

# Hand Reconstruction with Little's Flap, Cross finger Flap and V-Y Flap. A case report

Emmanuel Stephano Bracho Ruiz M.D.  
 Daniela Rodriguez Ramirez M.D.  
 Marco Moreno Rubio M.D.  
 Jorge Julio Sanchez Jimenez M.D.  
 Horacio Sanchez Espinoza M.D.  
 Daniel Benito Castillo Martinez M.D.  
 Mariano Tovar M.D.

Mexico City, Mexico

Case report

Plastic Surgery



## Background

The fingertip, defined as the portion of the finger distal to the insertion of the flexor and extensor tendons, is the most commonly injured part of the hand. Although replantation is not always possible. Specialized structures of the fingertip make it critical for functions such as sensation, fine handling, and gripping. There is no such thing as the ideal flap, and a specific defect can be addressed with a variety of flaps with similar outcomes. Factors like age, sex, hand dominance and nature of work will influence the reconstructive plan. The difficulty often faced by surgeons is choosing the right flap for the right patient. It is important to be familiar with the treatment options available for such injuries in order to provide a good functional and aesthetic outcome for patient. Patient-oriented reconstructive plans are always essential, which fit the need of the patient with proper clinical guidance.

**Keywords:** Hand Surgery, Hand Trauma, Fingertips Reconstruction, Hand local flaps, Hand Reconstruction

Soft tissue defects of the digits are one of the commonest problems presenting to orthopedic, plastic, and hand surgeons for specialist care. There are many insults that can compromise the soft tissue of the hand, including trauma, thermal injury, infection, and malignancy, several techniques have been described for fingertip reconstruction with good functional and cosmetic outcomes. Different factors must be considered when choosing one surgical technique over another. Most important, the characteristics of the injury will dictate what type of reconstruction is available. The various flaps can be classified based on contiguity to the defect: homodigital, heterodigital, local (hand), regional (forearm), distant (groin/cross-arm), and free flaps. Homodigital flaps are further categorized into random-pattern, axial-pattern, or perforator based flaps, depending on the pattern of vascularization. Easy flaps do not require vascular dissection and should be frontline choices for surgeons in training. Fingertip reconstruction is indicated for restoration of good padding of the finger that will allow for adequate grip function, restoration of sensation, and a good aesthetic result in the setting where replantation is not possible and shortening with revision amputation is not desirable. Depending upon the geometry, location,

and mechanism of the injury, one technique may be preferred over another.

## Case report

We present the case of a 45-years-old patient, right hand writer, without any medical history, and completely healthy referred to our plastic and reconstructive surgery department with posttraumatic avulsion of the nail complex and bone exposure of thumb, index and middle finger of his right hand, Due to the gravity of the injury, and a hand writer patient we did a primary surgical repair with Little's Flap, Cross finger Flap and V-Y Flap.

## Surgical anatomy

A good understanding of fingertip anatomy is crucial to appropriate management. The skin and epidermis of the volar fingertip is thick, Underneath this layer lies a highly vascular fibrofatty tissue constituting the finger pulp. The fingertip has a rich vascular supply from the terminal branches of the digital arteries. The thumb, index, and middle fingers have a dominant ulnar digital artery; in the ring and little fingers, the dominant is the radial digital artery. The 2 digital arteries anastomose as transverse palmar

From the Plastic Surgery Service at Hospital Central Norte Pemex. Received on May 30, 2023, Accepted on June 5, 2023. Published on June 8, 2023.

Consideration in digital and hand soft tissue reconstruction
<b>Defect Characteristics</b>
Location
Level of amputation
Geometry
Size
Number of digits involved (adjacent vs. nonadjacent)
<b>Technical Considerations</b>
Level of difficulty
Available resources
<b>Patient factors</b>
Hand dominance
Occupation and functional demands
Preexisting illnesses
Compliance with postoperative rehabilitation plan
Cosmetic concerns, preferences and expectations

**Table 1.** Consideration in digital and hand reconstruction.

arches in 3 consistent locations: at the level of the C1 (proximal transverse palmar arch) and C2 (middle transverse palmar arch) cruciate pulleys and just distal to the flexor digitorum profundus tendon insertion (distal transverse palmar arch).<sup>4</sup> These arterial system arches form the anatomical basis for many of the techniques described, specifically the pedicle-based island flaps.

