

# P3 Flap: Technique for Fingertip Reconstruction

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**Summary:** Fingertip amputations represent an important spectrum of injuries, and most are avulsions or crush trauma. There is no consensus about one single standard treatment, and a wide number of techniques are available. The authors present the P3 flap as an option for covering fingertip defects with bone exposure, avoiding painful scars in the pulp area, without a donor site. This study included 12 fingertips with amputated segment not available for replantation. Volar oblique fingertip defects and transverse amputations with bone exposure, not more proximal than Hirase Zone IIB, were included. Defects were less than 2 cm. The patients were followed up for an average of 6 months. The aesthetic and functional outcomes and fingertip discrimination recovery were evaluated at 6 months by the static two-point discrimination (2-PD) test and DASH score (quick version). The average postoperative 2-PD test at 6 months was 5.9 mm (range from 5 to 8 mm). The mean healing time of the fingertip was 4 weeks. Nail deformity was reported in three cases with level IIB of amputation. None of the P3 flaps failed, and local infection was not reported. The average DASH score at 6 months was 1.1. The mean time to return to work was 38 days (range from 30 to 53). The P3 flap proposed in this study demonstrates a reliable single-stage technique, performed under local anesthesia, for fingertip defect reconstruction, avoiding skin incision and scars in the pulp region and preserving digital length and nail bed. (*Plast Reconstr Surg Glob Open* 2023; 11:e5002; doi: [10.1097/GOX.0000000000005002](https://doi.org/10.1097/GOX.0000000000005002); Published online 22 May 2023.)

## INTRODUCTION

Fingertip amputations are defects occurring distal to the insertion of the flexor tendon and represent an important spectrum of injuries.

There is no consensus about one single standard treatment, and a wide number of techniques are available: secondary healing, composite grafting, local advancement flaps, island flaps, replantation, and microsurgical free flaps.<sup>1</sup>

The geometry of the defect is crucial for the reconstruction option, as well as the size, the presence of bone exposure, the amount of residual nail bed, and the skills of the surgeon.

The two most used flaps for smaller defects with bone exposure in a single-stage procedure are volar advancement flaps: the Atasoy flap<sup>2</sup> and mono or bilateral Kuttler flap.<sup>3</sup> In the literature, it is reported that all these flaps and their subsequent technical modifications are limited

by their restricted advancement (no more than 1 cm) and by disabling scars in the pulp.<sup>4,5</sup>

The purpose of this study was to describe a new idea for covering bone exposure, for those patients with defects sized up to 2 cm. Based on the V-Y flap advancement concept, the fibro-adipose flap, called the P3 flap, was used for 12 cases, avoiding the “V” scar on the pulp. The surgical technique and outcomes are described.

## PATIENTS AND METHODS

Twelve fingertips were reconstructed using the P3 flap. Inclusion criteria were volar oblique fingertip defects and transverse amputations not more proximal than Hirase Zone IIB with bone exposure and nail still intact or slightly injured. Defect size was up to 2.0 cm. We enrolled 12 patients who met the inclusion criteria. There were five crush injuries and seven avulsions of fingertips. The mean age of the patients was 42 years. Two index fingers, five middle fingers, four ring fingers and one thumb were operated on. All the cases were operated on by the same hand surgeon; the mean follow-up was 6 months. The sensation

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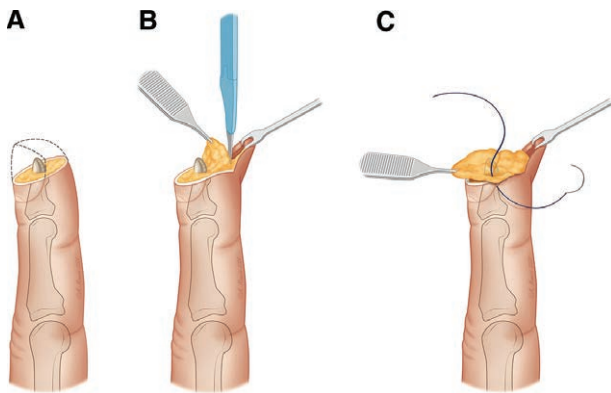
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and functional outcomes were evaluated at 6 months by the static two-point discrimination (2-PD) test and DASH score quick version. (See table, Supplemental Digital Content 1, which shows enrolled patients' clinical and demographic data. <http://links.lww.com/PRSGO/C559>.)

