

Tennis elbow

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“Tennis elbow” is a misnomer for a condition that occurs frequently on the lateral condyle of the elbow. There are many causes for this condition, and it is generally accepted that tennis accounts for only 5% of these painful elbows. Tennis is also a misnomer in that, over the centuries, two very distinct forms of this game have developed (1, 2).

The original “real” tennis derived from a ball game that is depicted on Egyptian temple carvings dated 1500 BC. In the 8th century the Moors invading Europe took the game with them; Christian monks adopted the game and spread it throughout the European monasteries. By the early 18th century, the game was played by aristocracy and royalty and was known as royal or real tennis. When England prospered in the 19th century, many large estates built their own courts following the example of King Henry VIII. He had a court built at his Hampton Court Palace, and it is still in use by a small group of enthusiasts.

“Real” tennis is played indoors within a long, rather narrow high-walled court from which a hard ball is bounced off by using a long-handled and tightly strung racquet. It’s a fast and somewhat dangerous game for which some courts still exist in Europe. In the 1930s, I played the game in my high school’s court. This introduced me to my first episode of tennis elbow—treated in the school clinic by calculated neglect.

In 1850, Charles Goodyear learned how to vulcanize rubber, and the “real” players began experimenting outdoors with rubber balls on grass. In 1877 the town of Wimbledon organized the first tournament of lawn tennis. Today “lawn” tennis is common and played on grass or hardened surfaces with a larger, hollow rubber ball (1, 2).

A British surgeon, Mr. R. S. Garden (3), reported in a paper published in 1961 that a German physician, F. Runga, described the condition in 1873; this reference is not available. In 1882, another British surgeon, Mr. Henry Morris, MA, FRCS,¹

¹History has it that King Henry VIII was a heavy eater with presumably a very high blood pressure. His symptoms were relieved by being bled by the barber surgeons of the day. His relief was so great he gratefully named them doctors. The contemporary internists did not accept this use of their title and called these bleeders “mister.” To this day, English surgeons gladly use this prefix since it allows them to hide in the general public and because doctors are generally considered well off and they would prefer to avoid inflated bills from merchants, garages, tailors, and others.

published an article in the *Lancet* describing “the lawn tennis arm,” in which frequent use of the backstroke leads to a sprain of the “pronator radii teres” muscle. He saw three such cases and “one gentleman said he had known of several lawn tennis players affected in the same way.” He claimed that “the symptoms soon disappear if the movements of pronation and supination are restricted for a few weeks and the forearm is enveloped in an elastic bandage or firm elastic webbing.” This muscle is well illustrated in my 6th edition of *Gray’s Anatomy* (1872), which weighs 4 pounds and describes on page 272 the muscle with all three words in a book of 778 pages. By contrast, the 38th edition of *Gray’s* (1995) consists of 2092 pages and on page 845 the muscle is now called extensor carpi radialis brevis (ECRB); this formidable book weighs 8¾ pounds!

DIAGNOSIS

“Tennis elbow” is now a well-established diagnosis, and its causative pathology has been well defined. Its incidence is common and it has many causes, among which only occasionally is the game of tennis.

The basic anatomical cause is sudden and often repeated use of the forearm extensor muscles, which previously had not been much used. Anatomically the muscle involved is the ECRB and not the pronator teres, as was suggested in the late 1800s. ECRB arises from the lateral epicondyle of the humerus, passing distally with its neighbor extensor carpi radialis longus. The longus inserts into the base of the second metacarpal, while the brevis largely inserts into the base of the third or central metacarpal of the hand. It is thus the powerful midline extensor of the hand.

The occupations, sports, and domestic activities that demand extension of the wrist are myriad. Some examples are plumbing; playing a musical instrument; painting; weaving; raking; using screwdrivers, pliers, and hammers; cutting meat; turning door-knobs; fishing; engaging in arm wrestling, racket sports, and other twisting movements; and lifting objects with an extended wrist. In the days before homes had washers and driers, many young

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mothers wringing out diapers had symptoms, which perforce rapidly became chronic.

Whatever the cause of this overuse injury, tennis elbow usually presents as a small area of chronic pain on the lateral aspect of the elbow. Other characteristic symptoms are pain on wrist extension, pain when shaking hands, and frequently a weakened grip. Even lifting a cup of coffee can precipitate pain. Often there is not one specific incident that produces the symptoms; repeated use of the hand will maintain and often increase the discomfort. An abrupt onset of symptoms is uncommon. In a first occurrence, the pain usually gets worse for several weeks and even months; it may even radiate down the forearm. Work or recreation may commence the condition. Although it can occur at any age, tennis elbow is said to be more common between 30 and 50 years of age. I got my second attack when I took up competitive rowing in high school, and it is occasionally recurrent even into my late 80s!

When faced with pain around the lateral side of an elbow and suspecting "tennis elbow," other causes of elbow pain must be excluded. Most are self-evident such as bursitis, infections, osteoarthritis or gout, and cervical radiculopathy. Radial tunnel syndrome can sometimes be hard to differentiate, since it is caused by compression of the posterior interosseous nerve passing between the superficial and deep parts of the supinator muscle (the arcade of Frohse). When this occurs, there is neither motor loss nor sensory impairment. Since the nerve winds around the neck of the radius, pressure at this point should increase the symptoms. The long finger test is also useful—incorrectly named "middle" since there are only four fingers (middle digit would be acceptable!). With the elbow in full extension, pressure on the fully extended fingers should produce pain in the radial tunnel; in positive cases the pain should be worst with pressure on the long finger.

