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Free distal ulnar artery perforator flaps for the reconstruction of a volar defect in fingers

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Summary *Background:* A volar defect in finger is a common manifestation in hand injuries, and proper volar coverage of fingers is of great significance for hand function and cosmetic appearance.
Purpose: The aim of our study is to investigate the feasibility of reconstructing a volar defect in fingers with the free ipsilateral distal ulnar artery perforator flap under the brachial plexus block.
Methods: Eight free distal ulnar artery perforator flaps were used to reconstruct volar defects in eight fingers. The involved fingers were three index fingers, three long fingers, one thumb, and one ring finger. The sizes of flaps ranged from 3.0 × 4.0 to 3.0 × 11.0 cm. All the flaps were harvested from the ipsilateral forearm of the injured fingers. The donor sites were primarily closed except in one case with a skin graft. The operation time ranged from 120 to 150 min, with an average of 130 min. All the operations were performed under brachial plexus block.
Results: All flaps survived completely without any complications during the 4—18 months follow-up. All the patients were satisfied with the hand function and the cosmetic appearance.
Conclusion: It might be a good workhorse flap to reconstruct the volar defects in fingers in hand surgery with the free distal ulnar artery perforator flaps.

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Introduction

Volar defects in fingers after hand injuries require flap reconstruction due to exposed structures such as tendons and nerves.[1] Flap options include local flaps namely advanced flaps, cross-finger flaps, the dorsal metacarpal artery flaps, and distant flaps such as abdominal flaps.[2,3] However, all these flaps have advantages and disadvantages.

With the development of techniques in microsurgery, free perforator flaps have been widely used in plastic and reconstructive hand surgery. Several free perforator flaps have been developed: for example, free anterolateral thigh flap (ALT), free paraumbilical flap (FPUF), and free medial sural artery perforator flap (FMSAPF)[4,5] in hand injuries. The donor sites of these flaps locate on the trunk and lower extremities. As a result, general anesthesia is needed for flap harvest and transfer. Meanwhile, the flaps from the lower extremities always contain thicker subcutaneous tissues, which mismatch the texture of fingers and need second stage debulking procedures. Therefore, flap from the upper extremity can be a good candidate for the reconstruction of skin and tissue defects in fingers. Recently, some new free perforator flaps from the ipsilateral upper extremity of the injured hand have been reported, one of which is the free distal ulnar artery perforator flap.[6,7]

The use of free distal ulnar artery perforator flaps to reconstruct finger defects was first reported by Inada.[9] The flap has advantages including thinner adipose tissue, matching texture, and similar vessel diameter with the recipient sites. Moreover, fewer variations of vascular anatomy and feasibility to be harvested under brachial plexus anesthesia favor it a good candidate flap for the reconstruction of volar defects in fingers.

In this article, we present our experience of reconstructing volar defects in fingers in eight patients with the free distal ulnar artery perforator flaps.

Material and methods

Patients

Between September 2010 and December 2012, eight free distal ulnar artery perforator flaps were transferred for the treatment of volar skin defects after hand injuries. Informed consent was obtained from each patient. Five males and three females with a mean age of 32 years old (range 21—45 years) were enrolled. The involved fingers were three index fingers, three long fingers, one thumb, and one ring finger. Among these defects, four cases were skin defects after hand injuries, three were skin necrosis after trauma, and one skin defect was due to the removal of an overlying scar. The length of the defects exceeded one phalanx in five cases, and the width of defects in three cases were more than half of finger circumference, which rule out the possibility of coverage with a cross-finger flap or a local flap. The skin and tissue defects around the metacarpophalangeal joints was observed in three cases with complicated hand injuries, and the vascular supply to the dorsal metacarpal artery flap might be compromised. The operations of three patients were performed on admission; the other five received elective operations. All the operations were performed under tourniquet control and brachial plexus anesthesia. The sizes of flaps ranged from 3.0 × 4.0 to 3.0 × 11.0 cm. All the flaps were harvested from the ipsilateral forearm. The donor sites of seven cases were closed primarily and the one that was 4.0 cm in width was closed with a free skin graft. Arteries were anastomosed with the common digital artery in five cases, with the proximal digital artery in two cases, and with the superficial palmar arch in one case on the recipient fingers or hands. Veins were anastomosed with the prepared dorsal or volar veins. The time of operation ranged from 120 to 150 min, with an average time of 130 min (Table 1).

Table 1 Demography of the Patients.

Patient	Age (years)	Gender	Defect location	Flap size (cm)	Operation time (min)	Recipient vessels
1	32	M	Volar and lateral sides of left proximal index	4.0 × 8.0	135	CDA/SV
2	21	F	Volar side of left proximal thumb	3.0 × 4.0	120	CDA/SV
3	28	M	Volar side of right proximal middle finger and distal palm	3.0 × 10.0	130	SPA/SPV
4	27	F	Volar side of proximal and middle phalanx of right index finger	3.0 × 8.0	130	CDA/SV
5	35	M	Volar side of proximal and middle phalanx of right middle finger	3.5 × 7.0	150	CDA/SV
6	28	M	Volar and medial side of proximal interphalangeal joint of right ring finger	3.0 × 7.5	125	CDA/SV
7	45	M	Volar side of right proximal index	3.0 × 5.0	120	PDA/SV
8	40	F	Volar side of right proximal middle finger and interphalangeal joint	3.0 × 6.0	130	PDA/SV

F, female; M, male; CDA, common digital artery; SV, superficial vein; SPA, superficial palmar arch; SPV, superficial palmar vein; PDA, proximal digital artery.