

# Working Without Pain

From carpal tunnel to tendinitis—cumulative injuries and the building trades

by Daniel Wing

**A** carpenter saws off a finger. A painter or roofer falls from a ladder. Most people in the building trades are well aware of the risks they take everyday (regardless of whether they take precautions). Construction, in fact, is one of the most dangerous industries.

But in recent years, there has been a growing awareness of a different class of injuries: those known as *cumulative trauma disorders*. Unlike a sudden injury such as a broken bone, cumulative traumas are caused by the gradual accumulation of small, sometimes unnoticeable, injuries that eventually result in pain. These disorders damage nerves and tissues resulting from long-term repetitive activities, such as years of swinging a hammer or picking up bricks. In fact, more than 16 million workdays are lost in the U. S. each year because of cumulative trauma disorders. But such injuries are not inevitable if you know the proper work methods.

This article will focus on the most common cumulative trauma disorders faced by people in the home-building trades: injuries to the upper extremities (hand, arm and shoulder). Most upper-extremity problems can be understood once you understand a bit of anatomy and the nature of connective tissues.

**The body's shock absorbers**—The main victim of cumulative trauma disorders is the body's system of connective tissues—muscles, bones, tendons and ligaments. Muscles are the body's active suspension system. By contracting and relaxing, they move the bones—the body's framework. They also absorb the stress of impact, protecting the bones from damage. Muscles are attached to bones by tendons—tough,

dense, elastic tissue. But tendons are more than mere fasteners: they transfer muscle power over a distance. The muscles that control your fingers, for instance, are in your forearm and palm; packing them into the fingers would make fingers too stubby to be useful. Long tendons make the connection, acting much like the strings of a

**Trigger finger**  
Inflammation of the tendons at the base of the fingers.

Ligament

Carpal ligament (forms the roof of the carpal tunnel)

**Carpal tunnel syndrome**  
Inflammation of the nerves that pass through the carpal tunnel, a tight space at the base of the palm.

