



A Pictorial Essay on Various Presentation, Evaluation and Management of Fingertip Injuries

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ABSTRACT

Fingertip injuries are the most common injuries of the hand. The disproportionately large and intricate cortical representation emphasizes the importance of restoration of function to as normal as possible. The goals of treatment in fingertip injuries are the preservation of length, durable and sensate coverage, and minimal donor site morbidity with the best functional and cosmetic outcome. Treatment depends upon the mechanism of injury, type of amputation, geometry and size of the defect along with the involvement of bone and nail bed. Different reconstructive techniques are indicated for the management of these injuries, ranging from primary closure to split skin grafting to the use of various flaps like cross finger flap, thenar flaps, FDMA flaps, volar V-Y advancement flaps. Improper treatment of fingertip injuries may result in stiffness, loss of function, and poor prognosis.

Keywords: Fingertip injuries, Fingertip amputation, Nail bed injuries

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INTRODUCTION

Fingertip injuries are the most common injuries of hand¹ and are quite commonly encountered during day-to-day activities.² A detailed clinic-radiological examination in the background of the mechanism of injury, type of amputation, geometry and size of the defect along with the involvement of bone and nail bed is mandatory to proceed with treatment.³ Awareness of the normal anatomy of a finger is also essential for correct diagnosis and treatment to avoid dysfunction or deformity. Most commonly the pediatric age group sustains these injuries.⁴ The goals in fingertip injury treatment are preserving length, durable and sensate coverage, and less donor site morbidity with the best functional and cosmetic outcome. The fingertip is a vital organ of sensation, main focus of treatment is sensory recovery.⁵ This article reviews the normal anatomy, and various etiology along with evaluation and management of fingertip injuries.

ANATOMY

The fingertip is defined as the tip of the finger distal to the insertion of flexor digitorum superficialis tendon. It comprises distal phalanx, soft tissue of the nail bed, and its edge.⁶ The volar side pulp consists of highly vascular fibro-adipose tissue. On the dorsal aspect, perionychium is made of a nail bed, nail fold, surrounding tissue and eponychium. Eponychium is the proximal-most fold that grows over the nail. The lateral folds of the nail are paronychium and the hyponychium is

the epithelium under the free edge of the nail.⁷ The nail bed is made proximally of germinal matrix and distally of sterile matrix.⁷ The vascular anatomy includes multiple branches from the transverse distal palmar arch (DTPA), formed by the anastomosing digital arteries.⁸ The digital arteries pass dorsally in relation to the nerves and the terminal branches arising from in relation to digital nerves form the transverse arch in the palmar subcutaneous tissue of the pulp area. The dorsal terminal vein present in the midline at the level of the DIPJ, is responsible for most of the drainage.⁹

ETIOLOGY

The most common mechanism of injury in the pediatric age group is door entrapment injury (Figure 1A) followed by *chara* cutting machine injury.¹⁰ With regard to adults, crush injury due to machine (figure 1B) or involvement of a sharp object is seen more commonly. Other injuries include lacerations and avulsions in the setting of occupational activities.

PRESENTATION AND EVALUATION

Patients mostly present with pain, bleeding and soft tissue defect (Figure 2A), subungual hematoma, and near-total or total amputation (Figures 2B and C).¹¹ Evaluation of these injuries begins with a detailed physical examination upon presentation, to assess the sensory and motor function along with vascularity in the form of capillary refill. Motor examination includes the range of motion of

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Figure 1: A. Door entrapment injury in child. **B.** Machine injury to index finger in adult.



Figure 2: A. Soft tissue defect following machine injury with exposed bone. **B.** Near-total amputation of ring finger. **C.** Total amputation of fingertips of index and middle finger.

the distal phalanx. Radiological evaluation should be carried out to rule out any underlying bony involvement in form of dislocations, fractures or the presence of any foreign body. Further management is guided by the mechanism of injury, distance of injury from a distal interphalangeal joint (DIPJ), involvement of bone and nail bed and size of the soft tissue defect.

