

HAND BURNS

KEY FIGURES:

Neglected hand
Escharotomy

Severe hand burns are especially problematic injuries because of their propensity for causing long-term disability. Proper treatment of the burned hand may mean that the patient can return to work and a normal lifestyle.

Unfortunately, if a large portion of the body is burned, the importance of the hands in terms of overall functional outcome is often overlooked. But if not properly treated, burns of the hand can result in severe dysfunction and significant morbidity. Simple interventions can make a huge difference in final outcome.

This chapter discusses specific interventions for treatment of a hand burn. A thorough discussion of the treatment of the “whole patient” with a burn injury is found in chapter 20, “Burns.”

Initial Treatment

- Cleanse the burned hand with a gentle soap and cool water. Saline-moistened gauze also may be used for cleansing. Remove any clothing or other material attached to the burned tissues.
- Grease embedded in burned tissues often can be removed by gently wiping with a petrolatum ointment. If tar is stuck onto the skin, leave it alone; it will separate as the tissues heal. If you pull the tar off, you probably will remove healthy skin, making the injury worse than it needed to be.
- Make sure that the patient’s tetanus immunizations are up to date.
- Pain medication is important; intravenous administration of morphine is the most useful approach.

- Apply an antibiotic ointment, such as silver sulfadiazine, to the burned areas, and cover lightly with gauze.
- Gentle cleansing with saline and application of antibiotic ointment optimally should be done twice each day, but daily is acceptable.
- The hand should be kept elevated (on a pillow or folded sheet) to minimize swelling.
- Oral or intravenous antibiotics should be used *only* if signs of infection are present.



Severely burned hand of a child who did not receive proper care. The hand is essentially nonfunctional and will not grow properly. *A*, Dorsal surface. *B*, Volar surface.

Blisters

A blister is a collection of fluid beneath a layer of burned skin. It represents a partial-thickness injury (see discussion of depth of burn on the following page). In general, a blister serves as a useful biologic dressing because it allows the deeper tissues to remain in a sterile environment. Blisters promote healing and decrease pain.

Leaving the blister alone is often the best initial treatment. However, some blisters become very tight, to the point that blood flow to the hand is diminished. Ischemia can lead to further, unnecessary tissue loss. Tight blisters also interfere with hand and finger motion. Therefore, when a blister feels very tight, it should be opened and the outer skin layer should be removed. The top skin layer also should be removed from blisters that have burst or look as if they are about to burst.

How to Debride a Blister

Debridement of blisters is not a painful procedure if done properly:

1. Clean the area with Betadine or some other cleansing solution.
2. Use a knife or scissors to make an opening in the outer layer of the blister.
3. Remove the outer layer of the blister by cutting it off a few millimeters from the point where it attaches to the surrounding nonblistered skin.
4. The fluid in the blister has a high protein content and may be almost gelatinous. Completely remove the fluid and gel-like material, and gently wipe the area with saline-moistened gauze.
5. Apply antibiotic ointment to the area, and cover with gauze.

Prevention of a Stiff and Useless Hand

A severe burn to the hand poses significant risk for long-term morbidity. The injured hand tends to assume a flexed posture, which can lead to stiffness of the interphalangeal (IP) and metacarpophalangeal (MCP) joint ligaments. Without aggressive treatment during the time required for the burn to heal, the hand may become permanently stiff with limited function.

- **Occupational therapy** is a vital component in the treatment of severe hand burns. If a therapist is available, make the referral.
- **Encourage the patient to move his or her hands and fingers often**, especially at dressing changes. The nurse or family can move the fingers and hand for the patient if the patient is unable to do so. Active and passive range-of-motion exercises should be done.

- **Pain control** is important because movement hurts.
- **Place the hand in a splint** to prevent it from assuming the flexed position that ultimately may limit function. The splint should keep the wrist in 20° of extension, the MCP joints in 70° of flexion, and the IP joints as straight as possible. The padding for the splint should be changed if it becomes soiled. At a minimum, the patient should wear the splint at night; critically injured patients should wear the splint at all times until the burns have healed.
- **Careful tangential excision of the burn and split-thickness skin grafting** should be done relatively early (within days of the injury if possible) for full-thickness burns. This will prevent the development of tight scars, which can lead to severe movement limitations. Only health care providers with surgical expertise should undertake these procedures. See the discussion of surgical treatments for more information.

