpositional adipofascial flap transplant from the palmar

side of the fingertip instead of a primary suture. Primary suture should be avoided for large skin defects of the fingers, because it can cause excessive tension, scar contracture, and joint stiffness. The adipofascial flaps provide sufficient coverage for the neural, vascular, bone, and joint structures while allowing the tendons to glide through. Compared with other local or distant flaps, transpositional adipofascial flaps provide several advantages, including (1) excellent and reliable soft-tissue coverage for complicated finger defects, (2) no need for de-epithelialization, (3) versatility, thinness, and good pliability of the flaps, (4) a one-stage procedure, (5) minimal donor site morbidity, (6) early range of motion for the finger joints, (7) reduction of wound pain, (8) early wound healing, (9) simplicity and rapidity of procedure, and (10) minimal scar formation.

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# 以轉位脂肪筋膜皮瓣 治療急性指部復雜性創傷

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我們成功的以轉位脂肪筋膜皮瓣治療七位急性指部復雜性創傷的病人。這是單一步驟的手術並且具有簡易及快速的優點。這皮瓣很薄且具備很好的伸展性並且提供指部軟組織缺損一個可塑性及可靠的覆蓋。最後我們是以全層皮膚植補在脂肪筋膜皮瓣的表面上。這手術可以讓病人的傷口提早癒合，提早讓指關節活動，減少傷口疼痛，降低疤痕的形成而且不需要讓病人再接受第二次手術。

**關鍵詞：**脂肪筋膜皮瓣，局部皮瓣，手指創傷  
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