Chapter 32

TENDON INJURIES OF THE HAND

KEY FIGURES:

Extensor surface of hand
Mallet finger
Mallet splints
Injured finger in stack splint
Repair of open mallet

Most hand specialists believe that the earlier a tendon injury is repaired, the better the final result. However, repair of a lacerated flexor tendon is not a surgical emergency mandating immediate repair.

If the tendon ends are easily identifiable in the wound, you should repair the tendon when you first see the patient. However, if immediate repair is not possible or if you do not have the necessary surgical skills, the tendon can be repaired at a later time when a specialist is available. The overall outcome will not be adversely affected by delayed repair.

The most important point is to thoroughly wash out the wound and loosely close the skin as soon as possible after injury. This treatment prevents wound infection and allows safe performance of definitive repair at a later time (preferably within 7–10 days).

Flexor Tendon Injuries

Suspect a flexor tendon injury if the patient is unable to actively flex the distal (DIP) or proximal interphalangeal (PIP) joint of a finger, the interphalangeal (IP) joint of the thumb, or the wrist.

Partial and complete flexor tendon lacerations should be repaired to prevent disability. Repair requires careful exploration in the operating room (the proximal end of the cut tendon almost always retracts and is therefore difficult to locate) and advanced surgical skills. A clinician with technical expertise in hand surgery should repair flexor tendon injuries; the procedure can be quite challenging.

An important part of the initial treatment after repair of the overlying open wound is to place the hand in a splint. For injury to the flexor tendon of the thumb, use a thumb spica splint. For injury to the flexor

tendon of the finger or wrist, immobilize the entire hand by applying a dorsal splint that covers the forearm, hand, and fingers. For more detailed information about splinting, see chapter 28, "Hand Splinting and General Aftercare." The patient should wear the splint until he or she is evaluated by a specialist.

Extensor Tendon Injuries

An extensor tendon injury should be suspected when the patient cannot extend the metacarpophalangeal (MCP) joint of a finger or the thumb, the IP joint of the thumb, or the wrist.

Injury to the extensor tendon mechanism on the dorsal surface of the finger is evidenced by an inability to extend the PIP and DIP joints. Unless the patient has lacerations over each finger, generalized inability to extend the PIP and DIP joints of *all* fingers probably represents an ulnar nerve injury rather than a tendon injury.

In wounds over the dorsal surface of the hand or a finger, the cut ends of the tendon often can be identified with minimal wound exploration. Therefore, an extensor tendon injury often can be repaired on initial evaluation without taking the patient to the operating room.

Dorsal view of the hand showing extensor tendons, accessory communicating tendons (vincular accessorium), and extensor expansions. (From Crenshaw AH (ed): Campbell's Operative Orthopaedics, 7th ed. St. Louis, Mosby, 1987, with permission.)

Repair of the Extensor Tendon

Administer local anesthetic either by direct infiltration of the wound or by digital block. Be sure to clean the wound thoroughly.

If you see the tendon ends in the wound, repair the tendon (see below). If you cannot identify the proximal end (usually the harder end to locate), try to extend the involved finger and wrist. If this maneuver is unsuccessful, try to enlarge the wound with a knife by an additional 1–2 cm. Keep the involved part in extension, and see if this maneuver brings the tendon end into view.

If you are unable to locate the tendon ends, surgical exploration by a clinician with hand expertise is needed. Loosely close the skin so that the repair can be done at a later date.

I**f the tendon ends are identified,** sew them together using a nonabsorbable suture such as 4-0 nylon. The tendon can be repaired with a single figure-of-eight suture. Alternatively, place one or two simple sutures in the tendon ends to bring them together.

Caution: When tying the suture(s), do not pull too tightly. You may rip the suture out of the tendon.

Repair the overlying skin laceration with a few simple sutures. Apply antibiotic ointment and dry gauze over the repaired skin. A splint is required to protect the repair.

Table 1. Splinting of Extensor Tendon Injury*

Location of Injury	Type of Splint
On finger	Volar splint of finger that extends onto palm of hand. It is best to use an aluminum splint or to make a splint from plaster. Finger should be immobilized with MCP joint in 10–15° of flexion and IP joints straight.
On thumb	Thumb spica splint.
Extensor tendon to finger(s) on dorsum of hand or wrist	Volar splint from forearm to fingertips. Wrist should be placed in 20° of extension, MCP joints in 10–15° of flexion, and IP joints straight.
Extensor tendon to thumb on dorsum of hand or wrist	Thumb spica splint.

* See chapter 28 for more information about splinting.

If the extensor tendon is repaired, the patient should wear the splint for 4–6 weeks. An occupational therapist (if available) should see the patient to promote proper tendon healing and hand function.

If the tendon is not repaired, the splint should be worn until the patient can be evaluated by a hand specialist.

Mallet Finger

Mallet finger results from injury of the extensor tendon at its insertion into the distal phalanx. The patient cannot fully extend the finger at the DIP joint. Without adequate treatment, the finger will not completely straighten, which can be quite bothersome. For example, patients will not be able to get objects out of their pocket, a common everyday activity.

Mallet finger. The patient cannot actively extend the DIP joint.

In contrast to most tendon injuries, a mallet finger can result from a closed injury (no cut to the overlying skin that also injured the tendon) as well as an injury with an overlying skin laceration. A closed mallet injury is caused by sudden, forced flexion of an extended finger. The tendon is torn off the distal phalanx, and sometimes the bone is fractured.

