

Case study

Successful salvage of a mutilated hand injury in a developing country: A case report

Abstract

Mutilating hand injuries are rare but it not uncommon especially in developing countries. Salvaging of the injured hand with adequate functional status is the goal of management. Early systematic debridement with intravenous antibiotics, good soft tissue handling and good rehabilitation is key to success for the management. we describe here a case of management of a militated hand injury in a young boy in resource constrained setting.

Comment [HF1]: The font (Times New Roman) must be the same in all the manuscript.

Comment [HF2]: Please, mention the age of the patient.

Introduction

The hand is a complicated structure made up of various tissues that are tightly packed in a short area (skin, nerves, blood vessels, tendons, bones joints, and intrinsic muscles)(1).

Comment [HF3]: Add reference numbers in square brackets, in all the manuscript.

Musculoskeletal trauma is expected to contribute 20% of the global disease burden by 2020, owing mostly to disability induced by these injuries(2). Upper extremity trauma accounts for the vast majority of musculoskeletal trauma in both developed and developing countries(3). Injuries to the hands and wrists are one of the leading causes of functional disability worldwide. The emergency presentation of a mangled hand is relatively rare among hand and wrist injuries(4).

Comment [HF4]: Please update. We are in 2023. What are the current for this claim?

Hand mutilation may be defined as injuries that cause severe damage to several tissues at once(5).It is sometimes impossible to salvage the elements necessary for proper hand function after the dramatic destruction of parts associated with mutilating injuries to the hand. The major goal of therapy is to restore circulation to the devitalized area, straighten the residual skeletal components, and restore skin cover to the denuded areas(5).The definitive treatment must be postponed until the survivability of the hand is confirmed. Complex surgeries are often required to turn a remaining part of the hand into a functioning unit(5).

Comment [HF5]: anatomical structures

There are no established data about the prevalence of such injuries in our country till date. Since, 80% of population in the country are involved agricultural works, the incidence of such cases are on rise. In this paper, we will describe a case of mutilated hand injuries.

Comment [HF6]: The contexte of "in a developing country" must be explained and justified in the Introduction:

1. In a developing country, what has changed in the salvage of a mutilated hands?
2. What are the difficulties involved in saving a mutilated hand in a developing country?
3. In the case of your mutilated hand, what is the difference between a salvage operation in your developing country and salvage operation in a developed country?

Case Presentation

19 year old male, who was a right hand dominant, got his left hand accidentally stuck into the grass cutter machine while trying to clear the debris. He succumbed to heavy bleeding and was immediately taken to a local district hospital. The wound irrigation and dressing, tetanus toxoid

injection, IV antibiotics, splinting and basic lab investigations were done from hospital there and referred to our hospital. Eastern Regional Hospital is one of the only regional referral center which foster orthopedic surgical services to six eastern districts in the country. There are no hand surgeons in the country and the cases are handled by general orthopaedic surgeon.

On reaching our center, patients vitals were all stable but his wound dressing were all soaked. Basic labs such as Complete blood count, Viral markers, grouping and cross match were send along with the x ray of hand. IV fluid maintenance were started from hospital there with patient nil per mouth. Emergency Operation theatre activation were done. Detailed explanation of the injury and need for immediate debridement with exploration were discussed with patient party and an informed written consent was taken. Injection Cefazolin 2g stat along injection Gentamycin 240mg stat and injection metronidazole were given at emergency room.

Patient was laid supine and general anesthesia were given. Tourniquet was applied and inflated before the wound dressing removal in order to prevent active bleeding while washing the wound. All the foreign debris were removed from the skin and soft tissues while washing. A systematic wound debridement were done with radically removing all the devitalized and contaminated tissues. Flexor tendons were exposed and tagged with sutures. Fractures of the bone were cleaned of debris and fixed with k-wire. Ulnar artery were completely transected and were repaired along with the median nerve. With multiple carpal bone fractures and tendon injuries, a decision on applying external fixator was implemented, in order to protect the soft tissues, bones and tendons.



Fig 1. Shows extensive **de** gloving injury involving multiple flexor tendons, bones, nerves and vessels with high degree of contamination.

Comment [HF7]: How long after the trauma? (very important). Please also specify the outcome of the clinical assessment you carried out on the patient's arrival.

Comment [HF8]: The palmar (flexor tendons) and dorsal (extensor tendons) surfaces of the hand are numbered in areas. Please specify the area where the hand has been mutilated.

