CLINICAL CASE

FUNCTIONAL OUTCOME IN A CASE OF CIRCULAR SAW HAND TRAUMA

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Abstract

Hand injuries are considered to be the most frequent body injuries. The hand is a complex and dynamic collection of different tissues, and, consequently, patients with hand trauma present with a wide variety of conditions, with different outcomes and therefore, proper assessment and management of the injuries is essential.We present a case of a 54 year old male, right-hand-dominant patient, admitted for a circular saw trauma of his left hand, which he had sustained 72 hours prior. He reported that immediately after the trauma, he had presented to a local emergency department where amputation of the hand had been proposed as the only possible treatment. He presented to our hospital 3 days later.His medical history was significant for urothelial carcinoma, currently under chemotherapeutic treatment with doxorubicin. He denied allergic reactions or anticoagulant medication. Upon presentation, he had smoked one pack of cigarettes a day for the past 30 years.

Keywords*: hand, circular saw hand trauma, complex injury, nerve repair, tendon repair, distant flap, soft tissue reconstruction*

Introduction

Hand injuries are considered to be the most frequent body injuries. The hand is a complex and dynamic collection of different tissues, and, consequently, patients with hand trauma present with a wide variety of conditions, with different outcomes and therefore, proper assessment and management of the injuries is essential.

Trauma to the hand from a circular saw is a common occurrence in developing countries. It tends to occur in young people, leading to psychological and socio-economic disability and loss if surgical treatment has no functional outcome [1].

Case presentation

Our patient, a 54 year old right-hand-dominant male patient was admitted for a circular saw trauma of his left hand, which he had sustained 72 hours prior. He reported that immediately after the trauma, he had presented to a local emergency department where amputation of the hand had been proposed as the only possible treatment. He presented to our hospital 3 days later.

His medical history was significant for urothelial carcinoma (pT1 N0 M0), currently under chemotherapeutic treatment with doxorubicin. He denied allergic reactions or anticoagulant medication. Upon presentation, he

had smoked one pack of cigarettes a day for the past 30 years.

On physical examination, the patient was a healthy appearing man: afebrile, a little underweight (BMI = 19 kg/m2), slightly pale teguments and mucosae, blood pressure of 120/75 mm Hg and pulse rate of 78 beats per minute.

Upon inspection of the left hand, the soft tissue defect was considerable with important palmar skin avulsion and complete laceration of neurovascular bundles and profound flexor tendons of digits IV and V (Figure 1). The digits were cyanotic and cool at the level of the proximal interphalangeal joint. There was also an area of discoloration on the palmar surface of the hand.

Figure 1 - Complex injuries of the left hand on admission.

As concerns vascularity, the radial and ulnar pulse were palpable, but there was a delayed capillary refill in all of the digits. Numbness was present on both the ulnar and the radial side of digits II, III, IV and radial side of digit I. And there was no active or passive flexor tendon function of either flexor digitorum superficialis or flexor digitorum profundus.

A hand x-ray was done in which we can observe only an intraarticular fracture of digit V (Figure 2).

Lab results showed the following:

- Albumin: 2.7g/dL;
- Total protein: 5.8g/dL;
- Fibrinogen: 753mg/dL;
- Leukocytes: 9.5x103;
- Haemoglobin: 10.9g/dL;
- VSH: 120mm/h.

Figure 2 - Hand X-Ray showing intraarticular fracture of digit V (arrow)

Any decision regarding surgical treatment was put off for 3 days in order to identify the vascular compensation of the dorsal hand vessels to the palmar side of the digits who had no neurovascular bundle on either side, radial or ulnar, as the presence of discoloration and cyanosis in all the digits was a matter of considerable concern for the viability of local reconstruction.

In the meantime, initial antibiotherapy was started, with:

- Ceftriaxone – 1g x 2 / day – 21 days;
- Gentamicin – 80 mg x 3 / day – 7 days;
- Heparin – 5,000 units subcutaneously every 8 hours – 30 days;
- Pentoxifylline – 100mg x 2 / day – 21 days;

In the first 5 days the patient was treated in the OR with surgical irrigation and wide debridement of the ischaemic tissues, with an obvious improvement.

The ultimate therapeutic goal was a functional hand, with proper vascularity, normal skin sensibility and good active and passive movements of the fingers, being able to flex and

extend the digits. For this ultimate goal, on hospital day 6, under general anaesthesia, particular attention was placed on the vascular, nervous and tendinous injuries, which were repaired according to the possibilities.

