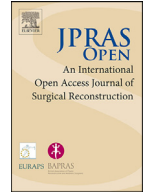




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Case Report

Bipedicled digital artery perforator volar adiposal turned-over flap for reconstruction of transverse fingertip amputation

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ABSTRACT

Different approaches to fingertip reconstructions are reported for cases in which microsurgical replantation is impossible. This report presents two cases of bipedicled digital artery perforator adiposal flaps for fingertip reconstruction after traumatic amputations. Adiposal flaps, including the radial and ulnar digital artery perforator vessels proximal to the distal interphalangeal joint, were elevated and turned to cover the fingertip defect. After donor-site skin closure, split-thickness skin was grafted onto the fingertip digital artery perforator adiposal flap. The technique is quick and easy to perform under loupe magnification and achieves good results in terms of healing, hand function, appearance, and patient satisfaction.

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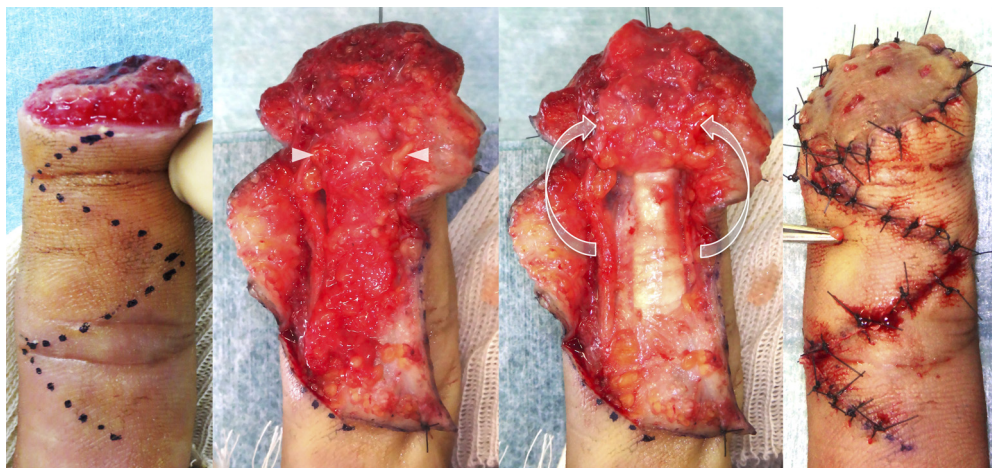


Figure 1. Intraoperative photographs of Case 1. Digital artery perforator adiposal flap elevated on perforators arising from both radial and ulnar digital artery (arrows) and turned over to cover the finger stump, and split-thickness skin was grafted onto the adiposal flap of the fingertip.

Introduction

Fingertip amputations are common injuries, and replantation is the best treatment. However, fingertip replantation can be difficult to perform. Various finger reconstructions have been reported for cases in which replantation is impossible. Here, we present two cases of a bipediced digital artery perforator (DAP) volar adiposal flap. The technique is easy to perform under loupe magnification and achieves good results. The patients provided informed consent for publication.

Case reports

Case 1

A 46-year-old man experienced a crush amputation of his left index finger during an accident with an electric circular saw. Complete transverse amputation occurred at zone 2 level according to the Tamai classification. Because the amputated fingertip was severely crushed, fingertip replantation could not be performed. Therefore, we attempted a finger reconstruction using a bipediced DAP adiposal flap. The end of the distal phalanx was crushed and exposed. After stump debridement, a zigzag incision was made on the index finger volar side from the stump to the proximal interphalangeal (PIP) joint level. A bipediced DAP adiposal flap, including both distal radial and ulnar digital artery perforator as pedicles, was elevated and turned over to cover the fingertip stump. After skin closure of the donor site, split-thickness skin harvested from the cubital fossa was grafted onto the DAP adiposal flap (Figure 1). At the 10-month follow-up, the flap and skin graft survived completely. The adiposal flap did not atrophy, and the round finger pulp contour was maintained. Aesthetically and functionally, the finger recovered well (Figure 2). Static 2-point discrimination (s2PD) was 5 mm and the Semmes–Weinstein (SW) test result was 3.61 compared with 3 mm and 2.83, respectively, on the unaffected side.

Case 2

A 27-year-old man experienced a crush injury of his left middle finger after a press machine accident. Despite continued wet dressing, the fingertip gradually became necrotic. At 3 weeks postinjury, we performed a fingertip reconstruction using a bipediced DAP adiposal flap with the same approach

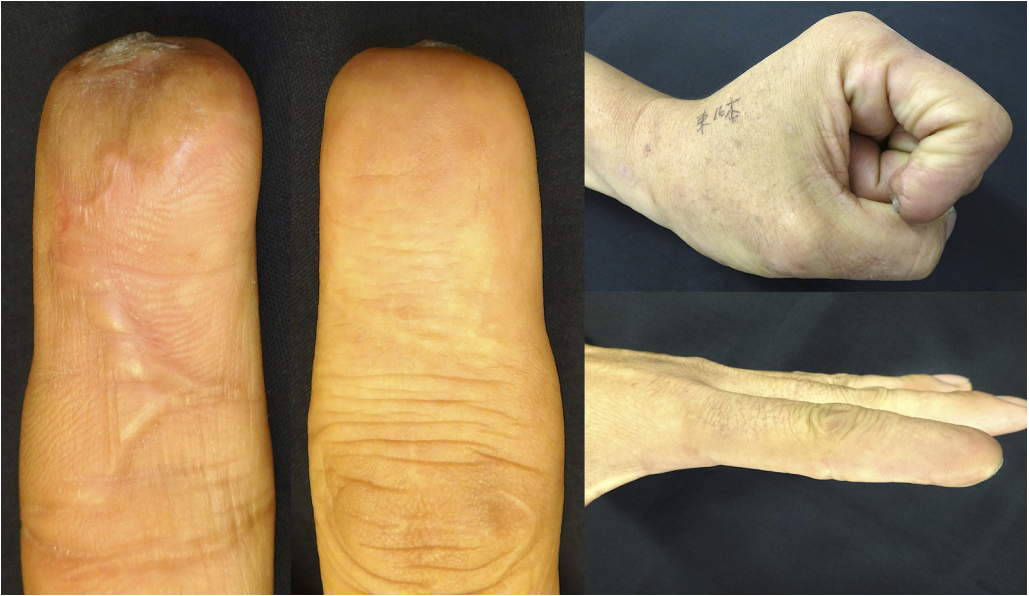


Figure 2. Photographs of Case 1 at the 10-month follow-up clinical examination. The finger recovered aesthetically and functionally well.