Determining Depth of Burn

As explained in chapter 20, “Burns,” it is often difficult to determine the severity of the burn at the first examination. Reevaluate the burn once it has been cleansed and regularly thereafter. Burns are described as first degree (superficial), second degree (partial thickness), and third degree (full thickness).

Table 1. Burn Wound Classification

Burn Depth	Appearance	Pain	Sensation
Superficial (first-degree)	Erythema	+	Yes
Partial thickness* (second degree)	Blisters, hairs (if present) stay attached	+++	Yes
Full thickness (third degree)	Thick, leathery feel Pale color Hairs (if present) do not stay attached Thomboxed veins may be seen	0	No

* Partial-thickness burns can be superficial or deep. A superficial partial-thickness burn may have a thin blister, and the skin will be soft and pink. A deep partial-thickness burn appears white and feels softer than a full-thickness burn; some hair follicles are still attached. A deep partial-thickness burn often behaves like a full-thickness burn.

The skin of the hand has a wide range of thickness. The skin over the dorsum of the hand is much thinner than the skin over the palmar surface. A more severe burn injury is required to cause a full-thickness burn to the palmar vs. the dorsal surface. Because the extensor tendons are so close to the surface, full-thickness burns to the dorsal surface of the hand can be especially problematic.

Estimating the depth of the burn is important to approximate time to healing. First- and superficial second-degree burns should heal within 2 weeks, whereas deep second- and third-degree burns can take 3–4 weeks or longer to heal.

If the burns do not show significant evidence of healing after 7–10 days or if a full-thickness burn occurs in an area where tight scarring is likely, consideration should be given to early surgical intervention (see Tangential Excision).

Surgical Treatments

Escharotomy

Severe, circumferential full-thickness burns of the hand and fingers require extra precautions. The burned skin becomes leathery and loses all elasticity. As the underlying tissues swell (from a combination of the burn injury and from the fluid that the patient receives), the burned skin cannot “give,” and pressure builds up in the tissues. Pressure build-up can lead to decreased circulation, which can result in further loss of tissue.

In all patients with severe burns, check for palpable pulses at the wrist. If they are not present, blood circulation to the tissues probably is inadequate because of the tightness of the burned tissues. An escharotomy must be done emergently to prevent further tissue loss.

Escharotomy is the placing of incisions into the burned tissues to release the tightness. Do not extend the incisions into the deeper tissues; *cut through the burned tissue only*. Incisions must be placed with care to prevent injury to the important underlying nerves, tendons, and vessels.

Escharotomy can be done at the bedside. **Caution:** Escharotomy can be a bloody procedure. Be sure that blood is available, along with gauze, clamps, and an electrocautery device.

Although the eschar itself has no sensation, the procedure can be quite painful. Intravenous morphine or intravenous sedation/general anesthesia is required.

To Treat the Fingers

An incision is made along the side of the finger. Usually only one incision is needed on each finger. Try to avoid placing the incisions on the radial borders of the fingers. Placing the incisions along the ulnar surfaces of the fingers will prevent future problems with scar sensitivity when the patient attempts to grasp objects.

