

Modification of the V-Y Advancement Flap in Finger Tip Amputations

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ABSTRACT

Background: V-Y flap is a reliable treatment for fingertip amputation injuries. Insetting the flap to replicate fingertip contour can be challenging with the conventional method of using sutures.

Methods: Eighteen patients underwent V-Y flap reconstruction with the modified inset technique for fingertip defects. The flaps were advanced between 8 and 10mm. The donor site is allowed to heal by secondary intention. At 6-12 months, static two-point discrimination, sensitivity, and flap appearance were assessed.

Results: All flaps healed uneventfully, and each patient returned to work between 8 and 10 weeks. Fingertip and nail contour were satisfactory in all cases.

Conclusion: This modification simplified contouring during flap inset and provided a viable alternative to flap inset and contour adjustment.

INTRODUCTION

The V-Y advancement flap was originally described by Tranquilli-Leali in 1935 [1], but was first reported in the United States by Atasoy et al., [2] in 1970. With this technique, a triangular flap is designed with the base at the edge of the amputation and the apex at the distal inter-phalangeal crease. To mobilize the flap, the fibrous septa, anchoring the skin to deeper structures, are gently divided. To free the deep margin of the flap, the subcutaneous tissue is separated from the periosteum and flexor tendon sheath. The full thickness skin flap is then advanced over the exposed bone, and the neurovascular bundles are preserved. The base of the triangle is sutured to the nail bed, and the V-shaped donor site defect is closed as a Y.

The advantages of the V-Y advancement flap are the preservation of sensation and length, and good soft tissue coverage. Tension, however, is the primary problem encountered with this flap, especially with larger defects.

The point of maximum tension occurs where the gap of the defect is greatest, which is in the mid portion of the defect. The need for a tension-free closure is highlighted in a variety of sources [3-6]. If a tension-free closure is not achieved, the flap is at risk for necrosis. In addition, the distal nail bed may be pulled in the volar direction, creating a hook nail deformity. As a result, modification of the execution of the flap to allow for a tension-free closure, thus avoiding this untoward complication.

PATIENTS AND METHODS

A total of 18 patients (21 fingers) who presented to the plastic surgery section with fingertip injuries from May 2010 to April 2012 were included in this study. Three of the patients had more than one finger injured. Patients' ages ranged from 2-43 years. X-ray was requested in all patients. 4 patients were managed in the emergency room and the remaining 14 patients were managed in theatre.

In children mask anesthesia was used while digital nerve block was sufficient for adults. Finger tourniquet using a penrose drain and hemostat was used and under loupe magnification with good light source. After irrigation and debridement of clearly nonviable tissue, management was proceeded; pre and post-operative photos were taken and patient follow-up and dressings were done in the outpatient clinic.

First, it is important to emphasize that the movement of this flap is predicated on the division of septal attachments. Once the dermis is incised and subcutaneous fat is visible, one should not dissect deeper. This ensures protection of the neurovascular bundles. All of the soft tissue attachments on the undersurface of the flap are left intact. In essence, the flap is freed to allow it to glide distally. This is not a true neurovascular flap.

After the flap has been advanced, instead of closing the V-shaped donor site defect in a Y pattern, the defect is left open and allowed to heal by secondary intention. The only area of the flap that is loosely sutured is the base of the triangle to the nail bed, just to cover the bone. Even in this area, sutures are used sparingly. Small wound gaps are of no concern.

Because the flap is only advanced a maximum of 1cm, the consequent defect left at the base of the phalanx is small. Without the burden of tight closure and foreign suture material, this open area heals adequately by secondary intention. Tourniquet was released to assess vascularity of the flap.

Dressing changes were performed twice a week for 2 to 3 weeks, until epithelization has taken place.

RESULTS

Patients age ranged from 2-43 years, 60% (12 patients) were under the age of 15 years; 10 patients were males (56%), 8 patients (44%) were females.

The most common mechanism of injury was crush injuries mainly with doors, especially in pediatric age groups and falling of heavy objects.

The most common finger injured is the middle finger (35%), ring finger (25%), index finger (20%), little finger (12%), the least common finger injured is the thumb (8%).