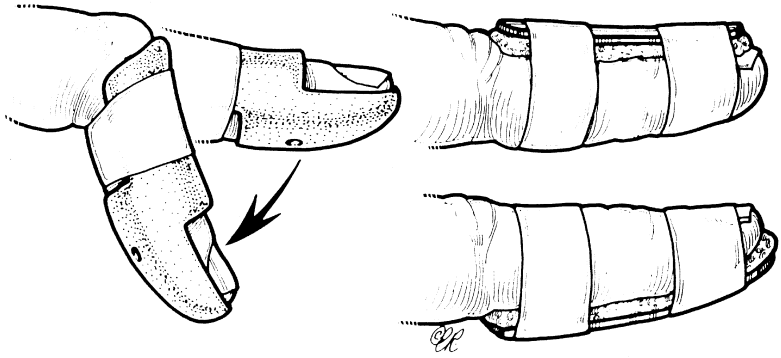
Closed Mallet Deformity

With No Underlying Fracture or a Fracture of < 50% of the Articular Joint Surface

The best treatment is a volar splint—either the commercially available splint (Stack finger splint) or an aluminum foam splint. If neither is available, a splint can be made from plaster or from a piece of a tongue depressor (with cotton padding). The splint should be long enough to immobilize only the DIP joint. The PIP joint should not be immobilized.

Position the DIP joint in slight hyperextension. **Caution:** Be careful not to hyperextend the joint too much because skin necrosis may result. Look at your own finger—you can see the skin blanch (indicating diminished blood circulation) when you overly hyperextend the DIP joint. This effect should be avoided.

If you are unable to get the joint into proper hyperextension with a volar splint, a dorsal splint can be used. Again, immobilize only the DIP joint. You must be careful because of the higher incidence of skin breakdown when the splint is placed over the dorsal surface of the joint.



Splints for treatment of mallet finger. (Illustration by Elizabeth Roselius © 1998. From Green DP, et al (eds): Operative Hand Surgery, 4th ed. New York, Churchill Livingstone, 1999, with permission.)

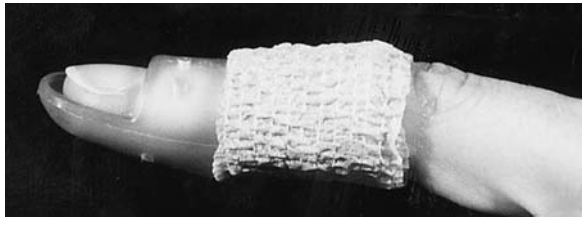
Tape is used to keep the splint in place. The splint is removed only to cleanse the finger (once daily). The patient should keep the joint in extension while the splint is off. The splint stays in place continuously for at least 6 weeks.

After 6 weeks, if the finger is nontender and the patient can actively hold the finger in full extension, the splint can be removed during the day, but only light activity should be allowed. The patient should wear the splint at night for another 4 weeks and when doing strenuous work with the hand.

If after 6 weeks the patient cannot actively hold the finger in full extension, the splint should remain in place continuously for another 4 weeks.

If at any time after the splint is removed the patient notices loss or weakness of full active extension of the DIP joint, the splint should be replaced and worn continuously for another 4–6 weeks.

This treatment regimen can be successful even if the patient does not seek treatment until several months after the initial injury.



Injured finger in a Stack splint.

With a Facture of > 50% of the Articular Joint Surface

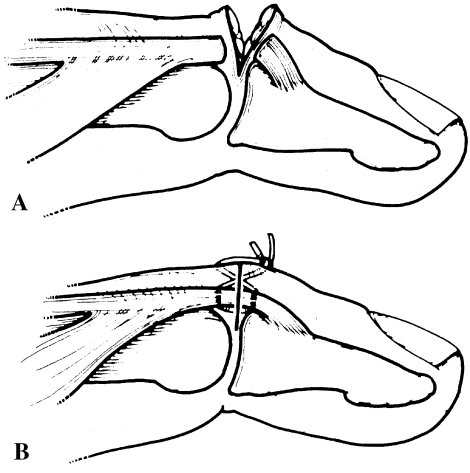
To optimize functional outcome, the fracture should be meticulously reduced and stabilized. This procedure requires operative treatment by a hand specialist. However, if none is available, try the treatment described above. It may be successful.

Open Mallet Deformity

In open mallet deformities, the overlying skin is lacerated as well as the tendon.

Once the finger has been thoroughly cleansed, the skin and tendon can be repaired together with one or two nonabsorbable figure-of-eight sutures (4-0 or 3-0 nylon). Alternatively, if you can see the tendon ends, the tendon can be repaired separately from the skin, but often this approach is not possible. A nonabsorbable suture should be used to repair the tendon.

The splinting regimen is the same as for closed mallet deformity. The skin sutures are removed after 10–14 days, regardless of how the repair was performed.



Repair of an open mallet deformity. The extensor tendon and overlying skin are lacerated *(A)*. The skin and tendon can be repaired together with one or two nonabsorbable figure-of-eight sutures *(B)*, which are removed after 10–14 days. The finger must remain splinted for at least 6 weeks. (Illustration by Elizabeth Roselius © 1998. From Green DP, et al (eds): Operative Hand Surgery, 4th ed. New York, Churchill Livingstone, 1999, with permission.)

Bibliography

1. Doyle JR: Extensor tendons: Acute injuries. In Green DP, Hotchkiss RN, Pederson WC (eds): Green's Operative Hand Surgery, 4th ed. New York, Churchill Livingstone, 1999, pp 1950–1987.
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3. Strickland JW: Flexor tendons: Acute injuries. In Green DP, Hotchkiss RN, Pederson WC (eds): Green's Operative Hand Surgery, 4th ed. New York, Churchill Livingstone, 1999, pp 1851–1897.