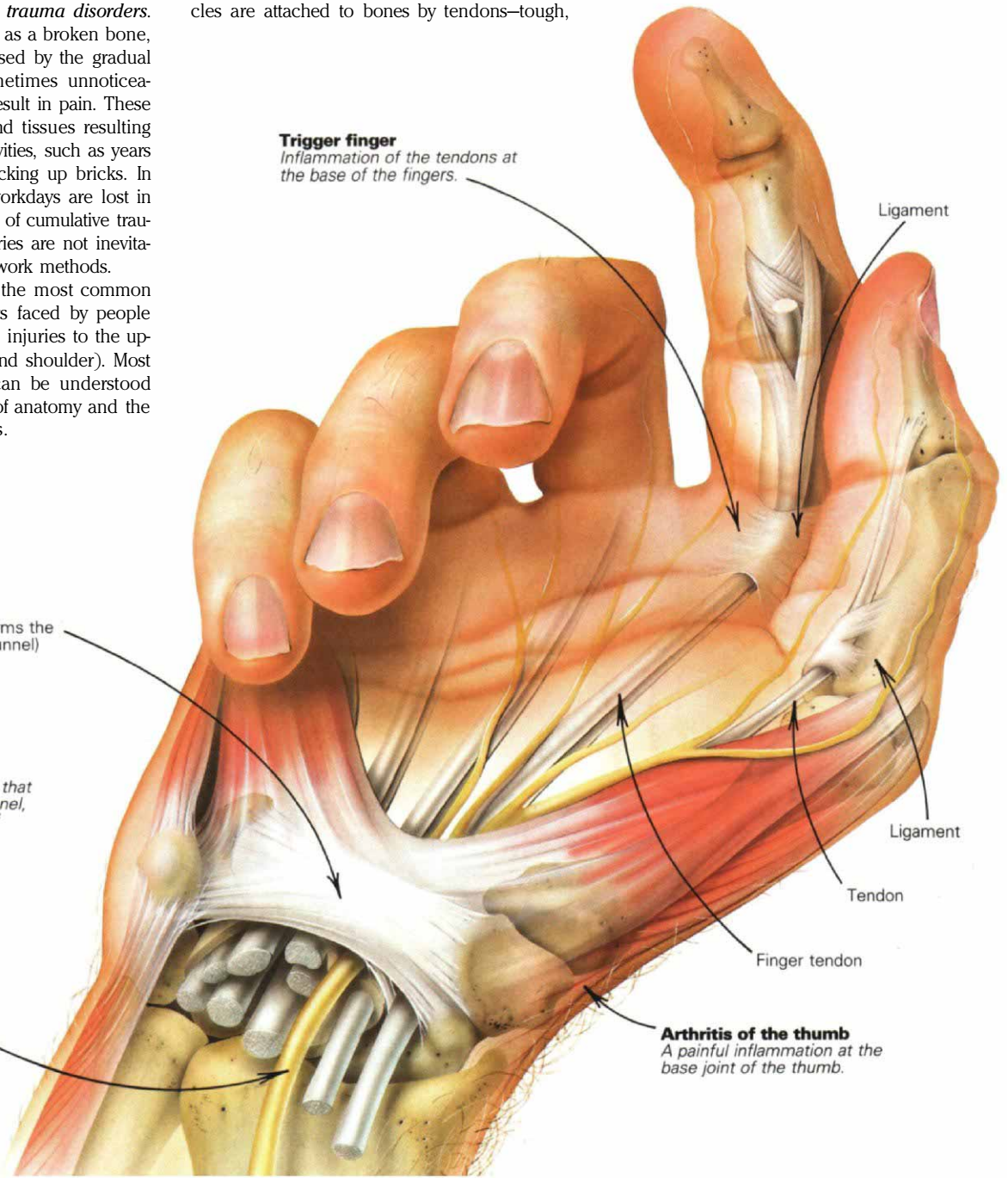
Ligament

Tendon

Finger tendon

Median nerve

**Arthritis of the thumb**  
A painful inflammation at the base joint of the thumb.



marionette. Ligaments connect bones to one another and hold organs in place. They are pliable but strong, letting the joints move but keeping that movement within safe limits.

There is a fine balance between damage and repair in this system. Although the body can safely adapt to strenuous work, it cannot do so overnight. Connective tissue may need weeks or months to adjust to a new task. But it may take only take a few days—or even a few hours—for a worker to do appreciable microscopic damage to underdeveloped soft tissue. Even a conditioned worker can be injured when the frequency or force of activity increases too much.

Particularly susceptible are workers who have to perform the same task all day long. It's the same kind of problem that develops when a three-times-a-week runner begins training for a marathon by running on a daily basis; without a one or two day lay-off, the runner feels pain and sees redness and swelling in the injured area. If such a program is not instituted slowly, it can easily cause permanent damage.

The ability of connective tissue to repair itself is weakened even further by three common conditions: vibration, such as that from the repetitive use of power tools or heavy machinery; low temperature, as experienced when working outside during winter; and fatigue. Any of these conditions will lower the body's ability to absorb impact and endure stress. This helps explain why injuries and cumulative trauma disorders are so common in the building trades.

Most cumulative trauma injuries we're concerned with here manifest themselves as inflammation. When the energy absorbed by a tissue exceeds its tolerance, a series of chemical steps takes place. These include an increase in blood flow to the tissue and the proliferation of inflammatory cells similar to pus cells. If the aggravating event is of short duration (a one-time injury, such as a sprained wrist), the process burns out quickly and the tissue begins to heal. If the aggravation continues (say, repetitive drilling with a dull spade bit), a vicious cycle develops in which the inflammatory response becomes self-perpetuating, leaving the tissue even more susceptible to injury.

Some cumulative trauma injuries show up as a loss of nerve function. Nerves are damaged when they are squeezed. When exposed to excessive pressure, the individual nerve fibers begin to lose their "insulation." This

causes a conduction block in some nerve fibers and a slowing of conduction in others. Such a fiber will recover if the pressure is relieved; otherwise it will stop conducting completely and begin to die. If the pressure is removed after this point, recovery of the nerve can be incomplete and the damage permanent.

**Accumulating pain**—Cumulative disorders can be either localized or diffuse. The most common localized problems experienced in the home-building trades are trigger finger, arthritis of the base of the thumb, carpal tunnel syndrome at the wrist, thumb/wrist tendinitis,

tennis elbow, shoulder impingement syndrome, and thoracic outlet syndrome. A more diffuse problem is called myofascial pain. All of these problems are caused by excessive stress applied to connective tissues or nerves. Treatment consists of rest, physical therapy, and steroid injection or surgery when necessary. The earlier these problems are recognized, the easier they are to treat. But all of these problems are avoidable—if one learns the proper work methods.