All flaps survived. Patients were followed-up for a period of 6 to 12 months. Generally, the soft tissue healed within 2 to 4 weeks, and all patients returned to work within months. No patient had a postoperative infection and all patients were satisfied with the result.



Fig. (1): Transverse amputation of the tips of the right long and ring fingers.



Fig. (2): Intraoperative appearance of the advanced flap. No sutures are used proximally.

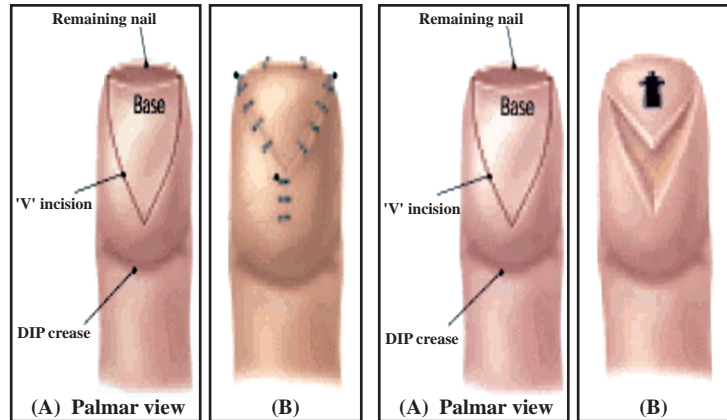


Fig. (3): Classic V-Y advancement flap. The V-shaped donor site defect is closed as a Y.

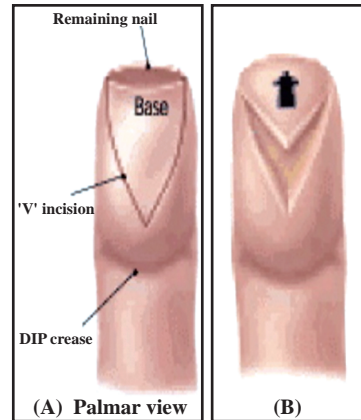


Fig. (4): The base of the triangle is sutured to the nail bed. The defect was left open and to heal by secondary tension.



Fig. (5): Fingertip injury.



Fig. (6): Preoperative fingertip injury.



Fig. (7): 2 Weeks postoperative.



Fig. (8): Late postoperative.



Fig. (9): Fingertip amputation ventral view.



Fig. (10): Postoperative repair ventral view.



Fig. (11): Fingertip injury ventral view.



Fig. (12): Late postoperative dorsal view.

DISCUSSION

Injuries to fingertips may appear minor but can have a great impact and serious implications because of the effect on so many activities. Typically they may result in lost work and sometimes the end of a career.

Fingertip and nail injuries account for 45% of all hand injuries seen in the emergency room. Middle fingertip is the most common injury followed by the ring finger, and thumb tip injury is the least common [1-3]. Everything distal to distal inter-phalangeal crease is considered the fingertip.

The glabrous skin on the fingertip is specialized for pinch and grasp functions; the nail protects the distal phalanx and provides counterforce to the tip pulp [4,5]. With the fingertip being the end organ for touch, preserving maximal function is of the utmost importance. Suboptimal reconstruction has the potential to significantly impact one's ability to work, thereby causing socioeconomic losses [6].

Optimal reconstruction preserves finger length, sensation and functioning, and enables a quick return to work. Although a variety of reconstructive techniques have been described for dorsal oblique and transverse fingertip amputations, the Atasoy V-Y advancement flap is a popular choice [6].

The advantages of this modification are potential reduction in the risk of hook nail deformities. This is explained by the fact that there is less tension at the tip of the finger because a counteractive proximal closure is not present at the apex on the V. Furthermore; the risk of hypersensitivity may be decreased.

It is believed that there are two reasons for this. First, the digital nerves at the base of the flap are preserved. Second, the faster healing allows the patient to start using their fingers earlier. This can be regarded as a form of early desensitization therapy.

Conclusion:

By solely suturing the base of the triangle flap to the nail matrix and allowing the donor site defect to heal by secondary intention, all of the benefits of the Atasoy flap are maintained. In addition, by leaving the donor site open, the primary problem associated with the Atasoy flap-closure under tension-is avoided.

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