

Case Report

Ring Avulsion Injuries: About Three Cases And Review of the Literature

Naoufal El Ghouf, Rhita Salah, Omar Zaddoug, Azzelarab Bennis, Ali Zine^a, Mohamed Benchakroun, Mansour Tanane, Salim Bouabid.

Orthopedic Surgery and Traumatology, Department of Orthopedic Surgery and Traumatology, Military Hospital Mohammed V

*Corresponding Author: Rhita Salah, E-mail: rhita.salah@gmail.com

ARTICLE INFO

Article history

Received: April 05, 2022

Accepted: May 14, 2022

Published: July 31, 2022

Volume: 10 Issue: 3

Conflicts of interest: None.

Funding: None.

Key words:

Amputation,

Finger,

Ray resection,

Ring avulsion,

Revision amputation

ABSTRACT

Ring avulsions are rare and represent a wide variety of soft tissue and bone injuries, ranging from circumferential lacerations with or without vascular involvement to complete amputations. Treatment options are variable and depend on the injury pattern as well as functional and aesthetic requirements. We hereby report three cases of ring avulsions in three young males; all classified Urbaniak III, two treated with a revision amputation and the other with intrapalmar ray resection. In last follow-up of 12 months, the three patients were satisfied with cosmetic as well as functional results.

INTRODUCTION

Hand is the most important functional unit of the upper limb. Its function is to grasp and form precise movements such as writing and eating. According to a NEISS (National Electronic Injury Surveillance System) study in 2009, incidence of upper extremity injuries was estimated to 1130 per 100000 persons per year including finger lacerations (220), wrist fractures (72) and finger fractures (68) (1).

Ring avulsion injuries occur secondary to a forcefully pull on a finger and have consequently severe soft tissue damages ranging from circumferential soft tissue laceration to complete amputation. These rare injuries remain a challenge for hand surgeons, and have significant social and professional impact.

CASE 1

A 34-year-old right-handed male, carpenter, without medical history, presented at the emergency department (1H after his trauma), with avulsion amputation of the left small finger at the level of the distal interphalangeal (DIP) joint after his ring was caught by the wood-turning lathe.

Physical examination found a complete amputation. The flexor digitorum profundus (FDP) was completely removed with proximal skin avulsion (Figure 1).

Hand x-ray showed a disarticulation at the level of the DIP joint (Figure 2).

Our case was defined as class III according to Urbaniak.

The patient was admitted to the operative room (2H after his trauma), and underwent after his consent, under locoregional anesthesia, a revision amputation at the level of the proximal phalanx (Figure 3).

Postoperative period was uneventful and the healing took place three weeks later. A functional rehabilitation protocol was started immediately including self-mobilization of the fingers.

At the last follow-up of 12 months, there were no objective nor subjective complaints, and complete functional recovery of the hand was achieved.

CASE 2

A 45-year-old right-handed male, truck conductor, without medical history, presented at the emergency department (3H after his trauma), with a sub-amputation of his left ring finger at the level of the proximal interphalangeal (PIP) joint after his wedding ring was caught in a metallic hook in the truck.

Physical examination showed a sub-amputation through the PIP joint with only an anterior cutaneous bridge remaining (Figure 4).



Figure 1. Clinical image of the hand showing complete amputation of the fifth finger at the level of the DIP joint



Figure 2. Hand x-ray showing a disarticulation at the level of the DIP joint of the small finger



Figure 3. Clinical image of the hand after revision amputation of the small finger at the level of the proximal phalanx

There was no circulation. Hand x-ray showed a dislocation of the PIP joint (Figure 5).

The case was defined as class III according to Urbaniak. We decided that amputation of the fourth ray was necessary and after a good deal of information given to the patient concerning aesthetic and functional outcome, he consented to our proposition.



Figure 4. Clinical image of the hand showing sub-amputation of the fourth finger through the PIP joint



Figure 5. Hand x-ray showing dislocation of the PIP joint of the fourth finger

The patient was admitted to the operative room (4H after his trauma) for a ray amputation. Under axillary block, we performed a disarticulation of the fourth carpo-metacarpal joint with a radial translation of the fifth ray then its stabilization by reconstructing the inter-metacarpal ligament between the fifth and the third metacarpals (Figure 6).

Immediate post-operative period was regular. An anterior plaster splint was applied for six weeks then removed and rehabilitation of the fingers was started.

At the last follow-up of 12 months, configuration of the hand was almost normal, space between middle and small fingers was reduced, range of motion as well as grip strength appeared to be within normal range.

CASE 3

A 17-year-old male, right-handed, student, without medical history, presented at the emergency department (2H after his trauma) with degloving of his left ring finger after his ring was caught by a metallic object during sports.

Physical examination showed a degloved digit at the level of the proximal phalanx (Figure 7).



Figure 6. Postoperative dorsal (left) and palmar (right) views of the hand after ray amputation



Figure 7. Clinical image of the left hand showing degloving of the fourth finger

Hand X-rays showed amputation of the finger at the level of P2 (Figure 8).

Our case was defined as class III according to Urbaniak.

