

The application of VY advancement flap in the reconstruction of fingertip injuries: Report of two cases

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Abstract

The V-Y advancement flap reconstruction technique as modified by Atasoy *et al.* is a reliable method for the management of fingertip amputations. It preserves the normal contour of the finger, helps pad the fingertip, preserves normal sensation and facilitates quick return to work. In this report, we present two cases of fingertip injuries that were managed by the V-Y flap advancement technique.

Keywords: Fingertip amputations, fingertip injuries, reconstruction, V-Y advancement flap

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INTRODUCTION

The fingertip is the portion of the digit distal to the attachment of flexor and extensor tendons. It is the most distal portion of the finger which provides both tactile and sensory functions. Traumatic injuries of the fingertip are the commonest injuries of the hand.¹ Thousands of emergency room visits take place annually due to these injuries. In the United States for example, they account for approximately 4.8 million emergency department visits per year.²

The injury can be in the form of crushing, avulsion, laceration or amputating injury and may include damage to skin and soft tissues, the bone, or the nail and nailbed. The tips of the longer fingers are more easily affected.^{3,4} Fingertip injuries are classified into four types based on the level of injury as first described by Allen Figure 1.⁵

- Type 1: These injuries involve only the pulp

- Type 2: Type 2 fingertip injuries involve the pulp and nail bed
- Type 3: Type 3 injuries of the fingertip include partial loss of the distal phalanx
- Type 4: Type 4 injuries are proximal to the lanula.

Type 1 injuries may heal quite satisfactorily by secondary intention while types 3 and 4 injuries often require some type of flap coverage.

Fingertip injuries can result in significant functional and cosmetic deficit if they are not treated appropriately. Although there is no consensus on the treatment modality for these injuries, the aims of treatment are to minimize pain, optimize healing, preserve sensation and length of the digits, avoid or minimize nail deformity and provide acceptable cosmetic appearance.²

V-Y advancement flap is a reliable treatment modality for fingertip amputation injuries and tends to fulfil most of the aims of treatment outlined above.

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Originally described by Tranquilli-Leali in 1935⁶ and later popularized by Atasoy *et al.* in 1970,⁷ the VY advancement flap is a tried and tested option in fingertip reconstruction and can be reliably advanced up to 5 mm.^{7,8} The V-Y plasty technique preserves the normal contours of the dorsal finger, helps pad the fingertip and preserves normal sensation. The potential difficulties include fingertip contour distortion and flap ischemia along suture line. Here we present two cases of fingertip amputation managed by the modified V-Y advancement flap technique as described by Atasoy *et al.*⁷

CASE REPORT

The first case was a 40-year old man who presented in the emergency room with injury to the tip of the left middle finger. He was involved in an industrial accident while operating a cutting tool and presented about 24 h after the injury. He was neither hypertensive nor diabetic and was in excellent health prior to the injury. He received first aid treatment at the company clinic before referral. The wound was dressed and he was placed on oral antibiotics before referral to our Centre.

On examination, there was amputation of the distal aspect of the middle finger at the level of the nail bed (Allen Type II injury). The stump was ragged, clean and bleeding freely. He was subsequently placed on intravenous antibiotics, analgesics, and then worked up for surgery. The surgery was done about 12 h after presentation.

The second case was a 21-year old house keeper who sustained injury to the distal aspect of the right middle finger. She accidentally jammed a metal door against her finger while running away from a stray dog. The finger was amputated at the level of the proximal 1/3 of the distal phalanx with crushing of the amputated part (Allen Type IV injury). She presented to the emergency room about 5 h after the injury. The stump was ragged and bleeding profusely. She was admitted and bleeding controlled by application of a firm crepe bandage. She was subsequently placed on antibiotics and analgesics, and then worked up for surgery which took place about 14 h after presentation.

