Scar Management of the Burned Hand

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KEYWORDS

• Hand • Burn • Hypertrophic scar • Laser

KEY POINTS

- Early management of acute hand burns with debridement, grafting, and mobilization is critical to minimize development of hypertrophic scarring.
- Once hypertrophic scars have formed, surgical scar release can be achieved with a variety of procedures from local tissue rearrangement to free flaps to restore hand function.
- Many modalities including laser therapy have become the standard of care in the rehabilitation of hypertrophic scars and can ameliorate scar texture, thickness, color, and pruritus.

INTRODUCTION

According to the Burn Association Repository, approximately 500,000 burn victims seek medical treatment every year, with 39% of these injuries involving the upper extremity and hand as observed in previous studies.[1–3] Although the hand comprises only 3% to 5% of the body surface area, it is highly susceptible to injury, through its close proximity to the thermal source and because it is commonly used as a shield to protect other parts of the body.[4] The hand is therefore prone to absorb a high amount of energy, which may result in severe injury. Injury patterns can vary among different burn etiologies and can have significant impact on the expected severity and management. Although injuries from flame or fire are the predominant etiology during recreational and work-related activities in adults, scald burns and contact burns account for most pediatric hand burn injuries.[5] Electrical injuries also pose a challenge in hand reconstruction, as these patients can require fasciotomies, which heal with hypertrophic scars.[6]

Acute management of hand burns should be performed at specialized burn centers that are equipped to provide a multidisciplinary team approach.

Aggressive early treatment of hand burns is critical and involves a combination of debridement, autografting, edema prophylaxis, early mobilization, splinting, and optimal hand rehabilitation.[7,8] A thorough initial assessment of the type of burn mechanism and burn depth should be accomplished to guide the need for surgical therapy. One should also be mindful that the acute burn

B. Levi Supported by funding from NIH/National Institute of General Medical Sciences Grant K08GM109105-0, Plastic Surgery Foundation, the Association for Academic Surgery Roslyn Award, American Association for the Surgery of Trauma Research & Education Foundation Scholarship, American Association of Plastic Surgery Academic Scholarship, American College of Surgeons Clowes Award, AAPS/PSF Pilot Award, International FOP Association.

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Hand Clin ■ (2017) ■–■

http://dx.doi.org/10.1016/j.hcl.2016.12.009

wound is a dynamic environment and may be influenced by factors including edema, local and systemic inflammation, and bacterial contamination, which can contribute to conversion of the burn depth.[9] Although epidermal burns will likely go on to heal without scar formation, a delay in re-epithelialization of partial-thickness burns beyond 2 to 3 weeks will result in hypertrophic scarring. Deep partial thickness and full-thickness burns are therefore best treated with early excision to viable depth and skin grafting to preserve hand function.[10] In general, the palmar skin of the hand should be allowed more time to heal by secondary intention, as the properties of the glabrous skin are difficult to replace with a skin graft. Early grafting of the palm will place thin skin in an area that requires durability and can lead to severe contractures (**Fig. 1**). Although thin spilt-thickness grafts are sufficient to resurface other parts of the body, the hand is best treated with thick unmeshed autografts (0.012–0.018 inch thickness) or full-thickness grafts to prevent secondary contracture and to optimize the final appearance. In general, we use thick split-thickness grafts in the acute period and full-thickness grafts with subsequent contracture releases. Surgical management should be followed by hand splinting in anticontracture positioning, commonly intrinsic plus, and elevation followed by early range of motion when the skin graft has appropriately healed.[11]

Despite aggressive medical and surgical management in the acute phase of the burn injury, hypertrophic scar formation and contractures are complications resulting in substantial functional and aesthetic impairment. This impairment has the potential to not only limit quality of life but also impact the ability to perform a profession in which unimpaired hand function is required.[12,13] Therefore, adequate management of hand burn hypertrophic scars and contractures is paramount in the rehabilitation of the burned hand. This management will often present the surgeon with a challenging task.

This article reviews common approaches to the prevention and management of hypertrophic scars and contractures of the burned hand.

DEVELOPMENT OF HYPERTROPHIC SCARRING IN THE BURN WOUND

Several risk factors for hypertrophic scar formation have been identified and include young age, infection, skin stretch, and anatomic location (ie, axilla, neck).[14] Although superficial burn wounds tend to heal without complications, deeper partial and full-thickness burns have a significantly increased risk of resulting in hypertrophic scar formation.[1] In epidermal burns, the dermis remains entirely intact and re-epithelialization occurs from preserved keratinocytes within the superficial dermis. Similarly, superficial partial-thickness burns involve the epidermis and superficial dermis leading to blistering with complete regeneration occurring though migration of keratinocytes from preserved hair follicles and sweat glands. These superficial injuries may require careful monitoring alone. In contrast, in deep partial-thickness burns, the density of skin adnexa is significantly decreased, leading to prolonged time to re-epithelialization and

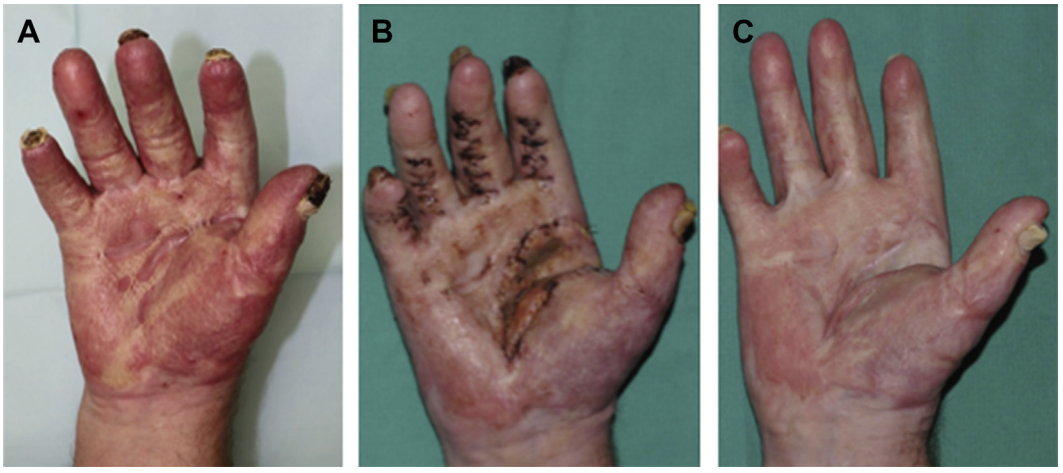

Fig. 1. A 58-year-old man with history of deep partial-thickness burns to the right hand from a natural gas explosion. (*A*) Initial presentation with scar band contractures involving the volar surfaces of the index, middle, ring, and small fingers and wide scar contracture over the ulnar border of thenar eminence. (*B*) Two weeks after z-plasty releases of digital contractures and full-thickness skin grafting from abdomen to palmar contracture. (*C*) Four months after surgery.