Chapter 27

# EVALUATING THE INJURED HAND

**KEY FIGURES:**

Normal posture
Forearm injury involving flexor tendons
Flexor tendon injury in the hand

Patients with hand injuries have many different presentations, ranging from a swollen, tender finger or a small laceration on the palm of the hand to a severely mangled hand. This chapter explains how to evaluate patients with a hand injury. It is important to do a complete exam of every injured hand so that no important injuries are missed.

As usual, **the first priority is to control life-threatening hemorrhage**. Apply point pressure over the wound. This does not mean to place gauze in the wound and wrap the area with an Ace bandage. It means to place a wad of gauze over the injured area and to apply firm point pressure to the injured site with two fingers. The pressure may need to be maintained for several minutes before the bleeding stops. In patients with arterial bleeding, exploration is required.

If the patient has a **rapid, exsanguinating hemorrhage** that cannot be controlled with point pressure, place a tourniquet or blood pressure cuff proximal (closer to the heart) to the injury. If a blood pressure cuff is used, it must be inflated to at least 50 mmHg above the patient's systolic pressure.

**Caution:** Tourniquets hurt and place the tissues at risk for ischemic injury. Optimally, the tourniquet should not be left in place for more than 15–20 minutes. If a tourniquet is needed, so is urgent operative exploration.

For **patients with a non–life-threatening injury**, the following elements are crucial to the evaluation of an injured hand.

## *Important Elements of the History*

As discussed more thoroughly in chapter 6, "Evaluation of an Acute Wound," it is important to obtain a good history from the patient.

Information about what caused the injury may have important implications for treatment.

### *Nature of Injury*

**Human bites** are very dirty wounds. Never close a human bite to the hand. Such injuries require specific antibiotics, and surgical exploration and wash-out in the operating room may be necessary.

**Animal bites.** About 80% of cat bites become infected compared with 5% of dog bite wounds. Remember to ask about the animal's rabies vaccination status.

**Glass wound.** Did the glass shatter? Are foreign bodies retained in the wound?

**Knife/sharp object wound.** The object may have penetrated more deeply than you think.

**Dirty wound.** Worry about particulate matter in the wound, and check tetanus immunization status.

**Burn.** Is injury due to thermal, chemical, or electrical burn? Each has different implications. See chapters 20, "Burns," and 34, "Hand Burns."

**Component of a crush injury.** Crush mechanisms involve a more extensive injury than you may initially expect. See chapter 35, "Hand Crush Injury and Compartment Syndrome."

### *Other Important Questions*

1. Is the injured hand the **dominant hand**? If the injury involves the dominant hand, treatment outcome is especially important. This consideration may affect which treatment modalities you select.
2. What is the patient's **tetanus immunization status**? Update as needed. See chapter 6, "Evaluation of an Acute Wound," for tetanus booster recommendations.
3. Did **pulsatile bleeding** occur at the time of injury? Pulsatile bleeding (blood squirting out with some force as opposed to a continuous ooze) implies an arterial injury and usually mandates surgical exploration.
4. Was any **deformity** noted immediately after injury? Ask about an immediate deformity that has since disappeared. Many patients are able to reduce (realign) a dislocated joint right after the injury so that it appears normal at the time of exam. However, the injured finger may still require protective splinting even if it appears to be in its normal position.

5. Does the patient have a history of **previous trauma** to the hand? A previous injury may be the cause of an abnormal exam instead of the acute injury. Be sure to ask whether the functional deficit or contour abnormality identified on the exam was present before the current trauma.

## Physical Examination of the Injured Hand

**Remove immediately all rings** that the patient is wearing. Injury to a hand often leads to significant swelling. The rings may become quite tight, possibly to the point that they cut off circulation to the finger. If the ring is tight, lubricating jelly or antibiotic ointment is often useful. If this strategy is unsuccessful, the ring may need to be cut off with a ring cutter or strong wire cutter.

Full evaluation of the injured hand may necessitate **anesthesia** to control the pain so that the patient can cooperate with the exam. See chapter 3, "Local Anesthesia," for specific information. *Be sure to test sensation distal to the injury before administering local anesthetic.* Once you have given the anesthetic, it is too late to test for sensory function.

### *Vascular Exam*

#### *Active Bleeding*

Is the wound actively bleeding during the exam? If so, is the bleeding pulsatile, with bright red blood (probable arterial injury), or continuous, with darker blood (probable venous injury)?

#### *Capillary Refill*

Check for capillary refill of the digits distal to the injury. Is the tissue pink, indicating sufficient circulation, or is it bluish or pale, indicating inadequate circulation to the distal tissue?

#### *Radial and Ulnar Pulses*

Make sure that the radial and ulnar pulses are intact, even if capillary refill of the hand seems normal. Missing an arterial injury can have serious consequences (see chapter 33, "Nerve and Vascular Injuries of the Hand").

