Chapter 38

CHRONIC HAND CONDITIONS

KEY FIGURES:

Pulley system of fingers
Trigger finger release
A1 pulley opening
Carpal tunnel anatomy
Carpal tunnel release incision

Chronic hand pain is a common complaint, especially among people who work with their hands. What initially may seem to be only an annoying pain can turn into significant disability without adequate treatment. This chapter discusses several of the most commonly encountered chronic hand disorders.

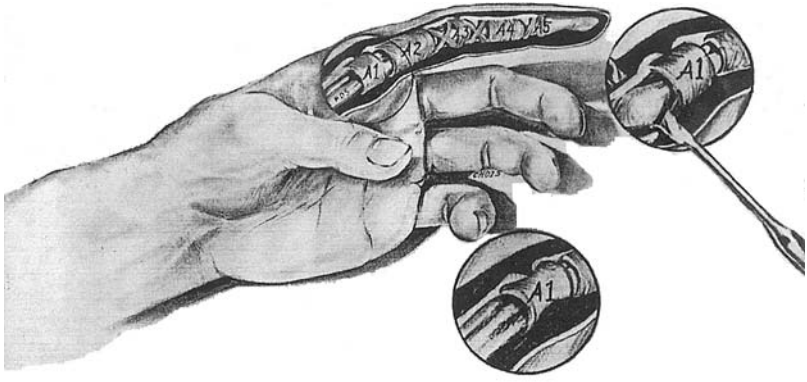
Trigger Finger

Anatomic Background

The flexor tendons travel through a connective tissue, synovial-lined tube as they course through the fingers. This tube runs from the metacarpophalangeal (MCP) joint (just proximal to the MCP flexion crease as you look at the palm of the hand) to a point immediately proximal to the distal interphalangeal (DIP) joint.

This tube is highly pliable and thin. The tissue is slightly thicker in several areas, called pulleys. The purpose of the pulleys is to prevent the tendons from bowstringing during finger flexion. This action is important for adequate grip strength and proper hand function. The most important pulleys are A1, A2, and A3, which overlie the MCP joint, the proximal phalanx, and the proximal interphalangeal (PIP) joint, respectively.

The digital neurovascular bundles (digital nerve and vessels) run along either side of the tube in the soft tissue.



Anatomy of the flexor tendon pulley system. Top inset illustrates flexor digitorum profundus nodular thickening. Bottom inset illustrates flexor digitorum superficialis decussation fraying. (From Zelouf DS (ed): Atlas of the Hand Clinics. Philadelphia, W.B. Saunders, 1999, with permission.)

Definition of Trigger Finger

The technical name for trigger finger is stenosing tenosynovitis. It is postulated that repetitive use of the fingers or thumb causes the A1 pulley to become thick and unyielding. Pathologic thickening in the tendon near the pulley also may occur. As a result of such changes, the tendon is unable to glide properly through the pulley. In extreme cases, the tendon may become stuck outside the entrance of the pulley (just proximal to the MCP flexion crease).

The clinical result is triggering of the affected finger or thumb. Triggering means that the digit assumes a flexed posture. Active straightening of the affected digit is often difficult. Massage of the tissues of the distal palm and passive extension of the finger or thumb may be required. Sometimes the digit cannot be fully extended even with these measures.

Before the development of triggering, patients often complain of chronic pain not only in the area of the MCP joint but also in the area around the PIP joint.

Congenital trigger finger may be seen in infants. Because of the small size of the tissues, this problem should be treated only by a hand specialist.

Diagnosis

The history of triggering is usually the most important finding. Sometimes patients simply complain of a dull pain in the distal palm or the PIP joint of the affected digit(s).

On physical exam, feel the tissue just proximal to the MCP joint at the distal palmar skin crease. This is the location of the A1 pulley. Gently flex and extend the affected digit, and you may feel a small "knot" moving back and forth. This "knot" clinches the diagnosis in a patient with the above clinical symptoms.

Nonoperative Treatment

Steroid injection around the A1 pulley may provide symptomatic relief, which can delay the need for surgery for many months. Betamethasone is commonly used; inject 0.25–0.50 ml around the A1 pulley. Warn the patient that it will take a few weeks to see whether the injection is successful. A second steroid injection can be given 6 weeks after the initial injection if no improvement has been noted. Sometimes the second injection is successful even if the first resulted in little improvement.

