



Management of Fingertip Injury Allen Type III in Suburban Hospital : A Case report

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ABSTRACT

Fingertip injuries are the most common injuries that occur to the hand. Various treatment options have been described including healing by secondary intention, skin graft, homodigital, heterodigital and regional flaps as well as free flap. Small defects with limited exposure of the bone can be treated conservatively with healing by secondary nature. Good results can be achieved with standard dressings or a semi-occlusive dressing. With larger defects, surgical treatment is needed. Without prompt and precise treatment, finger injuries can interfere with the complex function of the hand and may result in permanent deformity and disability. This report aims to report management in patients with fingertip injury. A 63-year-old male patient with fingertip injury allen type III digiti II manus sinistra. Patient treated with pharmacotherapy and surgical treatment.

INTRODUCTION

Fingertip injury (FTI) is an injury to the area distal to the insertion of the flexor digitorum deep tendon¹. One third of all traumatic injuries affect the hands; fingertip injuries are the most frequently traumatized parts. Fingertip although small in area, has many important anatomical structures, including the nail bed, nail plate, extensor tendon, flexor tendon, distal phalanx, pulp, and digital nerves after the trifurcation¹⁻⁴. It is widely recognized as an important and specialized structure within the hand that contributes to function through fine motor control and sensation and to the aesthetic value of the hand. Therefore the treatment of these injuries is complex and requires addressing both functional and aesthetic concerns. Several strategies have been described in the literature to appropriately evaluate and treat these injuries⁵. Approach to injury management fingertip is based on several factors, including age, hand dominance, gender, pre-existing medical conditions, mechanism of injury, work and characteristics specific injuries⁶.

Conservative management or revision amputation is common in the United States, and thus, replantation is performed in only 14% of fingertip amputation injuries⁷. In contrast, replantation or reconstruction is conventionally performed in Asian countries; replantation is performed in 29% of fingertip amputation injuries in Japan⁸. Although there are limited data regarding the appropriate indications for re-plantation, distal fingertip amputations without bone defects tend to be treated with replantation in Japan^{7,8}. Although fingertip lesions are often mistaken for minor injuries but in fact an injury to this section often causes interference sensibility to loss of function significant. This poses a challenge due to the unresolved issues regarding cost and functional outcomes⁷⁻⁹.

CASE REPORT

Our patient is a healthy 63-year-old man. He injured the 2nd finger of his right hand at home when he was repairing gear wheel of his motorcycle. This injury resulted in a fingertip amputation. He presented to our emergency department within 1 hour of the injury. On physical examination, general status condition was found *compos mentis* awareness, good nutritional status and vital signs has hypertension grade II that not known before. On local examination status shows *vulnus amputatum* at distal phalanx digiti II dextra, no hematoma or edema seen (Figure 1). Active and passive movement of normal wrist joints. Active and passive movement of the metacarpophalangeal (MTP) and proximal interphalangeal (PIP) joint of the thumb finger normal. Active and passive movement of the MCP, PIP and distal interphalangeal (DIP) finger joints 3,4,5 normally. Pulsation palpable radial artery, CRT < 2 seconds



Figure 1. *Vulnus amputatum digiti II manus dextra*

Due to the intact germinal matrix on the dorsal side, the injury was classified as an Allen type III. Intravenous antibiotics and analgetics were administered in the emergency department and sterile dressings were applied. Patient and relatives are given explanation and information related to the injury, and offered for therapy. After discussing the various treatment options, a surgical repair stump was chosen. After that patient given written and verbal informed consent, patient

underwent repair stump. Surgery was performed under loco-regional anaesthesia (supraclavicular plexus) and tourniquet control. Several flap techniques were not performed because of the small remaining distal phalanx and the transverse type of amputation (Figure 2).



Figure 2. Preoperative repair stump

The proximal stump was first cleaned and debrided. Small incisions were made on the lateral of the nail fold to expose the proximal nail bed and germinal matrix and to make cube that give best functional and aesthetic outcome. Local flap like V-Y advancement flap can not be made because too proximal amputation. In this surgery just done with repair stump. The tissue sutured with nonabsorbable nylon 4/0 suture (Figure 3). A sterile dressing was applied. Postoperative the patient was treated with intravenous antibiotics for 24 hours. After which he was discharged home with oral antibiotics for 1 week.



Figure 3. Post operative repair stump

DISCUSSION

As the terminal extension of the fingers and hand, the fingertips are the portions of the upper extremity through which we touch, feel, write, draw, and perform activities of daily living. With the advent of new technology, our dependence on our fingertips for everyday living continues to increase, as we more often surf the internet, program handheld organizers, use smart phones, operate the TV remote control⁶. The question is much more complicated when there is loss of tissue. The main treatment objectives are (1) closure of the wound; (2) maximize sensory return; (3) preserve length; (4) maintain joint function; (5) early return to work; (6) achieve a satisfactory cosmetic appearance; and (7) early prosthetic fitting. How these goals are achieved will depend on the amount of tissue lost, whether there bone exposed, and which finger is involved. Injuries can be classified according to where the amputation has occurred or whether the injury primarily involves the pulp (soft tissue) or nail bed⁶.