Note what happens when you press on either the radial or ulnar artery. Does the pulse of the other artery disappear? In patients with an injury to the radial artery in the mid-forearm, for example, you may still feel a pulse in the radial artery at the wrist. In most people the radial and ulnar arteries come together in the hand to form the palmar arch. Because of

this anatomic arrangement, blood from the ulnar artery flows through the palmar arch. From the palmar arch blood travels into the digital vessels and into the distal radial artery. Thus patients with injury to the proximal radial artery may still have a palpable radial pulse at the wrist. If you press on the ulnar artery to occlude its flow and the radial pulse also disappears, injury to the radial artery is indicated.

## *Sensory Exam*

Test sensation distal to the injury. It is best to determine whether the patient can differentiate between a sharp stimulus (pinprick) and a dull stimulus (light touch of a dry cotton swab). Patients who cannot feel the sharp stimulus probably have a nerve injury.

## *Motor Exam*

Unless you see an obvious muscle injury, the purpose of testing the function of a specific muscle group is to evaluate for a specific underlying nerve injury or tendon injury (see below).

**Table 1. Muscle Functions and Associated Nerves**

| Muscle Function | Associated Nerve |
|---|---|
| Extension of finger IP joints, finger adduction/abduction, or abduction of the first dorsal interosseous muscle | Ulnar nerve |
| Thumb opposition | Median nerve |
| Wrist flexion | Median nerve primarily; some contribution from ulnar nerve |
| Wrist extension | Radial nerve |

IP = interphalangeal.

## *Tendon Exam*

1. Depending on the site of injury, make sure that nearby flexor and extensor tendons are intact. Remember that there are two flexor tendons to the fingers.
2. Flexion of the metacarpophalangeal (MCP) joints and extension of the interphalangeal (IP) joints are under intrinsic muscle control; they are *not* controlled by flexor or extensor tendons.
3. Note whether you can see cut tendon ends in the wound.

### *Exam for Fracture or Dislocation*

#### *Obvious Deformity*

Most finger dislocations and fractures are quite obvious, but this is not always the case. Sometimes the finger is just slightly swollen. The patient may report that right after the injury the finger looked "funny," but the patient was able to "pop it back" into position.

Rotational deformity when the patient flexes the fingers strongly implies a fracture or dislocation in need of reduction.

#### *Open Wound*

Is the joint visible in the wound? Is the capsule intact? Is a fracture visible? An open fracture (fracture associated with skin laceration) has a higher rate of infection and improper healing than a closed fracture.

*Whenever you have any doubt about the possibility of a fracture or dislocation, order a radiograph.*

#### *Soft Tissue Coverage*

Is there enough healthy tissue to allow wound closure or at least to cover exposed tendons, bones, nerves, or blood vessels?

#### *Foreign Bodies*

Check to be sure that no pieces of foreign material are present in the wound (e.g., grass, glass, metal, dirt). Some foreign materials can be seen on a radiograph. Foreign debris should be removed before the wound is closed to prevent infection.

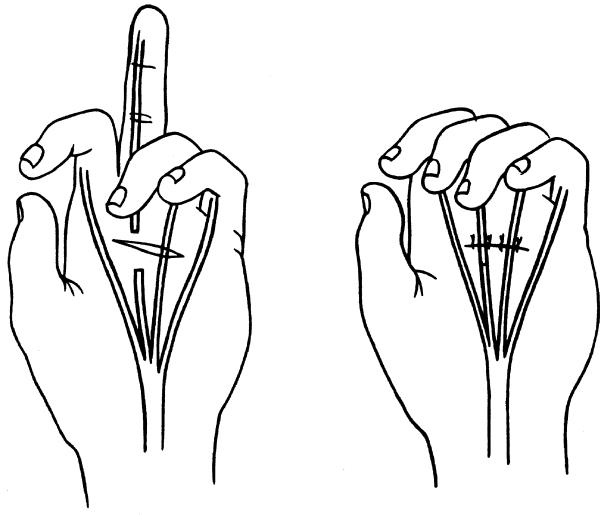
## Physical Exam of an Unconscious Patient

Although it is impossible to do a complete hand exam on an unconscious patient, certain parts of the exam can be performed:

1. Examine the wound, and evaluate the hand's vascular status, as described above.
2. For a gross estimate of the status of the flexor tendons, grab the patient's forearm and shake the hand gently. Then allow the hand to fall backward so that the palm faces up. The fingers should assume a gently flexed posture, with the little finger slightly more flexed than the ring finger, the ring finger more flexed than the middle finger, and the middle finger more flexed than the index finger. The thumb also should assume a slightly flexed position. If any finger assumes a more extended posture than expected, flexor tendon injury is indicated.

The resting posture of an uninjured hand in an unconscious patient. Note that all of the fingers are in a slightly flexed position.

An unconscious patient with a forearm injury involving the flexor tendons to the index and middle fingers. Note the difference in hand posture compared with the uninjured hand (above). The affected middle and index fingers are in an extended position.




Same process as in the two previous photographs, but the tendon injury is located in the hand. (From Crenshaw AH (ed): Campbell's Operative Orthopaedics, 7th ed. St. Louis, Mosby, 1994, with permission.)

## Bibliography

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