How to Inject the A1 Pulley

1. Draw the steroid solution into a syringe. Use a small needle (≤ 21 gauge) for the injection.
2. The landmark for the A1 pulley is the distal palmar skin crease of the affected digit.
3. Starting with an injection of a local anesthetic is not necessary because it will hurt just as much as the steroid injection. But give the patient a choice.
4. Alternatively, 1 ml of lidocaine can be added to the steroid solution to help alleviate the chronic pain temporarily.
5. Stick the needle into the tissues. You need to go deeper than the superficial skin. If the patient reports feeling pins and needles, you are probably in the digital nerve. Back out a few millimeters, and reposition the needle.
6. Draw back on the syringe to ensure that you are not in a blood vessel.
7. Ask the patient to flex and extend the finger with the needle in place. If the needle moves with the tendon, it may be lodged in the substance of the tendon. Back out the needle a few millimeters, and ask the patient to move the finger again. Keep adjusting the needle until the needle tip is no longer in the tendon.
8. Once the needle is in the correct position, inject one-half of the solution in the syringe. Move the needle a few millimeters to another position near the A1 pulley, check for the above positioning concerns, and inject the remainder of the steroid solution.

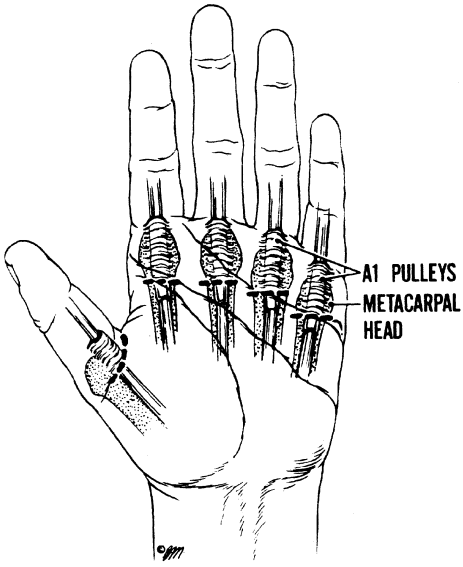
9. Remove the needle, place a Band-Aid over the injection site, and gently massage the tissues for a few minutes.

Operative Treatment

Operative treatment should be considered when two steroid injections are unsuccessful in alleviating symptoms or when symptoms argue against waiting 4–6 weeks for improvement.

A patient whose finger is locked in flexion also should undergo surgical treatment. Waiting for a steroid injection to work is impractical because of concerns about subsequent joint stiffness due to inability to move the finger for so long a period.

How to Release a Trigger Finger

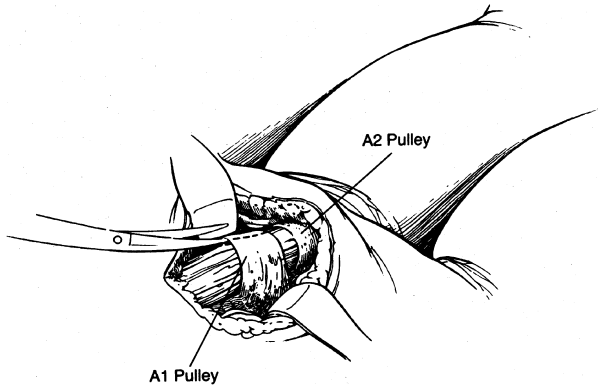


Incisions for release of trigger fingers and thumb. The index is released through an incision in the proximal palmar crease, the ring and little fingers in the distal crease, and the middle finger midway between the two palmar creases. The thumb is approached through its metaphalangeal crease. (Illustration by Elizabeth Roselius © 1998. From Green DP, et al (eds): Operative Hand Surgery, 4th ed. New York, Churchill Livingstone, 1999, with permission.)

1. Trigger finger release can be done with a **wrist block** or **Bier block**. General anesthesia is used less commonly.
2. The hand should be exsanguinated, and a tourniquet should be used on the forearm or upper arm. It is important to have a bloodless field to prevent injury to the nearby neurovascular bundles.
3. The incision (1–1.5 cm) should be centered over the distal palmar skin crease of the affected digit. It can be made with a vertical or horizontal orientation. The vertical orientation may be more protective

of the neurovascular bundle, but it is somewhat more difficult from an exposure perspective.