**Trigger finger**—The tendons that control the fingers pass beneath ligaments at the base of the fingers, on the palm side of the hand (drawing facing page). These ligaments act as pulleys to guide the movement of the tendons. The leverage provided by the length of the fingers increases the tensile stress on the finger-bending tendons by a factor of six. Because of this, excessive, repetitive stress placed on a particular finger can cause the tendon to become inflamed and to develop a lump that binds up on the ligament. For example, this can be caused by repetitive operation of a stiff trigger, especially if it's pulled with the end of the finger. At first, the finger may seem slow to return to a straight position after being bent. Eventually, the lump may become so big that it refuses to slide under the ligament unless the finger is straightened out by the neighboring fingers, or even by the other hand.

*Prevention: Grasp objects instead of pinching them. This will distribute the load across several fingers, reducing the leverage working against the tendons. The grasping force needed to perform a given task can be lowered even further by using a nonslip coating on the tool or wearing nonslip gloves. Injury rates may also be reduced by slowing the rate of repetitive tightening of the fingers against high resistance to less than one cycle every 10 seconds.*

**Arthritis of the thumb**—This problem occurs at the base of the thumb (drawing facing page). It has the same basic cause as trigger finger—the leverage provided by the length of the thumb multiplies the tendon force required for pinching or thumb-pushing tasks. The fulcrum for the lever is the joint at the base of the thumb, so each pound of "push" by the thumb becomes many pounds of compressive load at that joint.

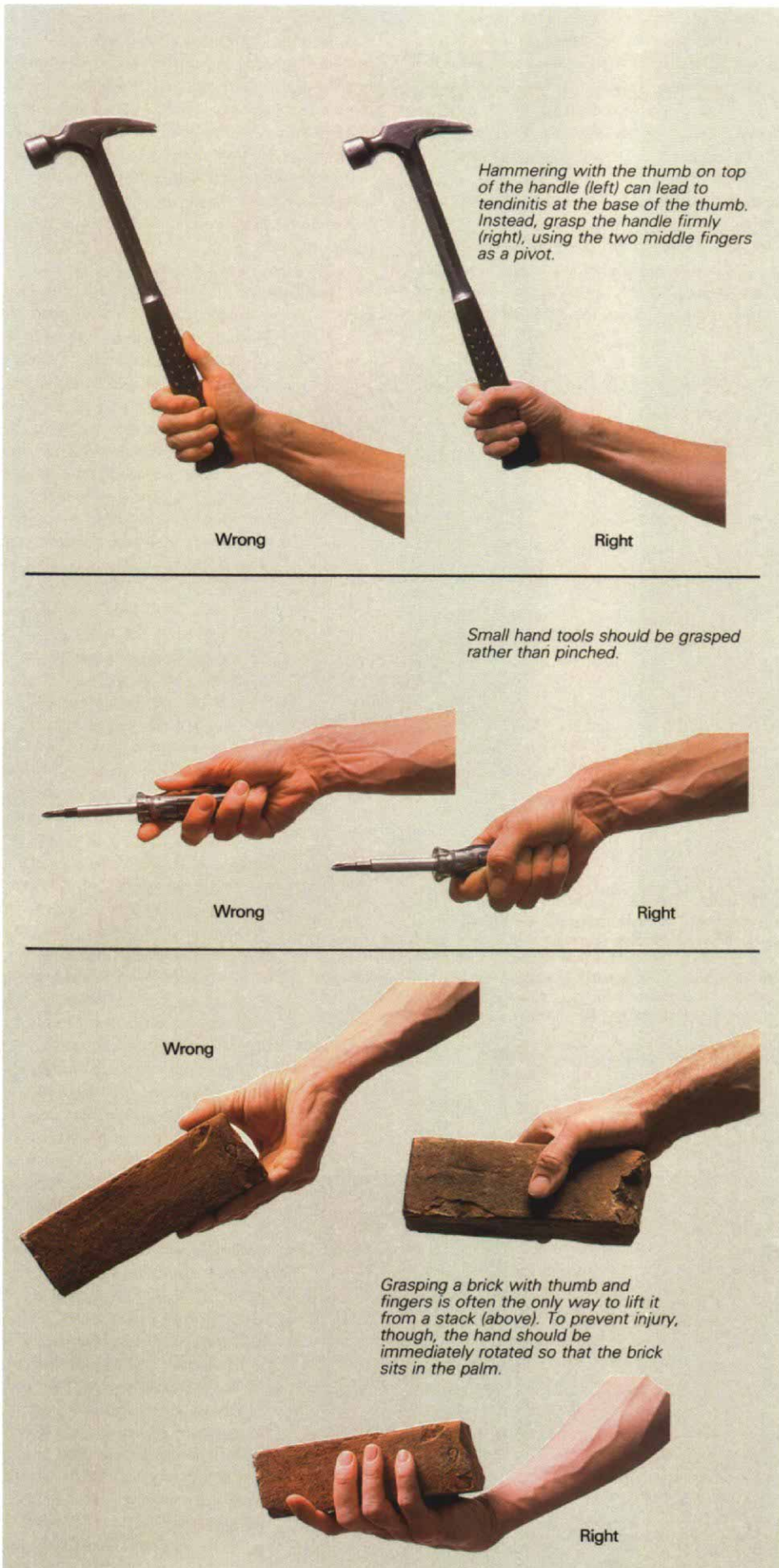
*Prevention: Avoid tasks that require forceful use of the thumb,*