Operative procedure

Volar V-Y advancement flap was performed for both patients with digital nerve block anaesthesia and tourniquet. Following prepping and anaesthesia, debridement of clearly non-viable tissues was performed and wound irrigation done. The remnant of the distal phalanx in the second case was just a tiny bone spicule which was disarticulated from

the distal interphalangeal (DIP) joint. A V-shaped volar flap was cut on the remaining distal phalanx with the tip of the flap at the DIP joint crease for the first case. For the second case, the flap was made on the middle phalanx, with the tip at the joint crease of the proximal interphalangeal joint. The fibrous septa were then divided from the underlying phalanx and the flap advanced. The V shaped donor defect was then closed as a Y. The closure was done in a tension

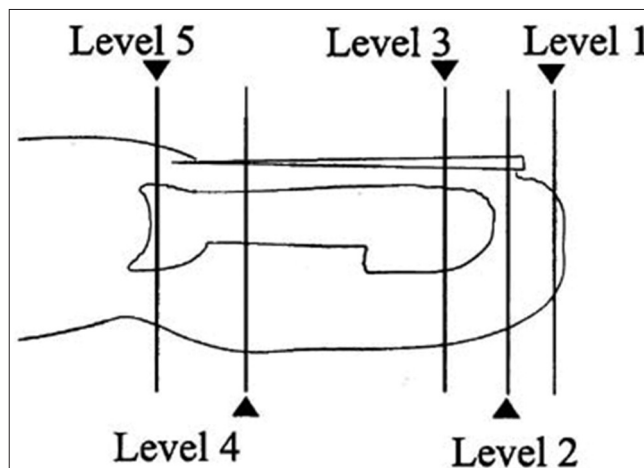


Figure 1: Allen classification of fingertip injuries



Figure 2: (a and b) Pre-operative images of case 1



Figure 3: (a and b) Immediate post-operative images of case 1



Figure 4: (a and b) Two-months post-operative images of case 1



Figure 5: Pre-operative image of case 2



Figure 6: Immediate post-operative image of case 2



Figure 7: Two-months post-operative image of case 2

free manner and dressing applied. Tourniquet was then released and the viability of the flap assessed. Figures 2-7 show the pre-operative, immediate post-operative and 2-month post-operative pictures of the two cases.

The flap in both cases healed uneventfully and each case was followed up for a minimum of 3 months. At 3 months post-operative period, each finger was assessed for contour, dysesthesia, static two-point discrimination sense and range of motion at the proximal and DIP joints. Both fingers regained normal contour and full range of joint motion. There was no complaint of dysesthesia while the static two-point discrimination score was 5 for the first case and 6 for the second case. No complications were recorded.

DISCUSSION

Fingertip injuries are a potential cause of significant morbidity within the community and at the workplace. With the fingertip being the end organ for touch,

preserving maximum function following injury is of utmost importance so as to limit to the barest minimum, the socioeconomic impact of the condition. Optimal reconstruction ensures preservation of length, sensation, contour, function and quick return to work. Although a number of options are open to the surgeon in the management of fingertip injuries, the V-Y flap reconstruction technique as modified by Atasoy *et al.* offers a reliable, simple and reproducible option for the management of this condition.⁷

The drawbacks of the V-Y flap reconstruction technique, are however flap necrosis and hook nail deformity.^{9,10} The risk of flap necrosis is high in cases of large defects as the flap can be advanced for a maximum of 5 mm.⁷ The point of maximum tension occurs at the mid portion of the defect which is the widest part. Thus there is need to emphasize that the closure must be tension-free. If a tension-free closure is not achieved, the risk of flap necrosis is high.

In addition, the high tension may pull the distal nailed in the volar direction which results in a hook nail deformity. To circumvent these drawbacks, some authors have advocated that the donor site should be left open to heal by secondary intension. In this technique, the base of the triangular flap is sutured to the nail matrix and the donor site defect allowed to heal by secondary intension. A number of authors have reported good result with this modification of the V-Y flap reconstruction technique.^{3,11}

We however did not encounter any complications with the two cases we reported. Both injuries healed satisfactorily with good looking pulp contour and full restoration of function. Both patients returned to work within 2 months of the injury. Patient selection is however, important in achieving the best result with the V-Y flap reconstruction technique. When the defect is large and may likely require flap advancement <5 mm, it is wise to choose another reconstruction technique, so as to give the patient the best chance of full recovery.

CONCLUSION

In carefully selected patients, the V-Y flap reconstruction technique as modified by Atasoy *et al.*⁷ offers a reliable option in the management of fingertip injuries. It results in the restoration of both form and function to the finger and ensures quick return to work.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will

not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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