4. Using **blunt dissection**—that is, using the scissors to spread the tissues, not to cut them (see chapter 2, "Surgical Techniques")—separate the soft tissues until you see the underlying tendon and A1 pulley. *Do not cut anything until you are certain that the neurovascular bundles are protected.* Use retractors to keep the tissues to the side of the your working area once the A1 pulley has been identified.
5. Use sharp scissors or the tip of your knife to open the pulley. Then open the entire pulley with a scissors. You will know you are at the end of the pulley when the tissue becomes thin and pliable compared with the thickened A1 pulley. The pulley is approximately 1 cm in length.
6. Flex and extend the finger to ensure that the tendon moves back and forth easily and that the entire pulley has been opened.
7. For postoperative pain control, inject a few milliliters of bupivacaine into the tissues that you have been dissecting.
8. Release the tourniquet, and apply pressure to control bleeding. Close the skin incision with a few interrupted sutures. Apply antibiotic ointment over the suture line, and cover with gauze dressing.
9. Alternatively, close the incision with a few interrupted sutures. Apply antibiotic ointment over the suture line, cover with gauze, and gently wrap the hand with an Ace wrap. Once the hand is dressed, release the tourniquet. Continue to hold pressure over the area around the incision for several minutes.



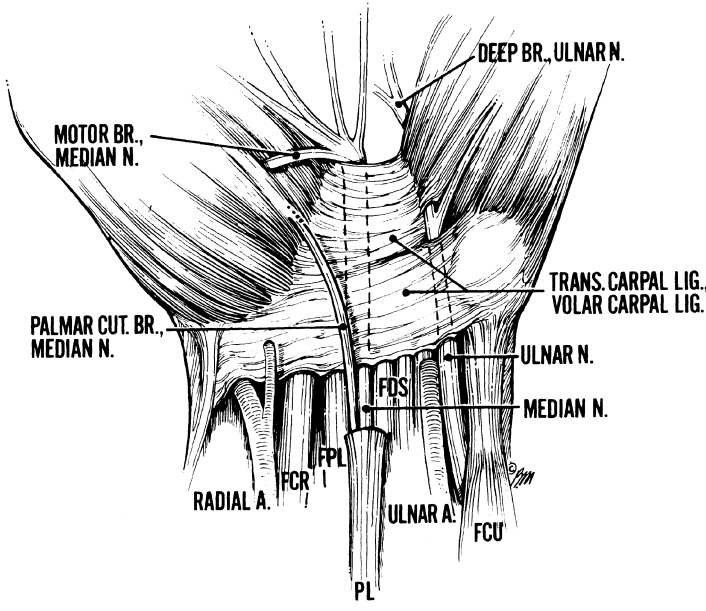
Trigger finger release. The A1 pulley is divided carefully with either scissors or knife. (From McCarthy JG (ed): Plastic Surgery. Philadelphia, W.B. Saunders, 1990, with permission.)

Postoperative Care

1. Acetaminophen or nonsteroidal anti-inflammatory agents should be adequate for postoperative pain control.
2. Keep the hand elevated to decrease swelling and decrease pain.
3. The patient should be encouraged to use the hand for light activities within 1–2 days after surgery.
4. Remove the dressing the day after surgery, and clean with gentle soap and water daily.
5. Apply antibiotic ointment to the suture line daily for the first few days. Cover with dry gauze as needed.
6. After 10–14 days, remove the sutures. Instruct the patient to increase gradually the activities performed with the hand until the patient has resumed regular activities.

Carpal Tunnel Syndrome

Anatomic Background



Anatomy of the carpal tunnel. The median nerve and flexor tendons transverse the carpal tunnel, lying beneath the transverse carpal ligament. (Illustration by Elizabeth Roselius © 1998. From Green DP, et al (eds): Operative Hand Surgery, 4th ed. New York, Churchill Livingstone, 1999, with permission.)

The carpal tunnel is essentially the space in the center of the palm just distal to the wrist. The carpal tunnel is bound by bone on three sides, and the transverse carpal ligament is the roof (i.e., the most superficial boundary). It is a relatively tight, fixed space.

The median nerve travels through the enclosed space of the carpal tunnel with the nine flexor tendons to the fingers and thumb. Anything that decreases the size of the tunnel, such as tissue swelling from repetitive hand and wrist movements, can place pressure on the median nerve. Pressure on the nerve causes dysfunction and clinical symptoms.

Although the median nerve at the wrist is primarily sensory, it gives off a motor branch to the thenar muscles responsible for opposition. The motor branch of the median nerve can originate from the main nerve before going under the transverse carpal ligament, in the carpal tunnel, or, most commonly, after leaving the confines of the carpal tunnel. The motor branch also can pierce through the ligament to innervate the muscles. It is important to have a thorough understanding of this anatomy to prevent injury to the motor branch if operative intervention is undertaken.

Definition of Carpal Tunnel Syndrome

The symptoms of carpal tunnel syndrome (CTS) include pain and tingling in the hand and distal forearm as well as numbness along the median nerve distribution of the hand. Hand clumsiness may occur, and the symptoms often are aggravated when the hands are in extension or grasping objects. Examples include reading the newspaper or grasping the steering wheel while driving.

