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CASE REPORT

Complex table saw hand injury-case report

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Abstract

Currently, Romania lacks a tradition of trade schools. This is due to the lack of awareness on the importance of this educational structure. Such multiple trades have been learned by simple observation from one individual to another. The importance of security measures has been taken for granted if not ignored. The number of traumas produced in wood processing has decreased rapidly due to the appearance of wood processing robots, the human factor being reduced only to their programming. The cases that arrive in the emergency departments are in a major percentage from the rural area, where the wood processing is done in the household without an adequate training and without going through a learning process. Hand injuries represent a great part of the Emergency Department presentations, and because of their fundamental functional use in daily life, repair of such lesions should be done with utmost care. Wounds of the hand typically have different degrees of severity depending on the mechanism of injury. Hand trauma probably represents the most frequent pathology of a plastic surgery ER and it should be handled with utmost care because of the fundamental function in the daily routine. The present article presents the therapeutic conduct of a complex case, multiple wounds with bone exposure, digital nerve sectioning and destruction of the flexor system of several fingers.

Keywords: table saw, hand injury, trauma, case report

Introduction

Hand injuries represent a great part of Emergency Department presentations, and because of their fundamental functional use in daily life, repair of such lesions should be done with utmost care. These notions are emphasized even more when an injury of the thumb is involved, as functional loss of the thumb results in inability to grasp and pinch.

Wounds of the hand typically have different degrees of severity depending on the mechanism of injury. One of the most debilitating mechanisms is circular saw and grinder injuries and fireworks, as it can lead to multiple irregular injuries of both bones and soft tissues. In such cases, reconstruction is difficult and the surgeon has the role of choosing the best method of repair. Bone fracture treatment options can include immobilization, bone-grafting or even amputation with toe transplantation, while soft tissue injury treatments may range from primary repair to grafting or using flaps for coverage [1-5].

Hand trauma represents maybe the most frequent pathology of a plastic surgery ER and it should be handled with utmost care because

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of the fundamental function in the daily routine.

While surgical approaches in hand trauma vary with the extent and mechanism of injury, table saw and circular saw injuries are by far the most frequent and quite challenging to manage due to the cutting-tearing-avulsion effect, requiring quite a large surgical armamentarium.

In most cases, trauma extends to the bones, with transverse fractures of the phalanx and metacarpals, with loss of soft tissue, polluted wounds and shattered skin flaps and tendon injuries.

After thorough debridement, the extent of the trauma is assessed and the surgeon must stabilize skeletal fractures, revascularize the tissues (if necessary) and ensure soft tissue repair and skin coverage of the hand. Multiple methods are available for bone reconstruction, such as immobilization, ORIF, screw or plate osteosynthesis, arthrodesis in case of an intraarticular fractures, bone grafting or amputation with free transfer of another digit (mostly used toe or long finger transplantation) [6,7].

Ensuring a stable blood supply is of paramount importance and microsurgical anastomosis of phalangeal vessels is frequently needed to avoid amputation. Tendon repair should be attempted primarily if there is no danger of shortening or contracture. Else, secondary repair is preferred. Skin coverage can be performed by direct closure, skin grafts, local flaps, or free flap transfers. Full thickness skin grafts are preferred in volar injuries of the hand [8-11].

Case presentation

A 39-years-old male patient referred to our clinic following a table saw accident affecting his right hand. General exam at admission in the Emergency Department showed stable hemodynamics status. An important detail from the anamnesis was that the accident took place more than 6 hours prior to hospital arrival. The primary evaluation of the injured hand revealed multiple deep wounds of the palmar view of the hand and the anterior view of the thumb, index, middle and ring finger, as well as the inability to flex the thumb and ring finger. He also lacked sensibility of the ulnar side of the thumb. He was admitted in the Plastic Surgery department for further examination. The Rx of the hand showed a fracture trajectory of the proximal phalanx and interphalangeal joint of the thumb.

Intraoperative exploration revealed highly contaminated wounds [12] and a significant soft tissue and bone defect of the proximal phalanx of the thumb, complete tear of the flexor pollicis tendon, extensor pollicis longus, superficial and deep digital tendons of the ring finger, as well as digital nerve laceration of the ulnar side of the thumb [13,14].

