

# INITIAL TREATMENT OF BURNS OF THE HAND

GEORGE S. PHALEN, M.D., and JAMES A. DICKSON, M.D.

Department of Orthopedics

In treatment of burns of the hand, as in treatment of any injury to the hand, the physician must preserve all tissue possible and institute a type of treatment which will permit prompt healing of the wound and early restoration of function. The doctor who first sees and treats a burned hand is given an opportunity never again afforded either to him or to any doctor who may subsequently treat the case. If the burned hand is seen within six or seven hours after injury it is still possible to convert the burned area into a clean wound and prevent sepsis, which will certainly intervene if the wound is left exposed. It is this sepsis which frequently does much more damage to the tendons and small joints of the fingers than the burn itself.

Since the original treatment of a severely burned hand is so important, every physician should know how to apply a satisfactory dressing. If the initial treatment has been adequate, the surgeon to whom the patient is referred for subsequent treatment is not confronted with the problem of a hand stiffened by sepsis which has been permitted to develop because of an unsatisfactory initial dressing.

First and second degree burns of the hand do not present a serious problem because the epithelial covering of the hand has not been entirely destroyed. Almost any type of treatment will result in adequate healing provided, of course, infection is kept at a minimum. In an extensive burn of the hand, however, it frequently is impossible to ascertain at once whether the burn is confined to the skin or whether it has extended to the subcutaneous structures. It is with such cases that we are chiefly concerned in this discussion.

Of primary importance is the general care of the patient. The administration of parenteral fluids, blood, and plasma may be necessary to combat shock. It must also be remembered that the hand is a very sensitive part of the body, and patients will require considerable sedation for relief of pain. It is folly to attempt any local treatment of the burn without adequate sedation, and, whenever possible, general anesthesia should be employed. An intravenous anesthetic of sodium pentothal is especially effective, although any type of general anesthetic may be used.

The hand is thoroughly but gently cleansed with soap and water, using gauze sponges or a brush on the unburned areas and cotton pledgets on the burned areas. Blebs need not be broken. Care must be taken not to remove or damage any skin which may possibly retain any

degree of viability. No attempt should be made at this time to determine the depth of the burn. Even though it may seem apparent that amputation of one or more fingers is inevitable, such amputation should be delayed at this time. Needless to say, all rules of surgical aseptic technic should be strictly followed.

After spending at least fifteen or twenty minutes in thorough cleansing of the injured hand, wrist, and forearm, the surgeon changes his gown and gloves, drapes the extremity with sterile sheets, and then applies a large pressure dressing. The area is first covered with a layer of greased gauze. Simple vaseline gauze may be used, or gauze impregnated with boric acid ointment, penicillin ointment, or any other type of bland antiseptic ointment. It is imperative that the greased gauze be smoothly applied. Four or five layers of plain gauze dressings are then applied. This is followed by a large amount of mechanic's waste, extending from finger tips to the elbow (fig. 1b). This waste

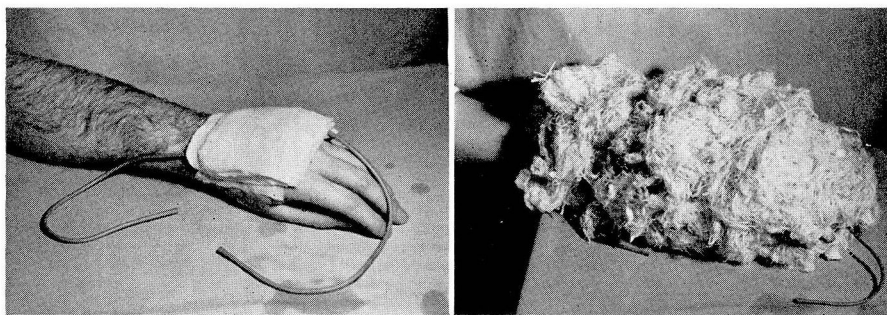


FIG. 1. (a) The granulating burned area on the dorsum of the hand has been covered with strips of fine mesh gauze moistened with sterile saline. Two rubber catheters have been incorporated in the moistened gauze dressings which have been placed over the bandage gauze strips. (b) Fluffed up mechanic's waste has been placed over the gauze dressing completely covering the hand and forearm.

must be fluffed up by hand before it is applied because it has a tendency to mat down when sterilized. A few abdominal cotton pads are then placed over the mechanic's waste and the entire dressing snugly compressed with an elastic bandage. If elastic bandages are not available, a continuous strip of stockinet which has been cut on the bias will serve just as well. A simple gauze bandage may be used but is not as effective in maintaining a constant even pressure. A plaster slab is incorporated in the outermost turns of the elastic bandage (fig. 2a). This splint is placed on the volar aspect of hand and forearm to keep the wrist in extension and provide more stability to the dressing. If it is desired to save the elastic bandages, they may be covered with a layer

of roller bandage gauze prior to application of the plaster slab, and the plaster slab may in turn be held in place by the roller bandage. This will prevent the plaster from adhering to the elastic bandages.

In applying the pressure dressing, care must be taken to place the hand in a position of function, that is, all joints of the fingers partially flexed and the thumb rotated into a position of opposition. It is especially important to see that the metacarpophalangeal joints are all flexed about 40 degrees, since these joints are prone to become stiff in extension. All too frequently one encounters a badly burned hand which has been treated for several weeks on a board splint; all joints of the fingers have become stiff in extension, and the thumb is fixed by the side of the hand in the plane of the palm. Such a hand will require many weeks of occupational and physical therapy to displace the thumb from the plane of the palm and to obtain sufficient flexion of fingers for any useful function.

