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Multiple-digit resurfacing using a thin latissimus dorsi perforator flap

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Summary Traumatic digit defects of high complexity and with inadequate local tissue represent challenging surgical problems. Recently, perforator flaps have been proposed for reconstructing large defects of the hand because of their thinness and pliability and minimal donor site morbidity. Here, we illustrate the use of thin latissimus dorsi perforator flaps for resurfacing multiple defects of distal digits.

We describe the cases of seven patients with large defects, including digits, circumferential defects and multiple-digit defects, who underwent reconstruction with thin latissimus dorsi perforator flaps between January 2008 and March 2012. Single-digit resurfacing procedures were excluded. The mean age was 56.3 years and the mean flap size was 160.4 cm^2.

All the flaps survived completely. Two patients had minor complications including partial flap loss and scar contracture. The mean follow-up period was 11.7 months. The ideal flap for digit resurfacing should be thin and amenable to moulding, have a long pedicle for microanastomosis and have minimal donor site morbidity. Thin flaps can be harvested by excluding the deep adipose layer, and their high pliability enables resurfacing without multiple debulking procedures. The latissimus dorsi perforator flap may be the best flap for reconstructing complex defects of the digits, such as large, multiple-digit or circumferential defects, which require complete wrapping of volar and dorsal surfaces.
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Many reconstructive surgeons make every effort to resurface traumatic digital defects. Various flap techniques are used to reconstruct such defects. In many cases, amputation may be the convenient option. However, preservation of distal limb length is crucial for preserving hand function and appearance. Loco-regional flaps from adjacent fingers, or from the hand or the forearm, are quite popular and suitable for small defects. However, large, multiple-digit and circumferential defects, which require complete wrapping of the volar and dorsal surfaces, can be challenging. The wounds are often complex and have inadequate local tissue, which necessitates the use of free flaps.[1–7]

Recently, perforator flaps have been highlighted for reconstructing large defects of the hand, because of their thinness, pliability and the minimal donor site morbidity. Several studies have described the use of thin perforator flaps, such as the antero-lateral thigh flap,[3,5,6] the medial sural artery perforator flap,[2] the superficial circumflex iliac artery perforator flap[8] and the latissimus dorsi perforator flap.[4] However, there have been few studies of distal-digit resurfacing, especially of multiple-digit defects.

In this study, we discuss the challenges of using thin latissimus dorsi perforator flaps for distal-digit resurfacing of traumatic digit defects in seven patients.

Patients and methods

Between January 2008 and March 2012, 107 latissimus dorsi perforator flaps were harvested for extremity reconstruction. Of these, seven were used for reconstruction of distal digit defects in seven patients. Only large, circumferential and multiple-digit defects are discussed here; single-digit resurfacing procedures are not considered.

Two of the patients were female and five male. The mean age was 56.3 years (range, 33—70 years). Data regarding patient age, diagnosis, flap location, flap dimensions, combined procedures, complications and duration of follow-up were reviewed retrospectively. Details of patient characteristics are presented in Table 1.

Preoperative wound evaluation and preparation

To evaluate the status of recipient vessels, all patients underwent preoperative multidetector row computed tomography (MDCT) and some underwent additional colour Doppler ultrasound. After debridement of necrotic tissue, negative-pressure dressings (Curavac; Daewoong Co., Seoul, Korea) were serially applied for about 2 weeks to achieve wound stability. Once the wounds were quiescent, we performed definitive reconstruction.

All scar tissue was debrided. If a bone graft was required to preserve bone length, the iliac bone was harvested and fixated prior to the dissection of recipient vessels. The radial artery, or one of its branches, was used as a recipient vessel depending on the individual case.