Night awakenings with hand numbness, and pain in the hand or distal forearm are also common complaints. Significant weakness and muscle wasting are late symptoms.

Diagnosis

Gentle tapping on the median nerve at the wrist causes tingling or the feeling of electric shocks. This phenomenon is called a positive Tinel's sign. Development of numbness in the median nerve distribution with flexion of the wrist, called a positive Phalen's sign, is also indicative of CTS.

Special electrophysiologic tests can be done to measure the nerve conduction velocity and the status of the muscles supplied by the median nerve. Although the physical signs and symptoms are often enough to diagnose CTS, these studies are useful when the diagnosis is in doubt. Electrophysiologic studies are also useful for documentation and medicolegal purposes.

Nonoperative Treatment

Often stopping or at least decreasing the amount of time in which the hand performs repetitive movements is necessary for symptom relief.

In addition, splinting the hand in neutral position (immobilizing only the wrist in 10–20° of flexion) during work and sleep may alleviate the symptoms. It often takes several weeks to see improvement. The splint should be used for at least 6–8 weeks before determining that it is not helpful. If symptoms improve, the splint should be worn an additional 1–2 months.

The use of nonsteroidal anti-inflammatory agents (e.g., ibuprofen, naproxen sodium), may help to relieve pain and decrease swelling.

A cornerstone of therapy is evaluation by an occupational or other movement therapist, who can teach the patient how to use the entire upper extremity in a more efficient manner. By incorporating use of the entire arm instead of just the hand or wrist, the patient distributes the strain of work more evenly. This approach should remove some of the stresses on the wrist and hand and may alleviate symptoms.

Another option, which should be used with caution, is to inject steroids around the median nerve. Betamethasone, 0.75–1.0 ml, can be injected in a manner similar to performing a median nerve block (see chapter 3, "Local Anesthesia"). You must take care to avoid injection into the median nerve, which can cause nerve injury and further problems.

Operative Treatment

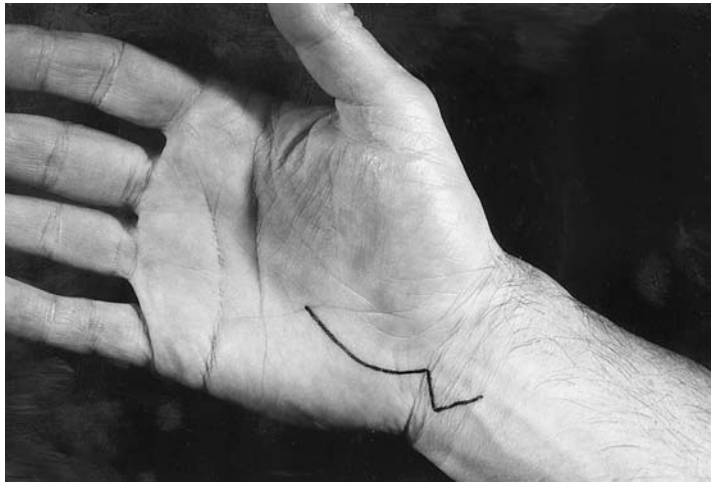
Carpal tunnel release (CTR) involves dividing the transverse carpal ligament to relieve the tightness in the carpal tunnel and thereby decrease pressure on the median nerve. Worldwide, CTR is performed most often by making a longitudinal incision in the palm and dividing the transverse carpal ligament under direct vision. Alternatively, in areas with access to endoscopic technology, CTR can be done with a small incision near the wrist or in the palm, with use of an endoscope to visualize and divide the ligament.

Although this operation is considered by many to be relatively minor, this writer does not agree. Complications, including injury to the median nerve or its motor branch and incomplete release of the transverse carpal ligament, may occur even when the operation is performed by a clinician with extensive hand surgical training. This procedure should be undertaken only if you have surgical expertise and a thorough understanding of the anatomy in the area. The patient should have significant signs and symptoms of CTS , including denervation of the thenar muscles.

Also, unless there are signs of muscle denervation, conservative treatment, especially movement therapies to teach the patient to use the upper extremity more efficiently, should be fully explored before turning to surgery. Not all hand surgeons agree.

How to Perform Carpal Tunnel Release

1. CTR can be done using a **wrist block**, **Bier block**, upper extremity **regional block**, or general anesthesia.
2. The hand should be exsanguinated, and a tourniquet should be used on the forearm or upper arm. It is important to have a bloodless field to prevent injury to the median nerve and surrounding structures.
3. The hand should be held in a fully supinated position for the operation. It is useful to wrap gauze around the thumb and clamp it to the operating drapes to help hold the hand in position.
4. A slightly curved incision, approximately 3–4 cm in length, is made in the distal palm over the ray of the fourth metacarpal. The incision is immediately ulnar to the vertically oriented palmar skin crease. If the incision needs to be elongated for better exposure, cross the wrist in a zig-zag fashion.