Little's neurovascular islanded flap is a heterodigital, single-stage, sensate flap. The flap is safe and effective in many respects but has problems and limitations, either a doppler or Allen test is needed before proceeding with the flap to test the patency of both digital vessels of the finger. The most significant drawback derives from the fact that this is a sensitive flap with innervation for the middle finger, and hoping for cortical reorientation often ends in disappointment. Most surgeons prefer the long finger, because the pedicle is longer. Flexion contracture of the middle finger is a common complication that occurs more frequently when a large flap has been raised, if the pedicle is insufficiently dissected, the flap will reach the thumb with difficulties, causing a painful band in the palm.

### Cross finger flap

It was first described by Gurdin and Pangman<sup>11</sup> and modified by Cronin in 1945. The flap

is designed at the level of the middle phalanx dorsally going from the proximal interphalangeal (PIP) to the DIP creases. It is a simple, easy-to-perform, useful flap for posttraumatic volar and dorsal thumb defect coverage. This is a random pattern flap based on the subdermal plexus from branches of the digital artery with the additional advantage that it can be used in any digit or multiple digits by stacking the digits adjacent to each other for multiple injured fingertips. The arterial supply to the flap can be at risk if the flap is designed too narrow or placed under excessive tension. This flap is usually divided 2 to 3 weeks after initial elevation. Reported complications of this flap are donor site scar, stiffness of the fingers and first webspace contracture.

### V-Y Flap

This V-Y advancement flap was first described by Tranquilli-Leali, and later by Atasoy for fingertip injuries. It is a viable option for small thumb tip defects up to 0.8 cm with exposed bone of the distal phalanx that cannot be left to heal with secondary intention or covered by skin grafts. The V-Y advancement flap is most suitable for coverage of transverse or dorsal oblique fingertip amputations. This flap provides excellent soft tissue replacement in terms of skin color, texture, sensation, and padding. The V-Y advancement flap incorporates the volar digital neurovascular bundles that provide vascular and sensory supply to the flap. However, V-Y advancement flap has a limited mobility and only about 0.5 to 1 cm of advancement can be obtained, which limits the use of this flap to small fingertip defects. The apex of the flap extends proximal toward the level of the distal interphalangeal (DIP) joint crease and the base extends distally to the radial and ulnar borders of the amputated nail bed after flap advancement, the proximal wound is closed as a Y, hence the name V-Y advancement flap.

### Complications

The most common complications of fingertip reconstruction include hypersensitive scar with persistent pain, nail deformity (hook nail, ridges, split nail), diminished sensation, cold intolerance, scar retraction, flexion contractures, chronic ulceration, infection, and flap loss.

### Discussion

Reconstruction of total lower lip defects are challenging. The aim is to obtain oral continence, reasonable function and an aesthetic acceptable result, to date, no surgical technique provides all of the requirements for an ideal lip reconstruction of defects

Techniques , Indications and technical tips		
Techniques	Indications /Contraindications	Technical Tips
Little’s Flap	Volar, transverse, or radial/ulnaroblique defects	Avoid skeletonizing the neurovascular pedicle  Leaving fat pad around neurovascular bundle will preserve vena commitantes, allowing flap drainage  Early active and gentle passive range of motion will prevent scar formation and contractures.
V-Y Flap	Dorsal oblique or transverse defects  < 1.0-cmesized defect	Apex of triangle should be at a DIP joint crease  Base of triangle should not be wider than the nail plate
Cross- finger Flap	Volar oblique defects for any or multiple digits  Contraindicated in ring and little fingers or any pathology that may predispose to joint stiffness	Use clear plane above paratenon of extensor tendon  Transverse incisions of flap should be at the PIP and DIP joints to ensure inclusion of artery supplying the flap.  Longitudinal incision can be placed between palmar and dorsal glabrous skin to provide a larger flap width  Releasing Cleland ligament will provide increased separation of digits and improved comfort for patient

**Table 1.** Considerations in digital and hand reconstruction.

The decision on which method of wound closure should be used depends entirely on the geometry of the wound and on local wound factors. The main factors leading to the use of flaps are exposed vital structures such as bone, tendon, and nerve; a wound not suitable for healing by secondary intention or grafting; or a need for soft tissue padding. Flaps have many distinguishing characteristics that can be used to classify them. Cormack and Lamberty proposed the six C’s system for reconstruction: circulation (probably the most important feature), constituents (tissue composition), construction (type of pedicle, method of transfer), conformation (geometric configuration), contiguity (location in relation to the defect), and conditioning (delay, expansion).