Flap harvest

To permit a two-team approach and reduce operating time, each patient was placed in a supine position with the arm abducted and elevated. An incision was made along the midline between the borders of the pectoralis major and latissimus dorsi muscles. To avoid missing very small perforators, traction and counter-traction were applied, and complete blood coagulation played an important role in identifying tiny perforators. Typically, many perforators can be found along the anterior border of the latissimus dorsi, and our goal was to find the most reliable ones. When no perforators protruded from the latissimus dorsi, reliable septocutaneous or direct cutaneous perforators were identified instead. Once suitable vessels had been selected, an outline was made, appropriate for the size of the defect. The flap was then dissected from caudal to cephalad

Table 1 Summary of patients.

Sex	Age	Diagnosis	Location	Flap size (cm^2)	Combined procedures	DASH score	Complications	Follow ups (month)
M	68	Crushing injury, hand	2nd, 3rd, 4th, 5th finger	20 × 14	Iliac bone graft	22.5	Partial loss	8
F	33	Acute embolization injury, hand	1st, 2nd, 3rd finger tip	14 × 7	Toe free bone graft	9.2	Scar contracture on second finger Partial resorption of free bone	8
M	56	Crushing injury, hand	3rd, 4th, 5th finger	14 × 7	None	7.5	None	12
M	70	Cellulitis, hand	2nd, 3rd finger	10 × 8	None	5.8	None	14
F	57	Cellulitis, hand	2nd, 3rd finger	11 × 7	None	11.7	None	14
M	60	Crushing injury, hand	1st, 2nd finger	14 × 9	5th finger amputation	18.1	None	18
M	50	Crushing injury, hand	2nd, 3rd finger	28 × 13	Iliac bone graft for 2nd, 3rd finger4th, 5th ray amputation	52.5	None	8

DASH score: The Disabilities of Arm, Shoulder and Hand (DASH) score.

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between the superficial and deep adipose layers. The flap was thinned further by monopolar electrocautery, with the flap held under tension with skin hooks, and with special care at the entrance of the perforator into the skin envelope.

Anastomosis was completed using either 9/0 or 10/0 nylon sutures. Postoperatively, vasodilators were administered intravenously to all patients for 2 weeks. Additionally, heparin was administered intravenously to two patients who experienced congestion even after treatment with vasodilators. The heparin was given for up to 5 days, until the congestion had resolved.

All flaps were divided 4 weeks after the surgery. Once the wounds had healed, the patients began physiotherapy and were soon discharged.

Results

The mean size of the perforator flaps was 160.4 cm^2 (range, 77–364 cm^2), and all flaps survived intact. One patient suffered partial loss of the skin graft, which was healed by a change of dressing, and, in another, the wound of the second finger was disrupted with exposure of grafted bone. In the latter case, the exposed bone was rongeured and the wound was closed. The functional outcome was assessed using the Disabilities of the Arm, Shoulder and Hand (DASH) score at 6 months' follow-up. The mean DASH score was 18.2 (range, 5.8–52.5). The mean follow-up period was 11.7 months (range, 8–18 months).

Case 1

A 68-year-old male suffered amputation of the right second, third, fourth and fifth fingers in a rolling machine accident. Immediate debridement and coagulation were performed. We recommended simultaneous bilateral second-toe transfer for reconstruction of the second and third finger. However, the patient refused the procedure because of his advanced age. We subsequently performed a free iliac bone graft to reconstruct all four fingers and resurfaced them with a 20 × 14-cm thin latissimus dorsi perforator flap.

We carried out internal fixation with miniplates and screws and made microanastomoses to the cephalic vein and the radial artery. Debulking and flap division were performed 4 weeks later. The dorsal side was debrided, and the thickness of the skin graft was reduced. However, the thickness of the flap tissue on the volar surface was preserved for better circulation and grasping.

Metacarpophalangeal joint function was saved, and the patient was able to grasp objects 6 months after surgery (Figure 1 and Video 1).

Supplementary data related to this article can be found online at http://dx.doi.org/10.1016/j.bjps.2013.10.007.