To Treat the Hand

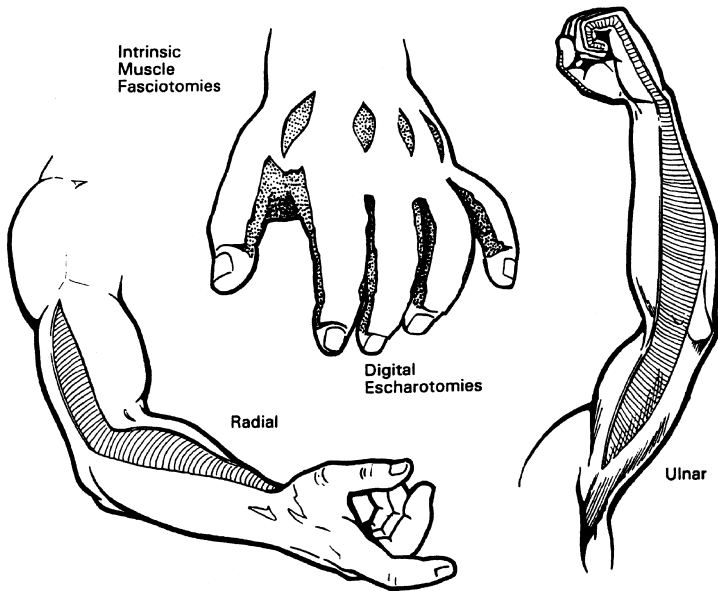
Four dorsal, longitudinal incisions should be made between the metacarpal bones. Place a clamp into the deeper tissues, and spread open the jaws of the clamp to relieve the pressure over the underlying interosseous muscles.

To Treat the Forearm

The incision starts at the radial side of the wrist and proceeds proximally along the radial side of the forearm. The incision should be extended onto the upper arm (staying along the radial border of the arm) until the tight burn has been released completely.

If the above incision does not completely relieve the pressure in the arm, an incision along the ulnar aspect of the arm and forearm should be made. Take care around the elbow. Keep the incision anterior to the medial epicondyle at the elbow to prevent accidental injury to the ulnar nerve.

Incisions should be left open; do not try to close them. The purpose of escharotomy is to relieve pressure and prevent further tissue loss. Perform the same type of dressing changes in these open areas as you



Escharotomy incisions should be placed to minimize risk for injury to nearby nerves, tendons, and vessels. (From Achauer *BM: Burn Reconstruction*. New York, Thieme Medical Publishers, 1991, with permission.)

perform to the burned skin. Alternatively, you may apply saline-moistened gauze to the incisions.

Be sure to keep the hand elevated and in a splint to minimize swelling. Split-thickness skin grafts will be required for final wound healing.

Tangential Excision

Tangential excision is a method to remove burned tissue. See chapter 20, "Burns," for specific details. Care must be taken to avoid removing uninjured tissue. To perform this procedure you must have technical expertise to avoid injury to underlying tendons, nerves, and blood vessels.

The excision should be done with a tourniquet on the extremity. The tourniquet allows you to excise more accurately only the burned tissue. It is important to leave the thin layer of tissue surrounding the tendons (peritenon) intact, if it is not burned. This tissue is vital for successful skin grafting. If the peritenon is burned, skin grafting is not possible. A distant flap is required for wound closure.

When the tourniquet is released, the area will bleed uniformly, letting you know that all burned tissue has been removed.

The wound is then ready for split-thickness skin grafting. See chapter 12, "Skin Grafts," for details.

Postoperative Care after Tangential Excision and Skin Grafting

Keep the hand elevated (on a pillow or folded sheet) to minimize swelling.

Keep the hand in a splint, as previously described.

The splint should be worn at all times for the first 2 weeks. As the grafts heal, the patient can wear the splint only at night. Critically injured patients should wear the splint at all times.

Once the grafts have begun to "stick" (5–6 days), start gentle active and passive range-of-motion exercises of the hand and fingers.

After a few weeks, as the grafts heal and the patient begins to use the hand more, the splint can be worn only at night. The splint should be used at night for at least 1–2 months.

Care after Burns or Skin Grafts have Healed

Once the tissues have healed, it is important to start treatment to prevent the scars from becoming thick and tight:

Scar massage is a useful modality that requires no special equipment.

Gently rub the fingers and hand with a mild moisturizing cream 2–3 times/day to soften scars, diminish itching, and improve functional outcome.

The best way to prevent hypertrophic scarring is to fit the patient with a pressure garment (if available). The pressure garment should be worn for as many hours of the day as the patient tolerates for several months.

For further discussion of these and other useful treatments, see chapter 15, “Scar Formation.”

Bibliography

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