**Conclusion**

There are different ways to reconstruct fingertips lesions, so patients must be informed about the various options in order to be able to make an informed decision about the best reconstructive procedure personally and professionally. Additionally,

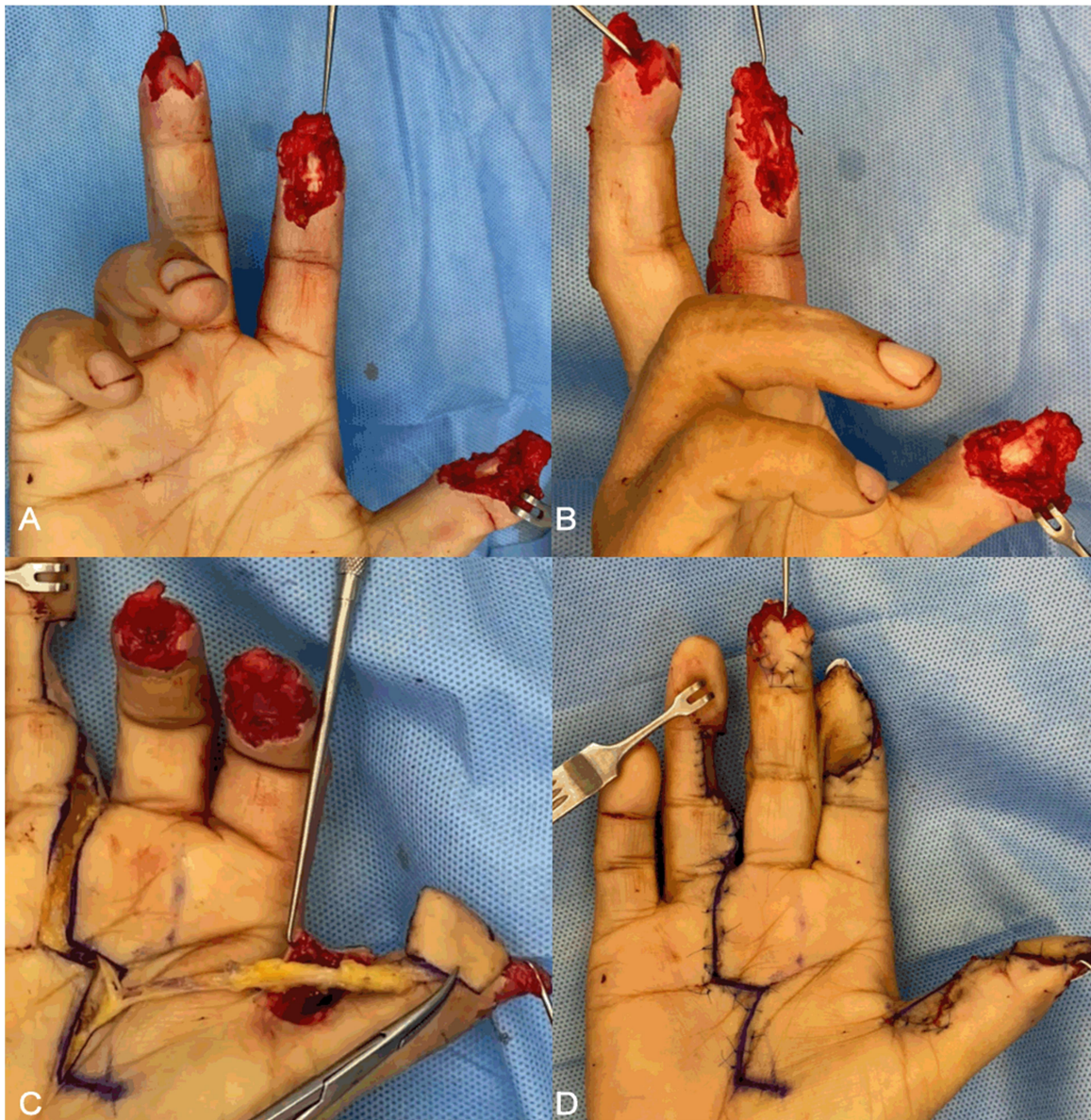
the patient must be a good candidate medically, socially and psychologically and commit to the reconstructive process. There is no such thing as the ideal flap, and a specific defect can be addressed with a variety of flaps with similar outcomes, the main goals in reconstruction are the restoration of functional length, stability, mobility, sensation and aesthetic appearance.