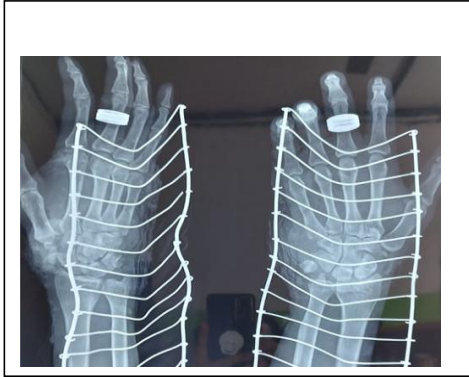


Fig 2: X rays shows the fracture of trapezium bone with subluxation of 1st carpometacarpal joint of left hand.



Fig 3: Immediate post-operative image showing loosely tagged skin sutures with external fixator



Fig 4: Post op x ray showing temporary fixation of 1st CMC joint with k wires and external fixator.

Second look surgery was done with wound debridement and closure after 72 hours and daily dressing of wound were done. Antibiotics were continued for 10 days and external fixator were removed on 10th post-operative day. A short arm splint was applied after removal of the external fixator. Passive range of motion were done by the physiotherapy team along with electrical stimulation of tissues for rapid healing. High protein diet were given to the patient for quick wound healing. Active range of motion were started at 4 weeks of surgery with intermittent hand splints.

Split thickness skin graft were done over the volar wrist at 3rd week postoperatively.

Comment [HF9]: The wound was closed by what? A flap?

Comment [HF10]: Please explain why. To start hand physiotherapy? This delay is very shortly from bones consolidation.

Comment [HF11]: Please mention the duration. Also describe the functional results after the physiotherapy.



Fig 5: Wound status at 4 weeks



Fig 6: Functional status at 2 months

Discussion

Managing the mutilating injuries to the hands are very much complex. We have to balance between the time for wound healing and its predisposition for high degree of stiffness. The priority is much given to save the hand as much as possible with good functional status. Most often, patients refuse for amputation even if it's beyond the possibility of salvaging. Good communication with patient and counseling are required to overcome such complex situations.

A holistic approach with systematic debridement of wound, meticulous soft tissue handling and IV antibiotics along with optimizing nutritional status of patient is crucial to avoid early complications of wound infections and delayed wound healing. Multidisciplinary approach involving hand therapist, nutritionist and wound specialist nurses are required for the successful outcome. Early and aggressive physiotherapy is critical for swiftly regaining hand function and range of motion. It aids in the reduction of edema and hand stiffness following injury(6).

Conclusion

The outcomes of mutilating injury reconstruction are quite diverse. There are several elements impacting the outcome: injury-related, patient-related, and treatment-related(7). Understanding the desired goal: the 'acceptable hand' (one with three fingers, near normal length, near normal sensibility, and a working thumb) is intended to be of tremendous assistance in primary care. Preservation of important structures such as joints, flexor tendons, and arteries during early debridement, which will aid in the development of this 'acceptable hand'(8)

References:

1. Lahiri A. Guidelines for management of crush injuries of the hand. J Clin Orthop Trauma. 2020;11(4):517–22.

Comment [HF12]: It is a Comment that you do, not a discussion.

Comment [HF13]: The context of "in a developing country" must be explained and justified in the Comments

2. Giladi AM, Ranganathan K, Chung KC. Measuring functional and patient-reported outcomes after treatment of mutilating hand injuries: a global health approach. *Hand Clin.* 2016;32(4):465–75.
3. Beveridge M, Howard A. The burden of orthopaedic disease in developing countries. *JBJS.* 2004;86(8):1819–22.
4. Gautam P, Gyawali S, Mainali P, Niraula H, Shrestha J, Lohani I. Mangled right hand: A case report. *Int J Surg Case Rep.* 2023;102:107846.
5. Midgley RD, Entin MA. Management of mutilating injuries of the hand. *Clin Plast Surg.* 1976;3(1):99–109.
6. Agarwal R, Agarwal D, Agarwal M. Approach to mutilating hand injuries. *J Clin Orthop Trauma.* 2019;10(5):849–52.
7. Alphonsus CK. Principles in the management of a mangled hand. *Indian J Plast Surg Off Publ Assoc Plast Surg India.* 2011;44(2):219.
8. del Pinal F. Severe mutilating injuries to the hand: guidelines for organizing the chaos. *J Plast Reconstr Aesthet Surg.* 2007;60(7):816–27.

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