A Technique for Tripartite Reconstruction of Fingertip Injuries Using the Thenar Flap With Bone and Nail Bed Grafts

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Fingertip amputation is the most common amputation encountered by hand surgeons. Treatment decisions are multifactorial, based on mechanism, level of injury, tissue loss, associated injuries, and patient preference, among others. In this article, we present use of the thenar flap in combination with bone graft and split-thickness nail bed graft to address the tripartite loss of distal phalanx, soft tissue, and nail bed. This method allows for a full-length and functional reconstructed fingertip that is aesthetically satisfactory and does not require microsurgical techniques. *(J Hand Surg Am. 2017;42(12):1040.e1-e7. Copyright © 2017 by the American Society for Surgery of the Hand. All rights reserved.)*

Key words Fingertip, nail bed, olecranon bone graft, thenar flap, tip reconstruction.

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FINGERTIP AMPUTATION IS THE most common amputation encountered by hand surgeons. Treatment decisions are multifactorial, based on mechanism, level of injury, tissue loss, associated injuries, and patient preference, among others. Physician preference and experience also play a role because many different techniques have been described for various injury patterns. Options range from simple revision amputations and skin grafts to local flaps and free flaps.[1–4] Fingertip amputations may also be candidates for replantation dependent on the level, if a favorable mechanism exists.[5] In this article, we present a technique that utilizes the thenar flap in combination with bone graft and split-thickness nail bed graft to address the specific defect with tripartite loss of distal phalanx, soft tissue, and sterile matrix. This method allows for a full-length and functional reconstructed fingertip that is aesthetically satisfactory and does not require microsurgical techniques. The approach, as conceptualized and refined by the senior author (D.C.), has been applied successfully for distal digit reconstruction for 25 years.

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SURGICAL ANATOMY

The fingertip can be viewed as a tripartite structure of soft tissue, bone, and nail. The nail complex is composed of the nail bed, including both the sterile and the germinal matrices, as well as the nail plate. The nail bed is in close proximity to the periosteum of the underlying distal phalanx. The distal phalanx provides structural support for the entire fingertip and is the support on which the nail grows—without adequate bone stock, nail growth will lead to a hook nail deformity. The fibrofatty tissue of the volar fingertip houses sensory organelles composed of mechanoreceptors to provide sensibility to the tip and also provides soft tissue coverage for the distal phalanx.

Fingertip amputations have been classified by level, most notably by Ishikawa et al,[6] into 4 zones.

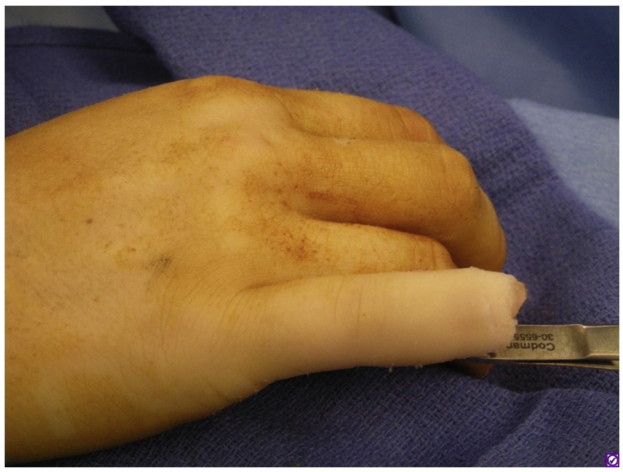

FIGURE 1: Patient sustained a fingertip amputation to the little finger after getting the finger caught in a closing door.

Zones II and III injuries, which encompass the area between the midportion of the nail and the base of the distal phalanx, are favorable for replantation. However, if replantation is not possible or is unsuccessful, all other described treatment options, with the possible exception of the partial second toe pulp free flap,[7] will lead to a shortened, aesthetically altered, and functionally handicapped fingertip. Whereas functionality is universally desirable, aesthetic concerns are also important to most patients and should be factored into the reconstructive decision-making process.

INDICATIONS

- Zones I to III finger tip injuries in which microsurgical techniques are not possible or not successful

CONTRAINDICATIONS

- Patients without adequate distal phalanx bone stock to accept olecranon bone graft
- Patients without intact germinal matrix or intact eponychial fold
- Patients who do not meet typical inclusion criteria for thenar flap
- Patients who do not understand or accept the prolonged, multistaged nature of the reconstruction

SURGICAL TECHNIQUE AND POSTOPERATIVE MANAGEMENT

The reconstruction is typically completed in 3 stages (Fig. 1). In the first, an elongated thenar flap is created that is generally 3 cm in length and 1.5 cm in width, based at either the radial or the ulnar margin of

FIGURE 2: Design of the thenar flap to treat the fingertip amputation.

the metacarpophalangeal crease of the thumb (Fig. 2). The distal border of the flap should be delineated close to and parallel with the flexion crease. The flap is sutured to the defect, and the thumb is immobilized in an adducted position (Fig. 3). The flap is then divided at approximately 14 days and the free edge is not inset (Fig. 4). It is dressed with bacitracin ointment and Xeroform (occlusive petrolatum gauze with 3% bismuth tribromophenate) and placed in a protective cagelike conforming dressing. The dressing should be changed on postoperative day 1 and redressed twice per week as the flap contracts to purposely heal by secondary intention (generally within 3–4 weeks). This period allows for remodeling of the flap and epithelialization (Fig. 5). The patients undergo hand therapy for range of motion (ROM), and are brought back to the operating room at approximately 1 month for placement of bone graft.

A cortical olecrenon bone graft is harvested in a manner to approximate the shape of the distal phalanx. An archlike incision is made on the dorsal surface of the thenar flap along the prospective junction of the hyponychium and sterile matrix to