The patient was admitted to the operative room (3H after his trauma), and underwent after his consent, under locoregional anesthesia, a revision amputation at the level of the proximal phalanx (Figure 9).

Postoperative period was uneventful and the healing took place three weeks later. A functional rehabilitation protocol was started immediately including self-mobilization of the fingers. A silicone finger prosthesis was put for aesthetic purpose.

At the last follow-up of 12 months, there were no objective nor subjective complaints, and complete functional recovery of the hand was achieved.

DISCUSSION

Ring avulsions are common in young males, manual workers, occurring after climbing over a fence, getting caught or less frequently falling down the stairs (2). They usually involve one finger (ring finger most often) (3).

Ring avulsions represent a technical challenge for hand surgeons regarding the severe injuries caused on both macroscopic and microscopic level including skin, tendon, vessels, nerves and bone damages. Main goal is to restore not



Figure 8. Hand x-rays showing amputation of the finger at the level of P2



Figure 9. Clinical image of the hand after revision amputation of the fourth finger at the level of the proximal phalanx

only the hand function but also a good aesthetic appearance. Many classifications have been proposed. Urbaniak et al. (4) divided the lesions into three classes based on the vascular status: Class I for adequate circulation, class II for inadequate circulation and class III for complete amputation or degloving. Nissenbaum (5) added class IIa for isolated arterial injuries. In 1989, Kay et al. (6) suggested an alternative classification including bone injuries which was modified in 1996 by Adani et al. (7) by distinguishing amputations distal to the flexor digitorum superficialis (FDS) insertion from those proximal to the FDS insertion.

Diagnosis is clinical showing a bleeding wound with sometimes visible avulsed vessel, nerve or tendon. X-rays should be taken for the injured finger as well as the amputated part, if present, in order to define bone lesions or eventually, the level of amputation (8).

Management of such injuries starts with stabilization of the patient with adequate analgesia and intravenous antibiotics.

Surgical treatment of ring avulsions has known two different eras. During the pre-microsurgical era, the treatment focused on revising the amputation instead of reimplanting the avulsed digit. Many options have been described includ-

ing coverage with remote pedicle tissue, completion amputations or intrapalmar ray amputations. After the advent of microsurgery, these options expanded to include revascularization and replantation (9).

Based on vascular status, adequate circulation (Urbaniak class I) requires soft tissue repair and bone injuries fixation if present. Inadequate circulation (Class II) requires urgent debridement and possible revascularization. Regarding class III injuries, surgical management is far from being agreed upon. A considerable assessment is required if any attempt is made at replantation (10).

CONCLUSION

Ring finger avulsions are rare but very serious and complex injuries, hence the importance of prevention especially in manual workers. While techniques continue to evolve in microsurgical field, surgical management is far from being agreed upon and patient must participate in the choice of his treatment depending on their occupational and personal requirements.

REFERENCES

1. OOTES, D., LAMBERS, K. T., et RING, D. C. The epidemiology of upper extremity injuries presenting to the emergency department in the United States. *Hand*, 2012, vol. 7, no 1, p. 18-22.
2. STRUCKMANN, V. F., GAUS, S., SCHILLING, T., et al. Digital avulsion injuries: epidemiology and factors influencing finger preservation. *Archives of orthopaedic and trauma surgery*, 2020, vol. 140, no 10, p. 1575-1583.
3. BROOKS, D., BUNTIC, R. F., KIND, G. M., et al. Ring avulsion: injury pattern, treatment, and outcome. *Clinics in plastic surgery*, 2007, vol. 34, no 2, p. 187-195.
4. URBANIAK, J. R., EVANS, J. P., et BRIGHT, D. S. Microvascular management of ring avulsion injuries. *The Journal of hand surgery*, 1981, vol. 6, no 1, p. 25-30.
5. NISSENBAUM, M. Class IIA ring avulsion injuries: an absolute indication for microvascular repair. *The Journal of hand surgery*, 1984, vol. 9, no 6, p. 810-815.
6. KAY, S., WERNITZ, J., et WOLFF, T. W. Ring avulsion injuries: classification and prognosis. *The Journal of hand surgery*, 1989, vol. 14, no 2, p. 204-213.
7. ADANI, R., CASTAGNETTI, C., BUSA, R., et al. Ring avulsion injuries: microsurgical management. *Journal of reconstructive microsurgery*, 1996, vol. 12, no 03, p. 189-194.
8. CROSBY, N., HOOD, J., BAKER, G., et al. Ring injuries of the finger: long-term follow-up. *Hand*, 2014, vol. 9, no 3, p. 274-281.
9. HAMOUYA, A., BARBATO, B., BEAUTHIER-LAN-DAUER, V., et al. Complete ring finger avulsion: Review of 16 years of cases at a Hand Emergency Unit. *Hand Surgery and Rehabilitation*, 2018, vol. 37, no 4, p. 206-211.
10. FEJJAL, N., BELMIR, R., EL MAZOUZ, S., et al. Finger avulsion injuries: A report of four cases. *Indian journal of orthopaedics*, 2008, vol. 42, no 2, p. 208.