Case 2

A 33-year-old female suffered respiratory arrest due to severe pneumonia. Her medical doctor administered epinephrine to maintain her blood pressure; however, this caused acute embolic disease of the distal digits, including eight toes and three fingers of the right hand (thumb and second and third fingers).

We recommended amputation of all eight toes. For the fingers, we planned a reconstruction using a thin latissimus dorsi perforator flap with a simultaneous free bone graft from the amputated toes. A 14 × 7-cm latissimus dorsi perforator flap was harvested, and the dorsal radial artery and cephalic vein were selected for microanastomosis. To stabilise the wound, the thumb and the second and third fingers were fixed with a Kirschner wire (K-wire).

We divided and debulked the fingertips, 4 weeks later. However, during follow-up, the second fingertip was found to be disturbed, with partial exposure of the bone. The exposed bone was rongeured, and the wound closed. On follow-up 6 months later, finger length had been maintained and the patient was able to pinch objects (Figure 2).

Discussion

Most patients in this study could have been considered for amputation, particularly when the defects were limited to the distal digits. However, amputation reduces the function of the hand, and particularly of the thumb, especially if multiple digits are involved.[9] Moreover, even when the injury is localised distally, amputation requires adequate soft-tissue coverage, which inevitably leads to shortening of the bone and the limb by more than one joint.

To avoid amputation, many options for digit reconstruction have been proposed. Local flaps such as the homodigital island flap, cross-finger flap or reverse dorsal metacarpal artery flap are commonly used for single-digit defects on the principle of replacing 'like with like'. However, these flaps are limited in size and mobility and, therefore, unsuitable for large defects, circumferential defects and multiple defects.[1,3,8,10–12]

Flaps from the forearm are widely used since they can be easily harvested in the same operation field. However, the radial or ulnar flap has been criticised because it involves the sacrifice of a major artery. Besides, harvesting a flap with a major artery from an already traumatised lesion can jeopardise the circulation of the whole hand. Recently, the radial or ulnar artery perforator flap has been introduced to salvage the major vessel while harvesting the flap. These perforator flaps are based on perforators from a major artery, which limits the length of the pedicle to approximately 20 mm and they are difficult to anastomose outside of the zone of injury.[13–15] The posterior interosseous artery flap has gained notoriety for its anatomical variability, not to mention donor site complications as a result of scarring of the exposed forearm after skin grafting.[1,16–19]

Distant flaps such as pedicled groin flaps are still used to cover mutilated hands; however, the protracted immobilisation and multiple operations required, including detachment and debulking procedures and refinements, prolong the time required for recovery.[9,20] Such long procedures can cause stiffness of the hand, and it can delay the patients' return to social life.

For functional reconstruction of the hand, and especially of the thumb, toe transfer has become the accepted