**Conflicts of interests**

The authors would like to declare that there is no conflict of interest

**References**

- 1.Chim, H., Ng, Z. Y., Carlsen, B. T., Mohan, A. T., & Saint-Cyr, M. (2014). Soft tissue coverage of the upper extremity: an overview. *Hand Clinics*, 30(4), 459–473, vi. <https://doi.org/10.1016/j.hcl.2014.08.002>
- 2.Das De, S., & Sebastin, S. J. (2020). Soft tissue coverage of the digits and hand. *Hand Clinics*, 36(1), 97–105. <https://doi.org/10.1016/j.hcl.2019.09.002>
- 3.Germann, G., Sauerbier, M., Rudolf, K. D., & Hrabowski, M. (2015). Management of thumb tip injuries.



**Figure 1.** A. multiple fingertips avulsions on thumb, index and middle finger. palmar view and B. Lateral view. C. Little's Flap for distal thumb reconstruction. D. V-Y Reconstruction for middle finger / Crossfinger Flap for reconstruction of Index finger.

The Journal of Hand Surgery, 40(3), 614–622; quiz 623. <https://doi.org/10.1016/j.jhsa.2014.09.028>

4. Maciel-Miranda, A., Morris, S. F., & Hallock, G. G. (2013). Local flaps, including pedicled perforator flaps: Anatomy, technique, and applications. *Plastic and Reconstructive Surgery*, 131(6), 896e–911e. <https://doi.org/10.1097/prs.0b013e31828bd89f>

5. Martinez, F. M., Navarro, M. L. G., Navarro, J. G., Ros, A. G., & Robledano, A. I. (2018). Hand Coverage. In *Issues in Flap Surgery*. InTech.

6. Panattoni, J. B., De Ona, I. R., & Ahmed, M. M. (2015). Reconstruction of fingertip injuries: surgical tips and avoiding complications. *The Journal of Hand Surgery*, 40(5), 1016–1024. <https://doi.org/10.1016/j.jhsa.2015.02.010>

7. Rehim, S. A., & Chung, K. C. (2014). Local flaps of the hand. *Hand Clinics*, 30(2), 137–151, v. <https://doi.org/10.1016/j.hcl.2013.12.004>

8. Tang, J. B., Elliot, D., Adani, R., Saint-Cyr, M., & Stang, F. (2014). Repair and reconstruction of thumb and

finger tip injuries: a global view. *Clinics in Plastic Surgery*, 41(3), 325–359. <https://doi.org/10.1016/j.cps.2014.04.004>

9. Usami, S., Kawahara, S., Yamaguchi, Y., & Hirase, T. (2015). Homodigital artery flap reconstruction for fingertip amputation: a comparative study of the oblique triangular neurovascular advancement flap and the reverse digital artery island flap. *The Journal of Hand Surgery, European Volume*, 40(3), 291–297. <https://doi.org/10.1177/1753193413515134>

10. Van Hove, B., & Del Piñal, F. (2023). Management of soft tissue defects of the thumb. *Plastic and Aesthetic Research*, 10, 8. <https://doi.org/10.20517/2347-9264.2022.59>

11. Workhorse flaps for thumb reconstruction. (2022). *Plastic and Aesthetic Research*, 9, 56. <https://doi.org/10.20517/2347-9264.2022.36>

Emmanuel Stephano Bracho Ruiz  
Plastic Surgery Service  
Hospital Central Norte Pemex  
Mexico City, Mexico