



CASE STUDY

Thermal Burn Injury from a Wedding Ring: An Unusual Case



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Abstract Thermal ring injuries are rarely reported in the literature. For this reason, treatment is varied without a standard approach. We describe a case of a thermal wedding ring injury sustained during a welding accident. It is critical to understand the 3 zones of burn injuries when managing these infrequent cases. Furthermore, the dynamic progression that ensues a thermal burn will directly affect outcome. A case is presented along with a graduated approach to the management of such injuries. © 2018 Elsevier Inc. All rights reserved.

Introduction

Overall, injuries to the digits from alloy rings are particularly rare. An overwhelming majority reported in the literature are from avulsion type of injuries. Urbaniak et al.¹ described the classification and management of ring avulsion injuries in 1981. The treatment of avulsion injuries ranges from conservative treatment to amputation. To date, there have been few cases reported in the literature of a thermal injury caused by a ring. Given the paucity of literature on thermal ring injuries, presented is an approach to this atypical electrothermal burn injury.

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Case description

A 59 year old non-smoking, Caucasian male with no significant past medical history presented to our clinic after sustaining a thermal burn to the left ring finger while welding copper pipes together. The arc from the welding device electrode came into contact with the wedding band, transmitting heat directly to the ring finger. The main complaint was throbbing pain without numbness or tingling. On examination, the finger appeared viable with adequate distal capillary refill. Distal sensation was also fully intact. Range of motion was slightly diminished in flexion and extension secondary to pain. The wound measured 4 mm in width and coursed circumferentially following the distribution of the wedding ring (Fig. 1). The injury was located just proximal to the proximal interphalangeal joint. The wound was deep to the dermis into



Fig. 1 Post-injury dorsal view of the left hand demonstrating circumferential third degree burn of the ring finger.



Fig. 2 Volar view of the left ring finger, 3 weeks post injury.

the soft tissues consistent with a full-thickness burn. There was no obvious tendon, artery, or nerve involvement present. The burn was irrigated copiously and debrided. Topical Silvadene was applied and the finger was covered with a non-adherent dressing. The patient was informed that the injury would be conservatively managed and observed over the next several weeks. At week 3, the finger maintained viability with no evidence of vascular deficit or contracture. The wound, however, had remained 4 mm in width and demonstrated minimal granulation tissue in the wound bed (Fig. 2). No signs of infection were noted.

Given that the wound was still open and there were no signs of compromise to the digit, the patient was taken to the operating room. The wound edges were debrided sharply and the bed was prepared with a curette. The skin edges were raised to create circumferential skin flaps. The flaps were advanced until adequate tissue re-approximation could be performed. The skin was then sutured together with 3-0 simple interrupted nylon sutures. After discharge, the patient returned to the office for postoperative serial examinations and appropriate healing was noted. Sutures were removed at postoperative week three. Hand therapy was initiated four weeks postoperatively. The patient tolerated hand therapy well. One year postoperatively, the wound healed satisfactorily without evidence of contracture, limited range of motion, or sensory compromise (Fig. 3a-b).

Discussion

With the lack of cases reported in regards to thermal injury from a wedding band, the approach presented here was anecdotal. The sequence to this case was conservative treatment followed by delayed closure once the digit proved to be viable over the course of several weeks. It is important to take into account the mechanism and histology of burn injuries when treating an injury of this caliber.

Traditionally, there are 3 zones of burn injury.² The zone of coagulation is the area of a burn that is nonviable, necrotic tissue, which should be excised and possibly grafted. The zones of stasis and edema are the zones that are most critical. They are dynamic and can change from viable to compromised and eventually necrotic. It is imperative to allow the injury zones to declare themselves prior to surgical intervention unless other circumstances prove urgent, such as compartment syndrome and infection. This declaration period was accomplished by several weeks of conservative burn wound care. If surgical intervention is performed early in the course and the digit becomes nonviable, it would be impossible to ascertain whether the initial injury was still evolving or if there was iatrogenic compromise during surgery. In the case presented here, consideration was given to allow the wound to heal by secondary intention. Since the wound was not healing as hastily as anticipated, a decision was made to intervene surgically by closing the wound in a delayed primary fashion, as



Fig. 3 Top: Dorsal view of a well healed left ring finger one year postoperatively. Bottom: Volar view of the left ring finger.

opposed to skin grafting. Skin grafting would render a second site of injury, associated with greater morbidity. Given that the wound was evenly circumferential, there would be no undue imbalance in tension resulting in either flexion or extension contraction. However, if the wound had been hemi-circumferential, a full thickness skin graft may have been chosen in effort to prevent contracture.

There have been scant cases of wedding band thermal injury described in the literature. The majority of the reported cases treat electrothermal burn injuries in a conservative manner.³⁻⁶ However, Sibley et al⁷ reported a case of partial-thickness circumferential electrothermal ring burn from a car battery treated with full-thickness skin grafting. The variability in treatment modalities described in the literature highlights the fact that management for this rare type of injury is anecdotal and not based upon a standard algorithmic approach. Potential treatments include healing by secondary intention with serial debridement, primary closure, skin grafting, allogeneic grafting, and amputation. Each of these approaches assume their own risks and benefits without a proven superior method.

It should be noted that proper education and prevention are of utmost importance. Workers with electric circuits should be cautioned in regards to the potential risks of injury. All jewelry including watches and rings should be removed prior to commencement.⁸ The rare nature of this injury yields a lack of a standard algorithm for management. For this reason, it is important to manage these injuries on a case-by-case basis and ensure the patient is aware of the potential complications that arise with each treatment modality. Thermal ring injuries may be safely managed by a trial of conservative treatment followed by possible delayed closure.

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