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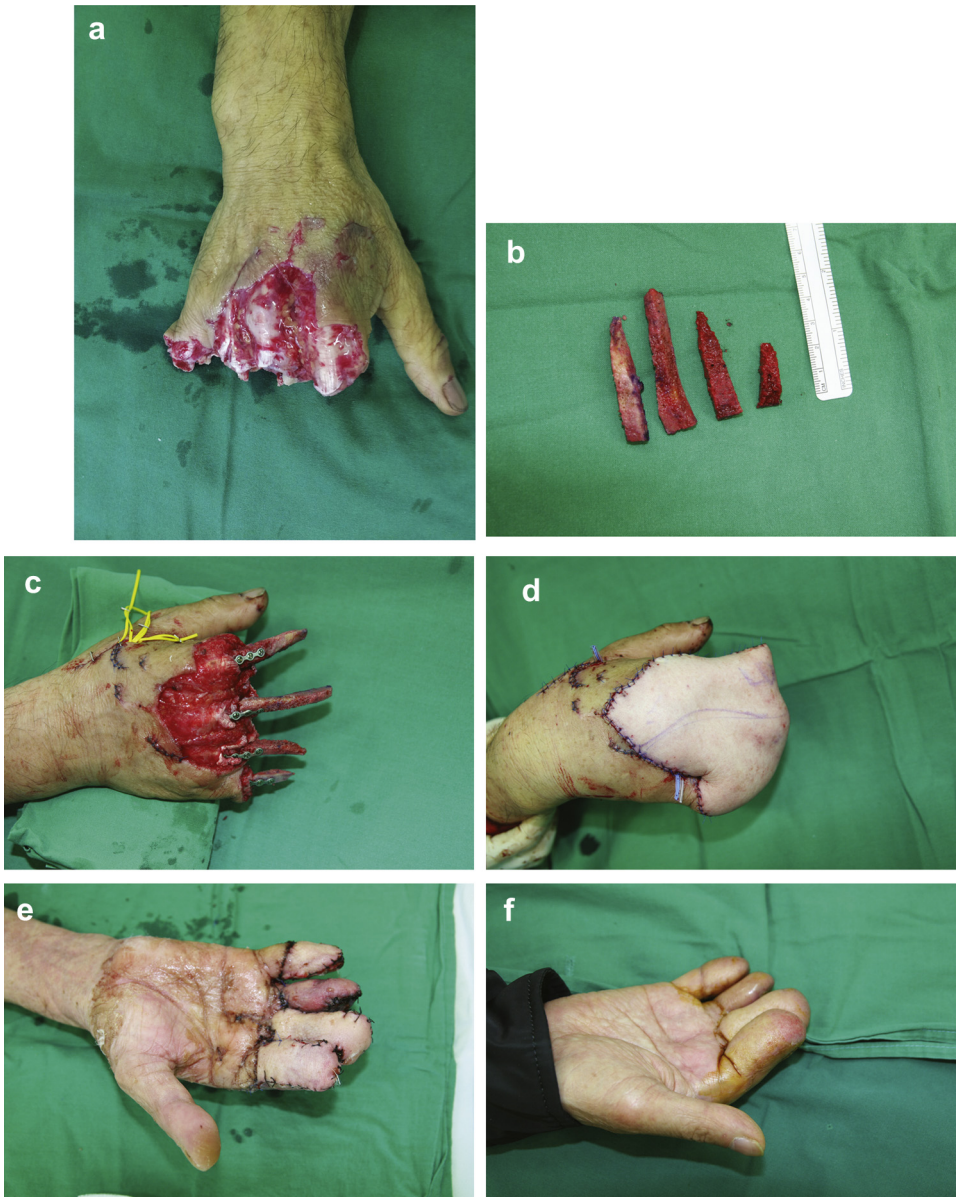

Figure 1 a. A 68-year-old male who suffered amputation of the right second, third, fourth, and fifth finger. b. A free iliac bone graft was harvested for all four fingers. c. The harvested bone grafts were fixed to the remaining proximal phalanges with mini-plates. d. The latissimus dorsi perforator flap covers all the digits and the grafted bones circumferentially out to their distal tips. e. Debulking and division were performed four weeks later. f. Metacarpophalangeal joint function was saved, and the patient was able to grasp and pinch objects six month after surgery.

method.[21–23] When thumb function is saved, the most important goal for hand reconstruction is the ability to pinch or grasp. From that viewpoint, second- or third-finger reconstruction should be considered.

Multiple toe transplantations can be performed to reconstruct multiple digits. Tsai et al. have reported transfer of the second and third toes as a single neuro-vascular transplant, which provides greater stability and pinching power but creates a problem for the foot in terms of standing and walking.[24,25] Another method is to transfer one toe from each foot, which minimises the foot problem but requires two recipient arteries in the traumatised hand. Multiple toe transfer has limitations due to the donor site problems it creates and the complex surgery requiring multiple anastomoses. In addition, toe transfer cannot cover large defects or multiple-digit defects, and when metacarpophalangeal joint function is poor due to severe tendon injuries or contractures, or direct joint injuries as in our examples, toe transfer is a pointless procedure.

