



## **MUTILATING HAND**

### **INJURIES**

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The mutilated hand represents a significant challenge for both the patient and hand surgeon. These devastating injuries are usually the result of industrial, agricultural, or power tool accidents. Regardless of the mechanism, these injuries have a number of common characteristics that need to be addressed to salvage function. Obviously the first treatment for these injuries involves a full patient survey, resuscitation, and careful documentation of the injury. After assessment, initial wound care includes tetanus prophylaxis, antibiotics, and clean dressings. Gentle realignment and careful splinting of the damaged hand can improve marginal blood flow. Good quality x-rays will help define the extent of bone involvement.

In general, mutilating hand injuries can be classified into four types: dorsal combined, volar combined, dorsal and volar combined, and

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amputations. By its very nature, a “combined” hand injury indicates that both hard tissue (i.e. bone or joint), and soft tissue (i.e. skin, tendon, nerve, artery, muscle) have been simultaneously injured.

Dorsal combined hand injuries can be quite dramatic in appearance. Large open wounds on the dorsum of the hand, sometimes with loss of skin and tendon, are the rule (figure 1). Segmental bone loss is not uncommon. In dorsal combined injuries, important neurovascular structures are usually spared. Volar combined injuries are associated with various neurovascular deficits as well as tendon and bone injury. Dorsal and volar combined injuries are the most complex and can include devascularization of the hand, degloving, and crush injuries with soft tissue loss (figure 2). Amputations can be at any level and have a “zone of injury” of various lengths. The length of the zone of injury determines whether reattachment is practical.



Figure 1.

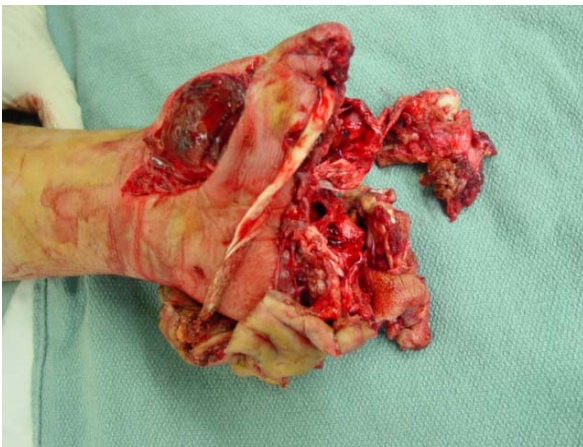


Figure 2.

Care for the amputated part is important. It is important to remember that while many partially or completely severed parts cannot be reattached, the parts can be used for “spare parts” to reconstruct other damaged areas

of the hand. For example, an amputated digit can supply useful nerve, arterial, or skin grafts to salvage another digit. Optimal care of the amputated part includes placing it in a saline moistened guaze wrap and placing it in a bag or specimen container. This container can then be placed on ice and transported with the patient. It is important not to place the amputated part directly in contact with the ice.

Proper reconstruction of a mutilated hand is a highly individualized process. Decisions to directly repair injured structures, substitute undamaged tissue for areas of damage, amputate or debride the injury, or secondarily reconstruct the injury depend on a number of factors. The first factor in this decision is the patient. Are they able to medically tolerate a lengthy surgery or numerous surgeries? Is it their dominant hand? Do they have socioeconomic circumstances that will allow a lengthy reconstructive and rehabilitative process that can last as long as one to two years? Do they have special vocational or avocational needs? The second factor is the injury itself. Can the basic functions of grasp, release, and pinch of the hand be salvaged? What tissues will have (NEED) to be replaced or amputated in order to have adequate debridement? What are the secondary reconstruction options? Will a useless part be salvaged when an amputation would be

functionally better for the patient? Can sensation to the hand be restored? Can the damaged area be “bypassed” after debridement? Only after all these considerations are reviewed can a proper plan be presented to the patient and carried out.

During surgery, a reconstructive protocol is utilized. This protocol is not rigid and the surgeon modifies it as necessary to optimize hand function. First, debridement of all contaminated and devitalized tissue is performed. Second, stabilization of the bone and joint injuries occur. Third, flexor and extensor tendon repair is carried out. Next, arterial repair under magnification is performed. If the ischemic time for the injury is already significant, arterial repair is done as a first step after debridement. Finally nerve and vein repair is completed. Once again this sequence is fluid and is altered as necessary. Bone, tendon, nerve, and vein grafts are sometimes necessary and planning for donor sites is required.

Surgery represents only the tip of the iceberg for these types of injuries. Many hours of supervised therapy with a qualified hand therapist are essential to optimize function and avoid new problems and injuries. Good pain management is required. Re-incorporation of the patient and their hand into activities of daily living and into the work force are critical for

maximizing function and for psychological reasons.

A mutilating hand injury is often a life-changing event for the patient and can require up to two years to maximize function and complete reconstruction. During this time the interactions of the patient with the surgeon, hand therapist, employer, vocational counselor, their family, and occasionally a psychologist are necessary for a team approach to this injury. The Michigan Hand Center has significant experience in handling these injuries. It is helpful to contact the Michigan Hand Center surgeon that will be taking care of the patient prior to transfer so that proper arrangements at the receiving hospital can be set up in advance to expedite care of the patient. Optimal care of these injuries is critically time dependent. If you have further questions concerning the management of mutilating hand injuries, please contact the Michigan Hand Center.