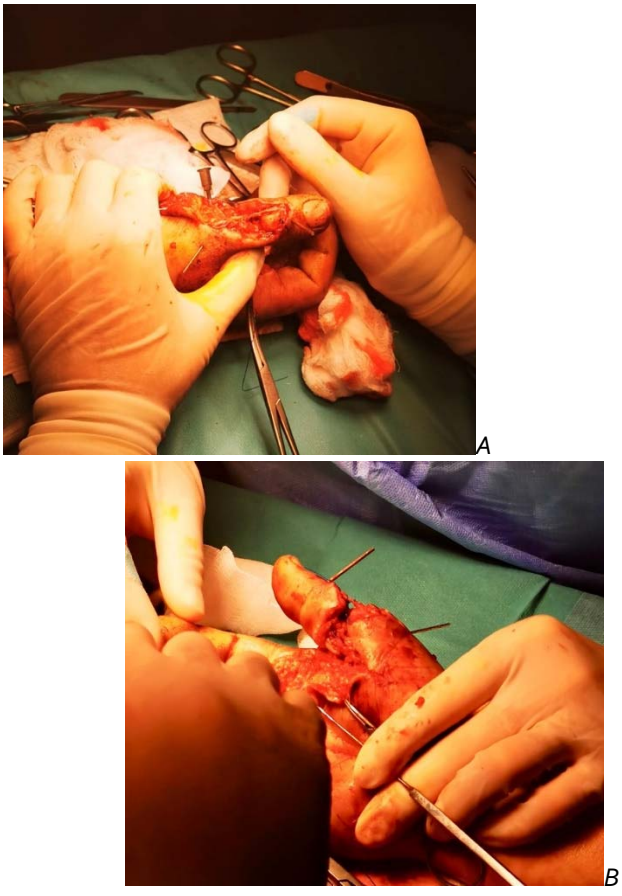


Fig. 1A, B IP joint destruction and bone loss

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The wounds were carefully irrigated and debrided and the fracture was stabilized with an external fixator to prevent bone loss and the loss of joint function. The neurovascular elements and the tendons were identified for later approach.

Following surgery, the surgeons opted for a tricortical bone graft from the iliac crest to stabilize the missing part of the distal thumb phalanx and interphalangeal joint of the thumb fixed in place with two 1.5mm diameter screws and covered with a first dorsal metacarpal artery flap (Kite flap) [15], neurorrhaphy of the ulnar digital nerve of the thumb, tenorrhaphy of the teared tendons and a full-thickness skin graft for the palmar wound, harvested also from the iliac crest area.

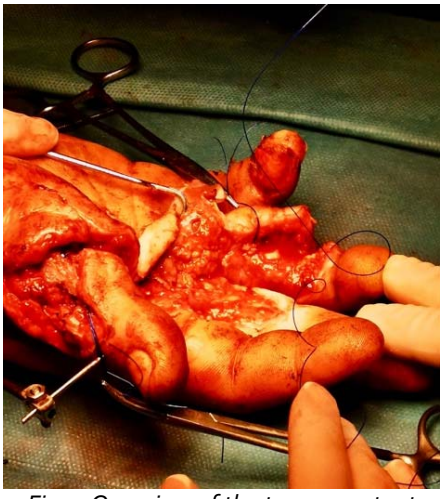


Fig. 2 Overview of the trauma extent

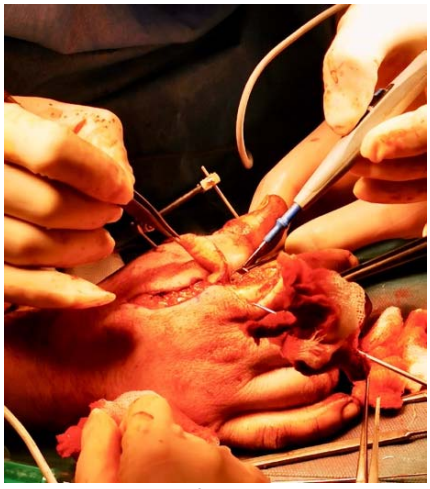


Fig. 3 Kite flap harvesting



***Fig. 4** Kite flap prepared for tunnelling and inset*

Discussions

These types of injuries often result in extensive soft tissue destruction and comminuted fractures that necessitate careful debridement and repair that can be challenging by requiring bone-grafting, fusion, amputation, microvascular repair, tendon, and nerve surgery.

Severe complex injuries of the hand with associated soft tissue and bony tissue loss require a very thorough process of thought and decision making because the management of such injuries depends on many variables like the level of the injury, the severity of the soft and bony tissue damage, the viability of the thumb and digits, as well as patient factors, including occupation, age, other background health problems, vices like smoking, alcohol, drugs etc., and the patient's expectations.

Depending on the type and level of injury, treatment options can include flap coverage, nerve grafts, vascular grafts, bone grafts, webspace deepening, phalangisation, tendon transfers, toe-to-thumb transfer, distraction osteogenesis, or pollicization.

In this case, the loss of bone radiologically was not that obvious as intraoperatively, where the full extent of the joint and bone destruction could be observed, thus opting for

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the external fixation to stabilize the remaining <20% of the IP joint of the thumb and less than half of the proximal phalanx.

There was a problem even from the first wound debridement and exploration the soft tissue coverage, but after the surgery and a few other debridements, the soft tissue loss was even greater and we opted for the Kite flap to cover the bone graft, and full thickness skin graft from the same iliac crest area. We opted for tricortical iliac crest graft because of the dimensions and the ease of sculpting the graft for good integration and for good donor site morbidity.

Conclusion

After initial surgery, follow-up surgery could be performed to optimize the functional and aesthetic outcomes. Thumb prosthesis is a variant in this field of research, having been in the spotlight in the last 2 decades, although in this case, if the flexion of the thumb was not satisfying, there were options like an interphalangeal joint prosthesis. Usually, these types of arthroplasties are performed in case of fine motion movements of the interphalangeal joint demand. If intense physical labor is the patient's main activity, arthrodesis is a better option. A Camitz transfer can be performed for even a better stability and flexion of the thumb.

Conflict of Interest statement

Authors state no conflict of interest.

Informed Consent and Human and Animal Rights statement

Informed consent has been obtained from all individuals included in this study.

Authorization for the use of human subjects

Ethical approval: The research related to human use complies with all the relevant national regulations, institutional policies, is in accordance with the tenets of the Helsinki Declaration, and has been approved by the review board of "Prof. Dr. Agrippa Ionescu" Emergency Hospital, Bucharest, Romania.

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Disclosures

None.

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