Free tissue transfer is inevitably required in cases of large, multiple-digit or circumferential defects that require complete wrapping of the volar and dorsal surfaces. The ideal flap for digit resurfacing should be thin and pliable, have a long pedicle for microanastomosis and be associated with minimal donor site morbidity. Thin perforator flaps can be harvested from several regions, such as the antero-lateral thigh flap,[3,5] the latissimus dorsi perforator flap,[4] the circumflex scapular artery perforator flap[26,27] and the

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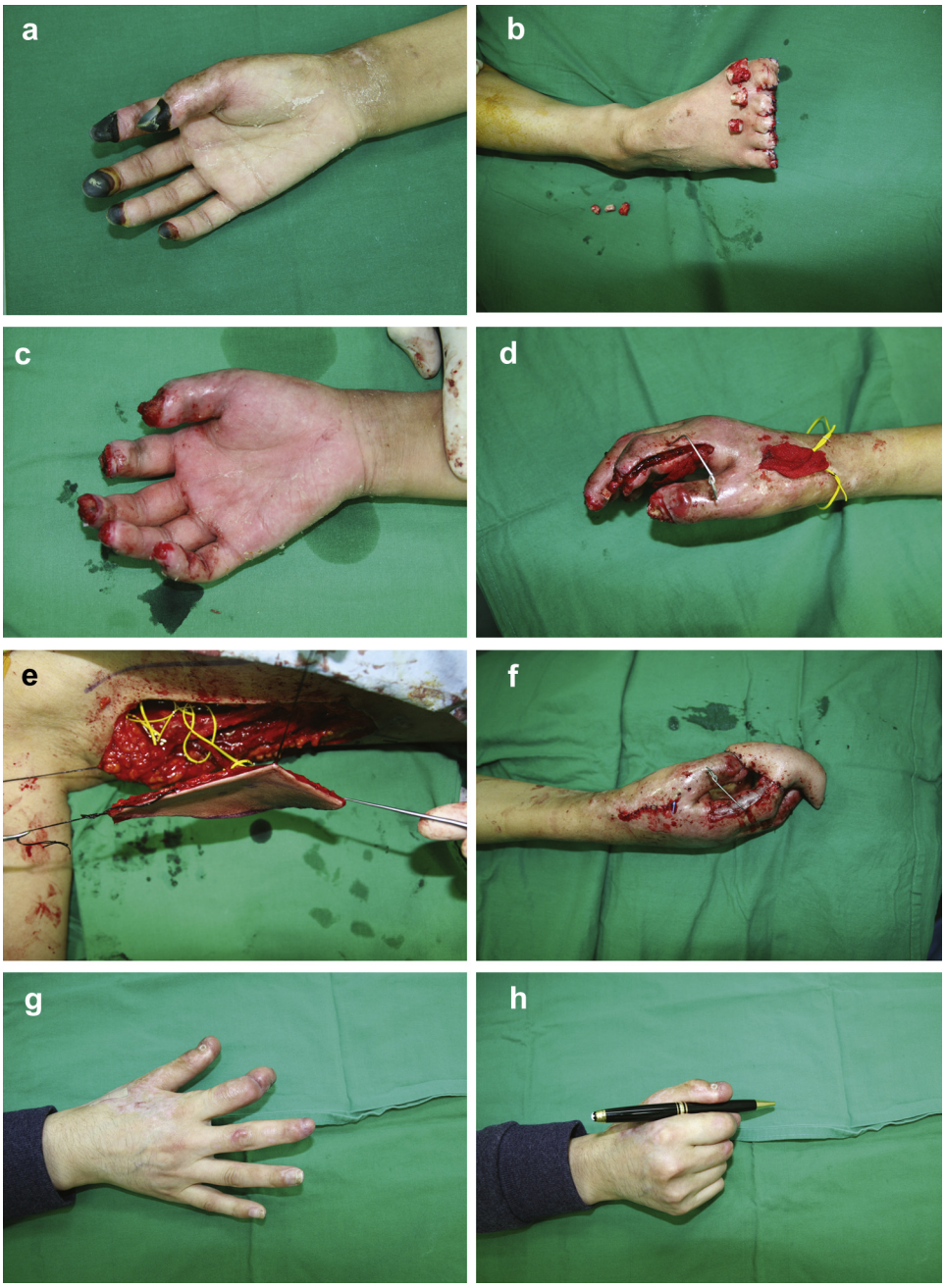