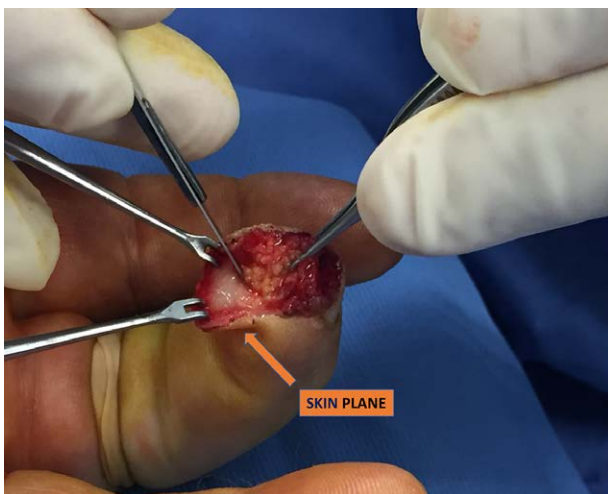
**Surgical Technique**

The amputated stump was accurately debrided. The tip of the residual distal phalanx was smoothed to ensure nail bed support. Reconstruction was performed under local anesthesia. The fibro-adipose tissue in the distal phalanx was accurately dissected from the periosteum plane and beneath residual skin, creating a layer in which blood supply was guaranteed from the proximal subcutaneous tissue (Fig. 1). Damage to the neurovascular network in the fibro-adipose layer was accurately avoided by careful dissection.

Flap dissection proceeds from distal (wound edge) to proximal, up to the distal interphalangeal joint crease.



**Fig. 1.** Anatomical drawing created by Marisa Mancini showing P3 flap technique. A, Fingertip defect with bone exposure. B, Dissection of the flap. C, P3 Flap advancement.



**Fig. 2.** The advancement of the flap was increased by dissecting the fibrous cutaneous septa.

**Takeaways**

**Question:** Is there a consensus about fingertip reconstruction? Different options are available, from secondary healing to microsurgical reconstruction. Which is the best solution?

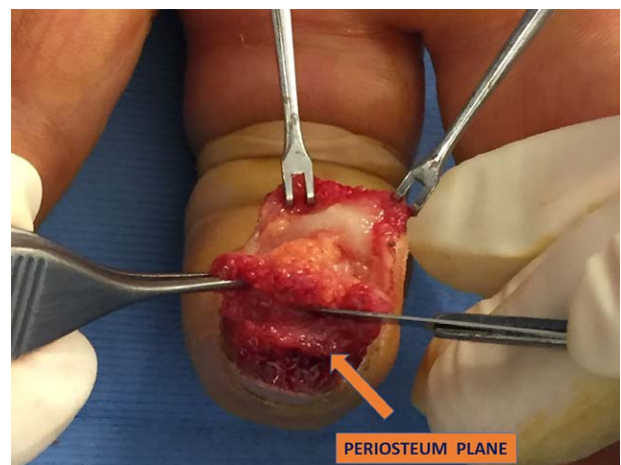
**Findings:** A new idea for the reconstruction of the fingertip is described, based on the elasticity of the fibro-adipose tissue of the pulp area. This tissue enables more advancement to cover bone exposure, instead of the cutaneous V-Y flap commonly used.

**Meaning:** The P3 flap allows for covering bone exposure, with no donor site and no disabling scar in the pulp.

The advancement of the flap was moreover increased by dissecting the fibrous cutaneous septa (Fig. 2) and the periosteum plane (Fig. 3); in this way, the P3 flap was advanced to cover the stump like a “blanket.” Skin incision was not performed in the pulp area. The flap was secured to the distal nail using absorbable suture material (Fig. 4). To avoid skin graft and donor site morbidity, the P3 flap was covered by using the hyaluronic-acid-based device (Hyalomatrix PA Anika therapeutics SRL, Padova, Italy); Tulle gauze and wet gauze were applied at the end of the procedure with a soft bandage without splinting. Dressing changes were planned at 7, 14, and 21 days postoperatively. An early active motion was started after 7 days. The silicone layer was removed after 21 days in the outpatient clinic, so dry dressings were used until complete healing. (See Video [online], which shows a step-by-step demonstration of how to harvest and advance the P3 flap on the defect.)