Carpal tunnel release. The skin incision should be made along a line over the fourth metacarpal bone to prevent injury to the motor branch of the median nerve. If the incision needs to be elongated for better exposure, cross the wrist in a zig-zag fashion.

5. If you are not experienced with this procedure, do *not* try to be slick by using a small incision. Make an incision that allows you to see clearly what you are doing.
6. Gently separate the tissues using **blunt dissection**. You need small self-retaining retractors or assistants who can hold retractors to keep the soft tissues out of the way.
7. You will encounter a muscle, the little known palmaris brevis. Gently tease the fibers to get them out of the way.
8. Beneath this muscle layer is the gray/white transverse carpal ligament.
9. Make a small opening in this layer with the tip of the knife or scissors.
10. Carefully extend the opening a few millimeters until you can see the underlying median nerve (it is a smooth, cream-colored structure). Then place a clamp into the opening in the ligament to protect the nerve, and use the tips of the scissors to divide fully the transverse carpal ligament. Dividing the transverse carpal ligament opens the carpal tunnel.
11. The distal extent of the ligament ends just before the palmar arch (an important vascular structure). Take care not to injure this vessel.
12. The ligament extends proximally onto the distal forearm as a fascial layer. Open the distal part of this layer by gently pushing the the barely open scissors from the leading edge of the fascia in the palm toward the distal forearm. You will know that you have divided the fascia thoroughly when you can easily pass your finger into the distal forearm without feeling any tightness. (This step is necessary only if the surgical incision has not crossed the wrist. If the incision has crossed the wrist, the fascial layer will be opened during normal dissection.)
13. For completeness, feel for a mass in the carpal tunnel. A mass is a rare cause of CTS.
14. For postoperative pain control, inject a few milliliters of bupivacaine into the tissues that you have dissected.
15. Release the tourniquet before closing the incision, and be sure that hemostasis is adequate. Close the wound with a few interrupted sutures, and cover with antibiotic ointment and dry fluffed gauze. Wrap the hand gently with an Ace wrap.
16. Alternatively, place a few interrupted sutures to close the incision. Apply antibiotic ointment over the suture line, and cover with fluffed gauze. Wrap the hand gently with an Ace wrap, and apply

gentle pressure to the area around the incision. Then release the tourniquet.

Postoperative Care

1. Acetaminophen or a nonsteroidal anti-inflammatory agent should be sufficient for pain control.
2. Keep the hand elevated as much as possible.
3. An ice pack placed on the volar aspect of the hand helps to alleviate some of the pain and swelling.
4. The soft dressing can be removed the day after surgery. The suture line should be cleansed with gentle soap and water each day. Keep the suture line covered with a gauze, and wrap the hand gently with an Ace wrap. The hand can be used for light activities, and gentle range-of-motion exercises should be done with the fingers.
5. Remove the sutures after 14 days.
6. Once the sutures are removed, gently massage the scar for several months to keep it from getting tight.
7. Gradually increase the use of the affected hand until the patient has resumed regular activities.
8. Occupational therapy is quite useful in the postoperative period.

Osteoarthritis

The most common joint disease of the upper extremity is osteoarthritis (OA). Although there are several other types of arthritis, OA is the only form discussed because of its high prevalence. Approximately 70% of people over 65 years of age have changes consistent with OA.

OA is caused by loss of joint cartilage and growth of new bone at the joint edges. The joints primarily affected are the finger DIP joints and the thumb carpometacarpal joint. The PIP and MCP joints are involved less often.

Symptoms include pain with hand use, joint enlargement and deformity, and joint stiffness with loss of motion.

The primary goals of treatment are relief of pain and maintenance of adequate hand function. Acetaminophen and nonsteroidal anti-inflammatory agents are the most useful medications. Several homeopathic remedies (e.g., arnica) also can be quite useful.

Occupational therapy or other movement therapy to encourage efficient use of the entire upper extremity is an important adjunct to treatment.

Surgery usually is done only for intractable pain and joint destruction that leads to significant loss of hand function. The most common procedure is fusion (arthrodesis) of the affected DIP joint. Arthrodesis or arthroplasty (joint replacement) may be indicated for a severely symptomatic PIP joint. These highly technical procedures should be done only by a hand specialist.

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