Fingertip amputations were classified by Allen from Type I to Type IV according to the degree of the injury. Allen classification classifies fingertip injury into 4 (four) types: Allen Type I: involves only tissue loss soft tissue (skin and pulp) distal to the distal phalanges. Allen Type II : involves the pulp and nail bed distal to the tip of the distal phalanges. Allen Type III : involves the nail plate and distal germinal matrix from the mid-distal phalanges. Allen Type IV : proximal to the nail plate covering the whole distal phalanx¹⁰. Most Allen type III/IV fingertip amputations are treated surgically, but conservative management can also be a viable treatment option¹¹.

The approach to management of fingertip injuries is based on several factors, including, age, hand dominance, digit involvement, sex, preexisting medical conditions, mechanism of injury, occupation, and anatomy of fingertip defect. Obtain the patient's history to ascertain the treatment approach⁶. The age of the patient can contraindicate certain treatment options, including crossfinger or thenar flaps, as the delay required before flap division can result in joint contractures in older patients. As the primary goal of treatment of an injury to the fingertip is a painless fingertip with durable and sensate skin, the knowledge of fingertip anatomy and the available techniques of treatment are of paramount interest. The sex and ethnicity of the patient can influence reconstructive options : cross finger flaps, which transpose hair-bearing skin to the palmar surface, are discouraged for women. The use of a cross finger flap in a patient with dark skin can also lead to an aesthetically displeasing color mismatch. Preexisting conditions like Dupuytren contracture or rheumatoid arthritis are contraindications to cross finger and thenar flaps because of the risk for resultant joint stiffness. Occupation and hobbies can be an important determinant in selecting fingertip treatment options for those concerned with returning to work⁶. Goals of treatment in fingertip injuries include preservation of useful sensation, maximizing functional length, preventing joint contractures, providing satisfactory appearance and avoiding donor disfigurement and functional loss^{3,11,12}. As fingertip injuries can be treated in different ways their management needs to be carefully individualized¹³. If there is no or minimal tissue loss, the wound can be closed primarily with or without debridement. Healing by secondary intention or open technique by combination of wound contraction and reepithelialization is applicable to small volarly directed fingertip wounds with no exposure of bone^{8,14}. This is not

preferred for wounds greater than 1 cm as it takes a long time to heal with the loss of volume. This approach has a definite place for fingertip injuries in children as they have good capacity of regeneration. If the wound is larger than 1 cm and volarly directed, without exposure of bone or tendon, skin grafting provides faster healing⁶. When bone or tendon is exposed at the base of a fingertip wound, the use of skin grafts is not feasible and a local flap is necessary. Regarding the treatment of the bone in a digital amputation, the bone under the stump end must be smooth. Remaining bone chips and devitalized bone should be removed. The bone at the stump end can be smoothed by using a rongeur and file. Bone length is not as important as a stump with mobile nonsensitive coverage. The bone of the distal phalanx must be of adequate length to support the nail bed and nail growth. With digital amputations involving the thumb, length is important¹⁵. Standard procedures for fingertip reconstruction include revision amputation¹⁶ and split-thickness or full-thickness skin grafts. Also, various local flaps have been used, including the V-Y volar advancement flap¹⁷, the homodigital neurovascular island flap¹⁸, the first dorsal metacarpal artery flap¹⁹, the Littler flap²⁰, the Moberg O'Brien flap²¹, the Atasoy flap²², the Hueston flap²², the Cutler flap²³, the modified volar advancement flap²⁴, the thenar flap²⁵ and the cross-finger flap²⁶. In addition, free flaps have also been shown to be effective when reconstructing extensive fingertip defects secondary to trauma, more specifically, the medial plantar venous flap²⁷, the glabrous flap²⁸, the free dorsoulnar artery perforator flap²⁹, the superficial palmar branch of the radial artery flap³⁰ and various toe pulp flaps. Revision amputation is one of the most common operations of the hand. Regardless of wound orientation, fingertip amputation injuries proximal to the lunula often require revision amputation³¹. The reported advantage of revision amputation compared with other reconstructive efforts is that it offers the patient a relatively quick return to the work force³¹. The most common reported reason for refusal of replantation is the inability to immediately return to work. For the reconstruction of fingertip and thumb tip defects, numerous options for defect coverage are available. For larger and complex defects, flap reconstruction with local, regional, or even free flaps are indicated³¹.

CONCLUSION

Finger injuries are common injuries in world wide. Since the fingertip performs complex sensory and aesthetic functions, the proper management of these injuries is crucial. All fingertip injuries should be thoroughly cleaned and debrided. While all injuries may present unique challenges, physicians must ensure that patients with crush injuries are thoroughly examined for nail bed injuries and distal phalangeal fractures, as these can lead to significant long-term morbidity if left untreated. The precise treatment strategy, whether conservative or operative, primarily depends on the extent of the injury and must be determined on a case-by-case basis.

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