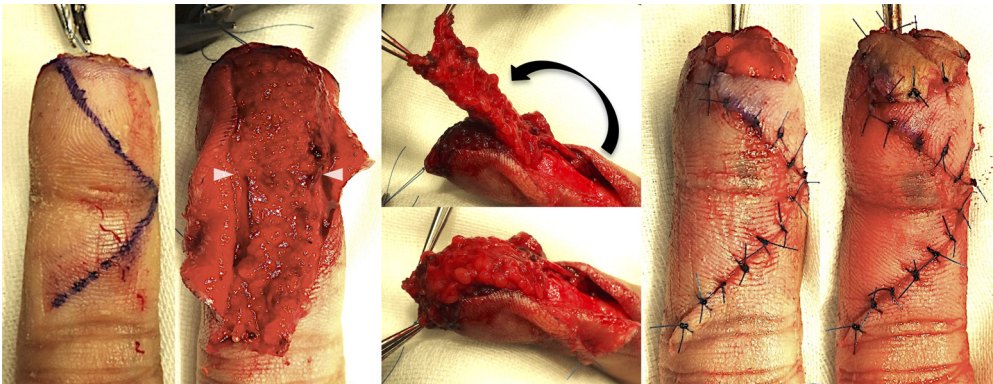


Figure 3. Intraoperative photographs of Case 2. Digital artery perforator adiposal flap elevated on perforators arising from both radial and ulnar digital artery (arrows) and turned over to cover the finger stump, and split-thickness skin was grafted onto the adiposal flap of the fingertip.

as for case 1 (Figure 3). At the 8-month follow-up, the flap and skin graft survived completely. The adiposal flap did not atrophy, and the round finger pulp contour was maintained. Aesthetically and functionally, the finger recovered well (Figure 4). s2PD was 4 mm and the SW test result was 3.61 compared with 2 mm and 2.83, respectively, on the unaffected side.

Discussion

Fingertip amputations are common injuries, and various methods of finger reconstructions have been reported. The goals of any fingertip reconstruction are to maintain digital length and volume and preserve finger function, including sensory recovery, while minimizing aesthetic loss.¹



Figure 4. Pre-operative and 8-month follow-up photos of Case 2. The finger recovered aesthetically and functionally well.

Primary closure often necessitates the removal of exposed bone, resulting in finger shortening. The major disadvantages of V-Y advancement flaps² are limited length of advancement and a tense closure line. Thenar flaps³ and cross-finger flaps⁴ require a two-stage operation. The reverse vascular pedicle digital island flap requires proximal transection at the digital artery.⁵

The DAP flap is a free-style flap in terms of flap design, size, volume, components, and pedicle location.⁶ Its disadvantages are limited flap size and occasional arterial inflow instability.

In our cases, we raised a DAP adiposal flap on the radial and ulnar digital artery perforators proximal to the DIP level. By including two or more perforator vessels without dissection or division of the digital neurovascular bundle, adequate blood flow was possible for relatively large adiposal flaps, which reduced the possibility of blood flow instability. Facilitating the advancement by elevating the adiposal flap off the flexor sheath allows coverage of the whole fingertip without bone shortening and maintains the volume. Additionally, this is an adiposal-only flap, so the donor site can be closed primarily without the need to perform free skin graft on the donor site. Almost no wound pigmentation occurs because the donor site is on the palm side. In our cases, quantitative measures of sensory recovery were good compared with those in most other similar fingertip flap reconstruction studies. Özcanli et al. treated 17 patients' fingertip defects with an innervated DAP flap.⁷ s2PD in the flaps were 2–4 mm (mean, 3.4 mm). The SW test results were 3.22–3.84. Tang et al. reported the recovery of sensation to S3+ (s2PD = 7–15 mm) or S4 (complete recovery, s2PD = 2–6 mm) grades.⁸ Our patients' results were comparable for optimal sensation despite the combination of adiposal flap and skin grafts, and cold intolerance was not detected.

The disadvantage of this flap is a long incision on the palm side of the finger. The zigzag design allows the incision to be avoided on interphalangeal creases, thereby avoiding skin contractures. Further, this flap requires donor-site grafting. Because we harvested a small amount of skin from the cubital fossa to overcome this disadvantage, the scars were barely noticeable after surgery.

Conclusion

The bipedicle DAP volar adiposal flap is a useful method for treating distal fingertip amputations with exposed bone. We have found the flap appropriate for relatively large oblique or transverse finger amputations. Because this flap has sufficient blood flow and length, it can cover the exposed bone and maintain digital length and volume of the fingertip. This technique is easy to perform under magnification. Within the small sample size in our series, it demonstrably achieves good results in terms of healing, recovery of hand function, sensory recovery, and patient satisfaction with the appearance.

Funding

None.

Guidelines

This report was written in line with the STROBE guidelines.

Ethical approval

Not required.

Declaration of Competing Interest

The authors have no financial or other interests to disclosure.

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