**RESULT**

Twelve patients underwent a P3 flap: eight were men, and four were women. The mean age at the time of trauma was 42 years (range, 19–65 years). There were five right side injuries (42%) and seven left side injuries (58%). The middle finger was most affected (seven of 12; 52%), followed by the ring finger (four of 12; 33%), the



**Fig. 3.** The periosteum plane was dissected to advance the P3 flap like a “blanket.”



**Fig. 4.** The flap was secured to the distal nail using 4-0 absorbable suture material.

index finger in two cases (16%), and the thumb in one case (8.3%). Seven cases were level IIB of amputation, four cases were level IIA, and one case was level I according to the classification criteria of Hirase.

The mean area reconstructed was 1.66 cm<sup>2</sup> (range, 0.8–1.9 cm). Regarding the mechanism of trauma, seven cases were cutting and five cases were crushing. All injuries occurred during work activities. The average postoperative static 2-PD test at 6 months was 5.41 mm (range, 5–6 mm); standard deviation (SD) = 0.49. The mean healing time of the fingertip was 30 days (range, 22–45 days); SD = 6.09. Hook nail was reported in three cases with level IIB of amputation. The average quick DASH score at 6 months was 1.1; SD = 0.39. The mean time to return to work was 38 days (range from 30 to 53 days); SD = 6.69 (See Supplemental Digital Content 1, <http://links.lww.com/PRSGO/C559>).

## DISCUSSION

In recent years, the reconstruction of the fingertip has changed substantially. Semi-occlusive dressing became popular, and its indication has increased after it was observed that even small areas of bone can heal secondarily with good skin quality. This method could be simple but tedious for the patient: a bad smell and macerated skin around the transparent adhesive may be obvious, and high microbiological contamination and bone protrusion may be seen at the end of the healing process. Secondary healing can take a longer time than local flaps and make it difficult for the patient to return to work until complete healing.<sup>6</sup>

Composite grafting has been associated with good results only in children; a low rate has been reported in the literature in adult patients, particularly smokers or diabetes-affected patients.<sup>7</sup>

Replantation can restore function with good aesthetic outcomes, but vascular anastomosis may be technically challenging distal to distal interphalangeal joint, and it may not always be possible.<sup>8</sup>

Flap reconstruction attempts to replace tissue with like tissues, but might add disadvantages: additional incisions, morbidity of donor site, vascular pedicle sacrifice, disruption of nerve with dysesthesia, scar contracture with stiffness, and partial or complete necrosis. There is no ideal solution, and the choice is strictly related to the surgeon's skill and also to continent of origin.<sup>9</sup>

The ideal flap should avoid a scar in the pulp area, restore volar convexity, and create a support for the nail bed to avoid any potential damage of the nail.<sup>1</sup>

We can place our approach in a midway among secondary healing and local advancement flaps. The P3 flap harvesting technique ensures numerous advantages: preservation of maximum length, adequate soft tissue advancement, and high aesthetic outcomes. Furthermore, the advancement of subcutaneous tissue avoids skin incisions in the pulp region and eliminates scar retraction and painful scars.

The use of a hyaluronic-acid-based device (Hyalomatrix) avoided dehydration of adipose tissue, prevented skin graft, and allowed for restoration of a great pulp convexity. This device is conformable to a variety of sizes, minimizes risk of bacterial contamination, and allows for monitoring of wound healing, thanks to the silicon layer.<sup>10</sup>

The P3 flap proved to be a reliable local flap, useful to reconstruct fingertip defects, because the technique was simple without high technical demands. Furthermore, the stable vascular supply of the flap enabled its use under local anesthesia, without the request of the main operating room, with high cost effectiveness. Patients with comorbidities like diabetes and cardiovascular diseases were included in this study without any temporary suspension of medications.

The P3 flap proposed is a reliable single-stage reconstructive option for fingertip defects; the sensitivity, functional recovery, and nail bed reconstruction using this flap seem to be promising.

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## DISCLOSURE

*The authors have no financial interest to declare in relation to the content of this article.*

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