Figure 2 a. A 33-year-old female who suffered acute embolic disease of the distal digits including eight toes and the right thumb and second and third fingers. b. The eight toes were amputated, and the phalangeal bones were harvested as free bone grafts for reconstructing the fingers. c. After debridement, the second finger was amputated at the distal interphalangeal joint, and the distal phalangeal bones of the thumb and third finger were exposed. d. Free bone grafts from the amputated toes were fixed to the finger bones with K-wires. e. A thin latissimus dorsi perforator flap (14 × 7 cm) was harvested to resurface the fingers. f. The flap covers the thumb and the second and third fingers. To stabilize the fingers, they were fixed with K-wires. g & h. After six months, finger length has been maintained, and the patient is able to pinch.

superficial circumflex iliac artery perforator flap.[28–30] However, the superficial circumflex iliac artery perforator flap has a limitation in size, being only suitable for small-to-moderate defects and has a problem of short pedicle length. The circumflex scapular artery perforator flap satisfies the criteria for an ideal flap, considering a large skin paddle, a long pedicle and less donor morbidity. However, this flap is harvested in the prone position. The change of position during operation is inevitable, which increases operation time and the risk of contamination of the operative field.

Only the antero-lateral thigh flap[3,5] and the latissimus dorsi perforator flap[4] fully satisfy these criteria. Both flaps are large and can be harvested safely even when only one perforator is available. A vascular pedicle as long as 10 cm can be obtained depending on the location and diameter of

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the recipient vessel. A two-team approach enables simultaneous flap elevation and preparation, since patient repositioning is unnecessary when harvesting a flap in the supine position. A 'super-thin' flap can be achieved by excluding the deep adipose layer during flap harvest. The flap can be further thinned to <5 mm, as long as sufficient fatty tissue remains around the perforators, and it is acceptable in digit reconstruction, where multiple debulking procedures are not necessary. A super-thin flap facilitates rapid sensory recovery, even without a sensory flap or a nerve graft. One of the key advantages of using a super-thin flap is that patients retain the ability to pinch and grasp.

Of the two flaps, we prefer the latissimus dorsi perforator to the antero-lateral thigh flap. Although both flaps are associated with minimal donor site morbidity due to preservation of muscle function, the donor site on the back is less exposed than the one on the thigh. Moreover, primary closure of the donor site is possible after harvesting a flap as wide as 13 cm, compared to only 8 cm when harvested from the thigh. Skin grafting over muscle has functional and aesthetic consequences.[3]

However, reconstructions involving free tissue transfer are associated with longer hospitalisation, recovery and rehabilitation compared to amputation. This requires patience and endurance on the part of both patients and surgeons. Thus, flaps should only be used in those patients who are willing to endure the long period of rehabilitation, and factors such as age, occupation, family situation and socioeconomic status should be taken into consideration.

For mutilated hands with multiple-digit defects, we perform a free iliac bone graft and simultaneously resurface the defects with latissimus dorsi perforator flaps. If the thumb is functional, the other digits need to be sufficiently long to be able to pinch and grasp, especially the index or middle finger. We opted for the iliac crest as the donor site of corticocancellous grafts because cortical bone provides strength and is less prone to resorption. Sabapathy et al.[6] reported that, when a bone graft was placed terminally, bone length resorption of approximately 20% was observed over 1 year. Our patients who received grafts from the iliac crest or other phalangeal bones gave similar results; but, this minimal resorption of the grafted bone did not affect their final aesthetic or functional outcomes, since the grafts maintained their strength and position and the soft-tissue coverage by free tissue transfer remained adequate.

