Rehabilitation of the Burned Hand

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KEYWORDS

• Burn hand deformities • Burn scar contracture
• Burn rehabilitation • Splinting the burned hand
• Range of motion • Hand therapy • Hand function

Hands are the most frequent sites of burn injury,[1] and proper management is essential to assure that optimal functional recovery is achieved. Although each hand represents less than 3% of the total body surface area, burns to the hand are considered serious injuries and should be referred to a burn center.[2] The thin, highly mobile dorsal skin, the sensory-enriched palmar skin, and the delicately balanced musculotendinous systems are all at risk with a hand burn. Successful management of the burned hand does not result simply from closing the wound. The hand is ranked as one of the three most frequent sites of burn scar contracture deformity.[3–5] The resulting loss of function from burns that include or are specific to the hands can have a devastating effect on the numerous life roles of the patient at any age.

When possible, burned hands are best treated by the entire burn center team, including physical and occupational therapists, with knowledge of burn wound healing and the potential problems that can be anticipated. This article outlines the principles of burn rehabilitation generally accepted in current burn center practice and is based more on the experience of the authors than on controlled comparative studies.

PROBLEMS TO ANTICIPATE

A thorough understanding of the effect of thermal injury on the structures of the hand can minimize or even avoid many burn-related problems. Some of the more commonly encountered complications after thermal hand injury include postburn edema, scar contracture, joint deformities, sensory impairment, loss of skin stability, and restricted functional use of the hand. A brief overview is given in this article. Other complications of thermal injury to the upper extremity that ultimately affect hand function are also considered.

Postburn Edema

An increase in vascular permeability coupled with a shift of fluids to the extravascular space should be anticipated following thermal injury. In superficial partial-thickness burns, minimal fluid is leaked into the extravascular space, and edema is minor and transient. In deep partial-thickness and full-thickness burns, edema is more severe (**Fig. 1**) and prolonged.[6] As edema increases during the first 72 hours postburn, so may the pressure within the compartments of the hand. Consequently, excessive intracompartmental hand and forearm pressures will impair arteriovenous and lymphatic function.[7]

Hand Deformities

There are several common burn hand deformities that can result from injury itself or the sequelae of injury.

Claw hand deformity

Claw hand can occur in the early postinjury period as a result of edema, tendon injury, or scar contracture. An immediate consequence of

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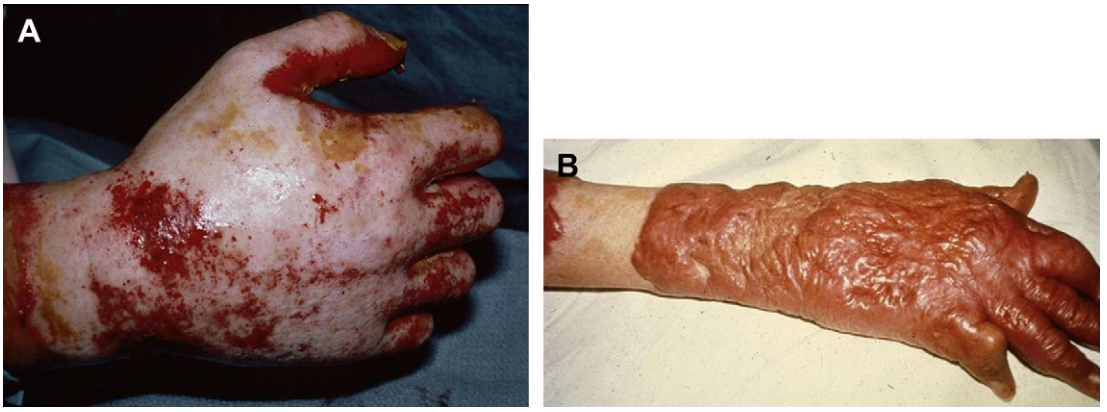

Fig. 1. Two complications of deep burn injury that can be minimized with intensive rehabilitation therapy include edema and scar. (*A*) Significant unresolved edema may result in limited mobility and chronic joint deformity. (*B*) Long-term hypertrophic scar that has not been molded and elongated to maximum length during its development is devastating, with permanent shortening of structures and joint deformity.

postburn edema can be hyperextension of the metacarpophalangeal (MP) joints and flexion of the interphalangeal (IP) joints, which is commonly referred to as a claw hand deformity (**Fig. 2**A). The severity of these deformities seems to be edema-dependent. Hyperextension of the MP joints occurs as the dorsal skin is drawn taut by the fluid shift into the extravascular tissues and as the palmar arches flatten. Flexion of the proximal interphalangeal (PIP) joints follows as a result of this edema-imposed tension on the common digital extensor tendon system and concurrent hyperextension of the MP joints.[8,9] The predisposition for MP joint hyperextension deformity to occur is intensified when the dorsal surface of the hand is also burned. Hyperextension

Fig. 2. Joint deformities can occur with tendon disruption, either from the original injury or from stretch or compression of damaged tendons. (*A*) Clawed hands with multiple deformities, including MP hyperextension, IP flexion, and thumb radial adduction. (*B*) Note boutonnière deformity of middle digit. (*C*) Palmar cupping deformity is frequently associated with hyperextension of the MP joint of the thumb, with loss of the grasping surface of the hand.