**Carpal tunnel syndrome, an inflammation of the nerve at the base of the palm, is caused by repetitive gripping with the wrist bent. To help prevent it, get in the habit of using power tools with the wrist in neutral. The neutral position is naturally assumed by the wrist when you let your arm fall to your side—not bent too far in any direction. The center view in both photos shows the correct position.**







especially out of the neutral position (the position it naturally assumes at rest). For example, the thick handles of some cordless drills and compact hand grinders put a greater load on the base of the thumb than a standard electric tool. When possible, choose tools with comfortably sized, nonslip handles. Some newer cordless drills have the battery pack at the base; the handle itself is small enough to let the thumb remain in the neutral (least awkward) position. This puts less load on the thumb. When using small hand tools, grasp them with the whole hand instead of just the thumb and index finger (middle photo, left). This will transfer the gripping force from the tip of the thumb to the flesh at its base, reducing both the leverage and the load on the joint.

**Carpal tunnel syndrome**—The median nerve supplies sensation to the thumb, index, middle and half of the ring finger. This nerve, along with the tendons of the thumb and fingers, passes through a tight space between the carpal bones in the base of the palm, called the carpal tunnel (drawing, p. 66). The nerve can be squeezed by the finger tendons, especially if the fingers are used while the wrist is bent (photos previous page). They can also be squeezed and inflamed if tendinitis (tendon inflammation) develops in those tendons; tendinitis increases the volume of the tendon, causing it to squeeze the very sensitive nerve. Pulling nails is a good example of the type of movement most likely to lead to carpal tunnel syndrome. Symptoms consist of numbness or pain on the thumb side of the hand, especially at night or after work. In advanced cases, there may be pain up to the elbow, as well as atrophy of the muscle at the base of the thumb.

*Prevention:* Use tools and work positions that allow the wrist to remain in the neutral position (photos previous page). The wrist should be slightly cocked-up and not bent too far toward either the thumb or the other side of the hand. Again, tools with comfortable, non-slip handles will make a difference. Do not use the base of the palm as a hammer to pound on stubborn objects.

Take a five-minute break from repetitive gripping activities (such as hammering) every half hour. For example, if one person is cutting and laying plywood while another is nailing it down, they should consider switching places several times during the course of the day.

**Thumb/wrist tendinitis**—Known as de Quervain's tenosynovitis, this is tendinitis below the base of the thumb, on the inside of the wrist (drawing facing page). The thumb tendons in that area travel in a lubricated sleeve, and the tendons and the sleeve can become irritated, either by repetitive motion or excessive stress, as when lifting heavy things with a pinching motion, with the thumb placed over the finger. To test the diagnosis, tuck your thumb into your fist, then use the other hand to stretch the wrist down gently away from the thumb to reproduce the pain.



Compare this with the same maneuver in the other hand.

**Prevention:** Stop at the first sign of pain. Avoid working with the wrist bent away from the thumb. For example, don't hammer with the thumb on top of the hammer handle and don't hold on tightly with the thumb and first two fingers. Let the handle "rock" around the ring and little fingers (top photos, facing page). Use proper hand placement when lifting heavy objects (bottom photo, facing page).