After debridement and bone grafting, the recipient vessels are identified and the flap is designed. The dimensions of the flap should be adequate since circumferential defects, even of single digits, require flaps of surprisingly large dimensions. If the circumference of the defect is not completely closed, this can lead to exposure, infection and loss of the bone graft. In cases of multiple-digit defects, the flap is designed three-dimensionally, ensuring adequate coverage of the circumference of each digit and all the way to the distal tip of the grafted bone. Super-thin flaps possess enhanced pliability, which enables them to be folded almost in half to cover volar and dorsal defects simultaneously, or to cover the exposed tip. Even though parts of the flap may become bulky during its production and insetting, adequate coverage is more important, as the flap can be readjusted and debulked 3–4 weeks later.

Understanding perforator vascularity enables surgeons to harvest super-thin flaps of sufficient size and pliability to allow versatile insetting and coverage of both complex defects and grafted bones. The latissimus dorsi perforator may be the most suitable flap for reconstructing complex digit defects including large, multiple-digit and circumferential defects that require complete wrapping of the volar and dorsal surfaces; although these procedures such as toe transfers are not dynamic reconstructions, by preserving the length of the distal limb, we create an effective normal digit for functional reconstruction.

Statements of the Institutional Review Board or Helsinki declaration

All authors followed the principles outlined in the Declaration of Helsinki, and all investigation and study relating to this article was approved by the Institutional Review Board (IRB; Hanyang 2013-03-020).

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Conflict of interest/funding

None.

References

1. Tare M, Ramakrishnan V. Free 'mini' groin flap for digital resurfacing. *J Hand Surg Eur Vol* 2009;**34**:336–42.
2. Chen SL, Chen TM, Lee CH. Free medial sural artery perforator flap for resurfacing distal limb defects. *J Trauma* 2005;**58**:323–7.
3. Adani R, Tarallo L, Marcoccio I, et al. Hand reconstruction using the thin anterolateral thigh flap. *Plast Reconstr Surg* 2005;**116**:467–73.
4. Kim JT, Kim SK. Hand resurfacing with the superthin latissimus dorsi perforator-based free flap. *Plast Reconstr Surg* 2003;**111**:366–70.
5. Kim KS, Kim ES, Kim DY, Lee SY, Cho BH. Resurfacing of a totally degloved hand using thin perforator-based cutaneous free flaps. *Ann Plast Surg* 2003;**50**:77–81.
6. Caulifield RH, Maleki-Tabrizi A, Birch J, Ramakrishnan V. Salvage of finger length in septicemic necrosis using 3 free flaps from a single anterolateral thigh donor site. *Ann Plast Surg* 2008;**60**:623–5.
7. Kim HD, Hwang SM, Lim KR, et al. Toe tissue transfer for reconstruction of damaged digits due to electrical burns. *Arch Plast Surg* 2012;**39**:138–42.
8. Koshima I, Nanba Y, Tsutsui T, et al. Superficial circumflex iliac artery perforator flap for reconstruction of limb defects. *Plast Reconstr Surg* 2004;**113**:233–40.
9. Sabapathy SR, Venkatramani H, Giesen T, Ullah AS. Primary bone grafting with pedicled flap cover for dorsal combined injuries of the digits. *J Hand Surg Eur Vol* 2008;**33**:65–70.
10. Elliot D. Homodigital reconstruction of the digits: the perspective of one unit – invited contribution. *Indian J Plast Surg* 2003;**36**:106–9.