MANAGEMENT

The treatment options include healing by secondary intention, primary closure, skin grafting and various flaps like- VY advancement (Figure 3), cross finger (Figure 4), thenar (Figure 5), neurovascular island, reverse vascular island, foucher flaps and toe pulp transfer, distal replantation (Figure 6) and terminalisation or revision amputation.

The injuries not involving any bony exposure can be treated by healing with secondary intention or skin grafting, whereas exposure of bones and tendons requires durable coverage in the form of flaps. Healing by secondary intention is ideal for superficial wounds that are less than 1-cm² in adults.¹² With moist regular dressings, the recovery period ranges from four to six weeks. For larger defects, skin grafting can be considered when no bone is exposed, or if the patient does not want a long recovery period by allowing healing by secondary intention. Long-term results from secondary healing are better than skin grafting in terms of sensory recovery.¹³ "Cap-plasty" is another option that is most commonly employed in children below five years of age, where



Figure 3: A. Failed composite grafting in 6 years old child. **B.** Cover of soft tissue defect with V-Y advancement flap. **C.** Rounded pulp after 6 months of follow up period.



Figure 4: A. Crush injury to index finger. **B.** Defect after debridement and cross-finger flap from middle finger. **C.** Durable cover at 6 months of follow-up.

the amputated part is sutured primarily as a composite graft after a thorough debridement and defatting (Figures 7A and B).

Recently, a new treatment modality in the form of flap repositioning for fingertip injuries with bone and nailbed loss has been proposed, which involves amputated stump (distal phalanx and free nail bed graft) reattachment with Kirschner wire as an excellent alternative option for replantation at centres lacking microsurgical expertise.¹⁴



Figure 5: A. Loss of pulp following door entrapment injury. **B.** Distal Replantation **C.** Thenar flap for reconstruction of pulp. **D.** After flap division. **E.** Rounded pulp at 6 months of follow up period.

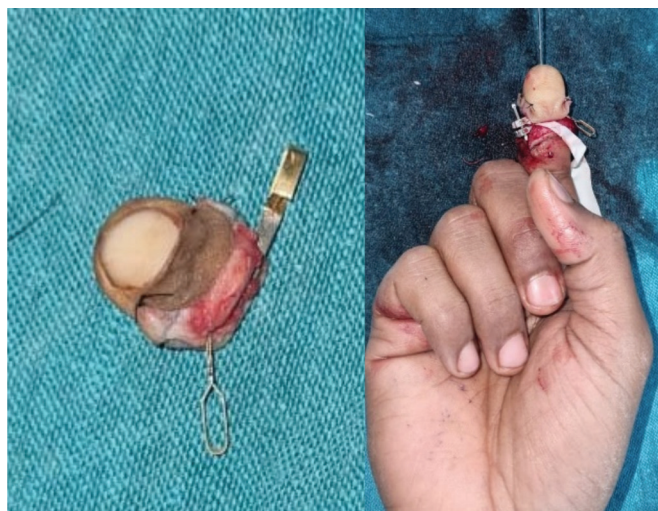


Figure 6: A. Explored digital vessel in amputated part. B. Distal replantation



Figure 7: A. Amputated part after de-fatting. B. Cap-plasty of thumb in a five-year-old child.

If the amputated part is brought properly preserved with normal architecture, distal replantation at the level of DIPJ or distal to it can be attempted. This gives an advantage of preservation of finger length and the nail bed. The functional and cosmetic outcomes are always better than any other treatment modality, even if the DIPJ is fused.¹⁵

CONCLUSION

Fingertip injuries are very common and most frequently reported injuries in trauma and emergency. Debridement and reconstruction

with various traditionally used flaps and grafting give good functional and aesthetic outcomes with minimum donor site morbidity. However, distal replantation should be attempted whenever possible for better functional and cosmetic outcomes.

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