Flexor pollicis longus was reconstructed by end-to-end techniques while the profound flexor tendons of the II and III digits were reconstructed by tenoplasty using 5 cm grafts harvested from the superficial flexor tendons of the same digits (Figure 3).

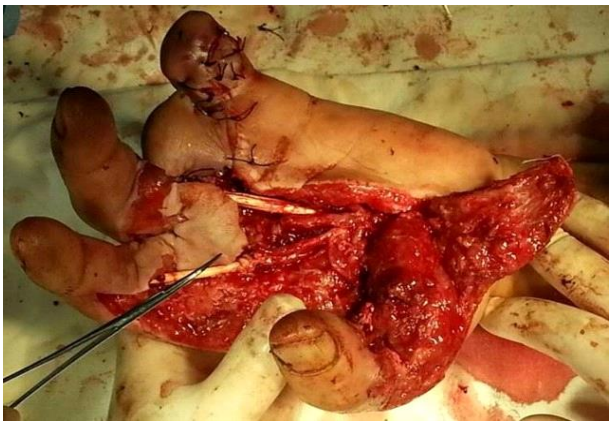

Figure 3 - Reconstruction of the II and III digit flexor tendons

Figure 4 - Nerve graft harvesting from lateral antebrachial cutaneous nerve

The insufficient vascular compensation of the dorsal side to the palmar side of the digits who had no neurovascular bundle on neither side, either radial or ulnar together with the persistence of cyanosis of the IV and V digits led to the amputation of those digits, at the level of proximal interphalangeal joint for digit IV and at the distal interphalangeal joint for digit V.

Nerves on the radial side of the left thumb and on both radial and ulnar sides of the II and III digits (defects of 7 and 3 cm respectively) were reconstructed using 3.5 loupe magnification and 8.0 prolene sutures with grafts harvested from the lateral antebrachial cutaneous nerve (Figure 4).

For the soft tissue defect, an abdominal flap (Figure 5) based superiorly was designed and used to cover the volar area of skin loss and a skin graft plasty for the thenar eminence (Figure 6).

Figure 5 - Abdominal flap based superiorly

Figure 6 - Skin graft for thenar eminence defect

Results

Stitches have been removed on day 14 postoperatively, with an excellent postoperative recovery and no complication at all. During hospitalization, the patient continued his treatment with Pentoxifylline (2 tablets / day), avoiding any physical, mechanical or thermic trauma and has been clinically and physically examined after 2 more weeks.

In the 3rd postoperative week, the flap was divided (Figure 7), excess fat excised and the skin defect closed.

Figure 7 - Flap divided after 3 weeks.

A rehabilitation programme is vital to achieve maximum potential function in the long term. Patients with complex hand injuries should also be prepared for long-term problems [2].

The patient have been discharged on day 33 with the recommendation of adequate physiokinetotherapy (Figure 8).

Figure 8 - Two months after patient discharge

Discussions

The hand is very exposed to injuries in the daily man's work. In a study by Frank M. et al, all lesions in 114 patients with hand trauma involved one hand, mostly the left non-dominant hand. The highest risk was considered to be injuring the thumb and the index [3]. In the same study most one-finger injuries occurred at the middle or distal phalanx. With increasing number of affected fingers, the level of the injury moved closer to the proximal phalanx [3].

The multiple functions of the hand are based on vitality, sensibility, motor function and stability. In severe and complex injuries to the hand, the functional results of the repair are often very poor. In a complex injury of the hand, surgeons are faced with the damage of the soft tissue and bone and the loss of vitality and consequently, loss of function of the hand [4].

The plan for hand traumas treatment depends on priorities. In a long ischemic time we have to change our concept and the vessels are first to be reconstructed, before nerves [4]. Therefore, restoring the blood supply is the most important step after reduction and osteosynthesis and after suturing injured tendons [5]. Nerve reconstruction is best done soon, but if suturing without tension is impossible, secondary nerve

grafting is to be preferred. Skin closure is to be done soon if possible, otherwise we need skin grafts, local or free flaps [5].

Regarding the postoperative recovery in neglected hand injuries, a study by Kotwal P.P. and Grupta V. showed that in 48 patients with neglected flexor tendon injuries associated with nerve injuries, 89 nerves were repaired using end-to-end techniques and the remainder was grafted [6], with good postoperative recovery, especially the sensory component.

Conclusions

This case presentation serves to highlight the importance of selecting proper treatment strategy for this kind of injuries at initial presentation. Three days was a long time for the early recognition of injuries that require urgent referral to a plastic surgeon, and each single functional restoration is critical for a good outcome.

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