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11. Koch H, Kielnhofer A, Hubmer M. Donor site morbidity in cross finger flaps. *Br J Plast Surg* 2005;**58**:1131—5.
12. Lee NH, Pae WS, Roh SG, et al. Innervated cross-finger pulp flap for reconstruction of the fingertip. *Arch Plast Surg* 2012; **39**:637—42.
13. Tancharoen C, Niumsawatt V, Ek EW, Thomas DJ. Free distal volar forearm perforator flap: clinical application in digital reconstruction. *ANZ J Surg* 2013 [Epub ahead of print].
14. Mathy JA, Moaveni Z, Tan ST. Perforator anatomy of the ulnar forearm fasciocutaneous flap. *J Plast Reconstr Aesthet Surg* 2012;**65**:1076—82.
15. Kim SW, Jung SN, Sohn WI, Kwon H, Moon SH. Ulnar artery perforator free flap for finger resurfacing. *Ann Plast Surg* 2013 [Epub ahead of print].
16. Woon CY, Lee JY, Teoh LC. Flap resurfacing of postinfection soft-tissue defects of the hand. *Plast Reconstr Surg* 2007;**120**: 1922—9.
17. Costa H, Pinto A, Zenha H. The posterior interosseous flap — a prime technique in hand reconstruction. The experience of 100 anatomical dissections and 102 clinical cases. *J Plast Reconstr Aesthet Surg* 2007;**60**:740—7.
18. Gavaskar AS. Posterior interosseous artery flap for resurfacing posttraumatic soft tissue defects of the hand. *Hand* 2010;**5**: 397—402.
19. Wong M, Tay SC, Teoh LC. Versatility of the turn-around technique of the lateral arm flap for hand reconstruction. *Ann Plast Surg* 2012;**69**:265—70.
20. McGregor IA, Jackson IT. The groin flap. *Br J Plast Surg* 1972; **25**:3—16.
21. Woo SH, Kim JS, Seul JH. Immediate toe-to-hand transfer in acute hand injuries: overall results, compared with results for elective cases. *Plast Reconstr Surg* 2004;**113**:882—92.
22. Del Pinai F, Garcia-Bernal FJ, Delgado J, et al. Overcoming soft-tissue deficiency in toe-to-hand transfer using a dorsalis pedis fasciocutaneous toe free flap: surgical technique. *J Hand Surg Am* 2005;**30**:111—9.
23. Ishida O, Ikuta Y, Kimori K. Double-toe transplantation following temporary insertion of a block of silicone for reconstruction of a traumatic metacarpal defect. *Plast Reconstr Surg* 2000;**105**:2455—8.
24. Wei FC, Chen HC, Chuang CC, Noordhoff MS. Simultaneous multiple toe transfers in hand reconstruction. *Plast Recontr Surg* 1988;**81**:366—77.
25. Tsai TM, Jupiter JB, Wolff TW, Atasoy E. Reconstruction of severe transmetacarpal mutilating hand injuries by combined second and third toe transfer. *J Hand Surg Am* 1981;**6**:319—28.
26. Dabernig J, Sorensen K, Shaw-Dunn J, Hart AM. The thin circumflex scapular artery perforator flap. *J Plast Reconstr Aesthet Surg* 2007;**60**:1082—96.
27. Branford OA, Davis M, Schreuder F. The circumflex scapular artery perforator flap for palm reconstruction in a recurrent severe case of Dupuytren's disease. *J Plast Reconstr Aesthet Surg* 2009;**62**:e589—91.
28. Iida T, Mihara M, Yoshimatsu H, Narushima M, Koshima I. Versatility of the superficial circumflex iliac artery perforator flap in head and neck reconstruction. *Ann Plast Surg* 2012 Aug 3 [Epub ahead of print].
29. Hong JP, Sun SH, Ben-Nakhi M. Modified superficial circumflex iliac artery perforator flap and supermicrosurgery technique for lower extremity reconstruction: a new approach for moderate-sized defects. *Ann Plast Surg* 2013;**71**:380—3.
30. Yoo KW, Shin HW, Lee HK. A case of urethral reconstruction using a superficial circumflex iliac artery. *Arch Plast Surg* 2012; **39**:253—6.

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