**Tennis elbow**—Technically known as lateral epicondylitis, this is a painful inflammation on the outside of the elbow, where the muscles that cock the wrist up attach to a flare on the bottom end of the upper-arm bone (drawing lower right). These muscles stabilize the wrist during a wide variety of hand activities, so avoiding an aggravation of this problem can be difficult. If only the muscle attachment is involved, the tenderness will be felt right at the edge of the bone. If the inflammation is severe, nearby ligaments and nerves can be irritated, causing pain in the forearm.

**Prevention:** Avoid excessive grasping of slippery objects and reverse "wrist curl" activities or holding onto violently twisting tool handles. Prevention of reinjury involves a regular, four-times-a-day stretching program over the course of a month or more, in which the elbow is straightened while the hand is turned down, the wrist bent, and the fist and fingers pushed steadily but firmly toward the palm for a minute or so, using the other hand. A physical therapist should be able to give a good demonstration of this.

**Impingement**—This condition of the shoulder (drawing above right) manifests itself as either tendinitis or bursitis (an inflammation of the bursa, a fluid-filled sac that acts as a bushing between tissues). When the arms are used to do overhead tasks, tendons and a bursa near the main shoulder joint can get caught beneath an arc of bone and a ligament connected to it. People with a muscle weakness or an imbalance in the shoulder area are especially vulnerable to impingement. The symptoms depend on which soft tissues in the shoulder area are irritated: tendinitis will hurt when the shoulder is loaded (when the muscles are being used), even if the arm is not moved. Bursitis will hurt when the arm is moved, even when it is done by someone else.

**Prevention:** Impingement is caused by working with the hands at or above shoulder height, so you should bring the work down to you whenever possible. If this is impossible, get a ladder that's tall enough to bring you up to the work and get help when lifting heavy objects overhead. Be conscious of your shoulder posture; rounded, rolled-inward shoulders are more likely to impinge. Keep yourself loose and strong with an exercise program that focuses on the shoulder-blade muscles and mid-back.

**Thoracic outlet syndrome**—This is a hard-to-diagnose, intermittent malfunction of the

nerves leading to the arm, causing numbness in the little and ring fingers, especially at night or after work. It can be caused by bone abnormalities in the neck, but can usually be traced to swelling caused by holding the arms above shoulder height, especially with the head turned. Even though it's common, thoracic outlet syndrome is often confused with other conditions, such as a pinched nerve in the neck, it is differentiated by its intermittent nature and by the predominance of numbness, rather than pain. In addition, the problem can usually be reproduced by working with the hands over the head. Medical treatment is not always necessary; as the muscles get stronger and stop pressing on the nerves, the symptoms often disappear.

**Prevention:** Avoid overhead work wherever possible. This, and a therapy program to alter the shoulder posture, are the only preventive measures.

**Myofascial pain**—Also called fibrositis, this is muscular pain that is not always experienced directly over the affected muscle. It can be felt at a distance, although the patterns of pain referral are somewhat predictable for each affected muscle. For instance, the coraco brachial muscle in the front of the shoulder "sends" pain to the outside of the elbow. The basic cause of myofascial pain is not understood, but it seems to be a form of oxygen and energy depletion in muscle cells. It may be related to previous muscle injury, patterns of muscle use, or central nervous-system hyperactivity (which may lead to disturbed sleep).

In myofascial pain, muscles stay "achey" and tender for weeks or months following an injury (which may be a minor injury), with the intensity of the symptoms waxing and waning in response to physical and psychological stress. The diagnosis is established when the pattern of local and distant pain is reproduced by pressure on a "trigger point" in a particular muscle and when other possible diagnoses are eliminated.

**Prevention:** Take regular stretching breaks, especially when doing work requiring constant contraction of a shortened or overstretched muscle. Looking overhead, for example (as when installing strapping or ceiling drywall), requires continuous contraction of shortened muscles in the back of the neck and upper back.

**Where to get help**—Your family doctor can usually work with a physical or occupational therapist to provide conservative care, although more aggressive treatment will require evaluation by an orthopedic surgeon or a physiatrist (a non-surgical physician specializing in physical medicine and rehabilitation). Your family doctor or your county or state medical society can provide you with the names of qualified specialists. □

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