After the pressure dressing has been applied it is often advisable to suspend the arm to prevent undue swelling. Elevation of the hand on a pillow may frequently suffice, but by suspending the arm one is assured that it will remain elevated day and night. A pad is placed over the humeral condyles, and, with the elbow flexed a few degrees beyond a right angle, a long strip of 3-inch adhesive tape is fastened along one side of the pressure bandage on the forearm, then around the elbow and up the opposite side of the forearm. The two ends of the tape are fixed to a block of wood to which a rope is attached; this rope may be passed through a pulley and sufficient weight applied to keep the arm suspended, or the rope may simply be tied to an overhead bar on the bed (fig. 2b).

If the pressure dressing, including plaster reinforcement, extends above the elbow, one will encounter no difficulty in applying suspension straps. When the dressing includes only the hand and forearm, however, it may be necessary to secure the adhesive suspension strap with two additional strips of adhesive along the medial and lateral aspects of the upper arm. If suspension straps are not passed beneath the flexed elbow there is a tendency to pull off the pressure dressing when the arm is suspended.

When the first dry pressure dressing is removed after seven to ten days, it is advisable to change the dressing in the operating room so that any necessary debridement and skin grafting may be done while the wound is still relatively clean. It is imperative that all denuded surfaces be covered promptly with skin. Bones and tendons which are left exposed to the air will certainly undergo ischemic necrosis, and it

is frequently possible to prevent many months of disability by prompt covering of exposed surfaces with skin.

If sufficient time has elapsed to assume that thorough cleansing of the burned hand will not produce a relatively aseptic wound, a moist pressure dressing must be applied. This type of dressing is completed exactly as described above but with the following modifications: strips of fine-meshed bandage gauze are moistened with sterile saline or boric solution and applied smoothly over the wound; three or four layers of regular gauze dressing, also moistened with saline or boric solution, are then applied. Over these are laid one or more soft rubber catheters with multiple holes cut along the distal two or three inches of the catheters. Another three or four layers of wet gauze dressings are then applied over the catheters (fig. 1a), and the dressing is finally completed with

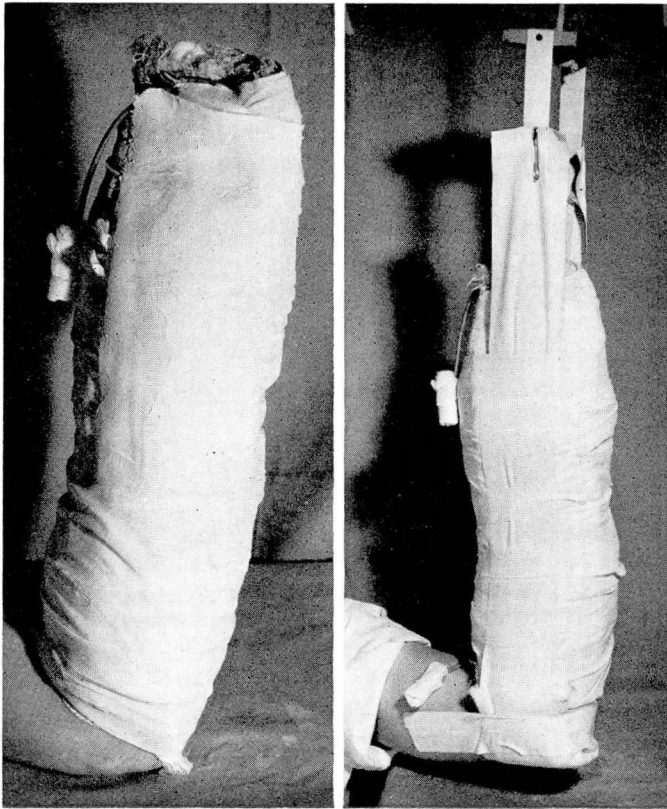


FIG. 2. (a) The moist pressure dressing has been completed with abdominal cotton pads and Ace bandages, and a plaster slab has been incorporated with roller bandage to keep the wrist in extension. (b) Strips of adhesive have been applied to suspend the arm.



mechanic's waste and cotton pads as described above. The open ends of the catheters are left outside the dressings and are sealed with a sterile glass plug or covered with a sterile dressing (fig. 2a). Into these catheters may be instilled sufficient sterile saline or sterile boric solution to keep the inner gauze dressing moist. The exact amount of solution to be instilled can be learned only by experience, but it is always better to keep the dressings too moist than too dry.

A moist pressure dressing of this type is of great value in cleansing septic granulating wounds prior to skin grafting, and the same type of dressing is re-applied when a free skin graft has been placed on the granulating surface. Pyocyaneus infection is frequently encountered in these chronic granulating wounds, and presence of this organism will almost surely prevent adequate "take" of a split-thickness skin graft. If such an infection is present it is well to keep the pressure dressing moist with  $\frac{1}{2}$  per cent acetic acid solution for a day or two both before and after the skin graft has been applied. These moist pressure dressings are usually changed every day or two. They may be left in place for five or six days if desired, although this is seldom indicated except with a split-thickness graft.

Development of excessive scar tissue in the hand and contracture of small joints in the fingers are kept at a minimum, and rehabilitation of the burned hand is greatly facilitated by employing the principles of treatment outlined above. There is nothing new or original about this type of pressure dressing, but it is hoped that further emphasis on this method will facilitate its adoption by all physicians who are called upon to treat a severely burned hand.