PATHOLOGY

In a recent thorough review of lateral epicondylitis, Faro and Wolf (4) stated that its treatment "has been shaped by a shift in understanding of the disease process from a phenomenon of inflammation to one of degeneration of a portion of the extensor tendon origin."

Nirschl and Petrone (5) in 1979, studying the origin of the ECRB, described the pathoanatomy of the area as an angiofibroblastic tendinosis. They considered this to be a degenerative process since no acute inflammatory cells could be identified. Thus, it is probably a failed reparative process rather than active inflammation.

Surgical exploration shows in the fibers of origin a small, usually circular area which is "dull, gray, friable, and often edematous." When this is found during surgical exploration, it should be excised.

TREATMENT

The obvious and best treatment is permanent avoidance of whatever movements caused the symptoms. In most cases such advice is impractical, and the patients have already tried various over-the-counter medications and unfortunately

continued their precipitating activities. Surgery is *not* the primary treatment.

Calculated neglect. Modification of provocative activities, preferably supervised by a therapist, is important, and cooperation of the patient is vital. Lacking such cooperation will inevitably lead to a prolongation of the symptoms. Untreated tennis elbow usually persists for many weeks and even months with repeated symptomatic incidents.

Physical therapy. Modalities such as massage, ultrasound, "cold laser," and splintage may give some temporary relief but are not universally helpful. Iontophoresis and phonophoresis have been used to drive in topical medications.

Injection therapy. Corticosteroid injection is frequently tried and should be aimed at the most tender spot on the lateral epicondyle. Follow-up studies tend to show that although these shots are comforting at the beginning, they do not yield permanent symptomatic relief. Reports show that repeated injections into the tendon origin area may contribute to weakening and even ultimate failure of the origin of the ECRB (6). Other chemicals have been tried, such as lidocaine, alcohol, and even carbolic acid and botulinum toxin, but none have given permanent relief.

Autologous blood injections. Some might consider it strange that an injection of a small amount of a patient's blood into his tennis elbow could be curative, but Edwards and Calandrucio (7) in 2003 reported that 22 patients in whom nonsurgical modalities had failed were completely relieved of pain even during strenuous activity after receiving this treatment. As further substantiation of this curious report, Dr. Bruce Minkin, who trained in hand surgery with me in 1986, reported that after putting up with a tennis elbow for 1½ years, he had his physician assistant inject 2 cc of Bruce's blood mixed with Marcaine. All symptoms were gone by 1 month after the injection. The pain has not recurred for over 4 years despite his demanding hobby of studying Mayan cave archeology, which entails deep descents by rope into burial sites!

Forearm support band. In 1971 Dr. A. I. Froimson (8) published a brief note regarding his use of a "wide band of heavy duty non elastic fabric lined with foam rubber to prevent slipping." He commented that the device was being produced commercially and was patented. I understand from him that all the royalties from his patent are paid to his medical school. After the patent time expired, some modifications in design led to a second patent. The royalties from this are directed to the Foundation of the American Society for Surgery of the Hand.

This band has a reasonable reputation for prophylaxis and treatment of mild cases of tennis elbow. In my travels, I have noticed it being used in a variety of sizes and colors in many different countries.

Over 30 years later, N. J. Meyer et al (9) published a study of the band using both a cadaveric and clinical model. This work showed that the support band provides a mechanical inhibition of 13% to 15% of the distal load of these ECRB during use of the hand. The success of this forearm support band has been considered to be due to decrease in the tension in the ECRB origin off the lateral epicondyle during forearm use. In effect, the

pressure from the band acts as a more distal origin of the muscle mass and thereby reduces the traction at the site of origin.

SURGICAL PROCEDURES

Lengthening the ECRB tendon

Several operations to relieve the symptoms of tennis elbow have been described. In his 1961 paper, Garden catalogued “excision of the tender area, ablation of the common extensor origin, Hohmann’s (1926) operation releas[ing] the extensor aponeurosis from the lateral epicondyle, Bosworth’s (1955) resection of the orbicular ligament and Kaplan’s (1959) denervation of the radio humeral joint.”

Garden felt that “surgical intervention at the elbow is never to be undertaken lightly.” Accordingly, he suggested that the action of the ECRB should be interrupted by a Z-lengthening of its tendon at the wrist. Under local anesthesia, a short incision on the dorsolateral aspect of the forearm proximal to the point where the thumb extensors cross the radius obliquely exposes the ECRB tendon. A Z-shaped tenotomy lengthens the tendon, and a catgut suture holds the divided ends together.

He listed his first 50 patients and reported that all benefited “in some way and most obtained full and lasting relief.” Post-operative dynamometer grip tests and spring balance measurements of radial extension showed no significant reduction.

I have not done this operation, preferring to operate, *if I have to*, at the actual site of the pathology on the lateral epicondyle. However, in a paper published in 1984, Heyse-Moore (10) compared the results of 50 cases of resistant tennis elbow in which 37 had the Garden operation and 13 had their radial tunnel decompressed by an anterior approach. This paper showed that the Garden operation may be a satisfactory minor procedure, which can be done under local anesthesia. It also showed that the radial tunnel syndrome is not the cause of resistant tennis elbow.

Fromson has commented that in his experience, lengthening of the ECRB at the wrist relieved pain in only about half of the cases. Jobe and Ciccotti (11) reported that others have been unable to duplicate Garden’s results and that “subsequent reports have noted persistent pain or recurrence in up to 80% of patients.”

Exploration on the lateral epicondyle

Many variations on surgery in this area have been described, and the method proposed by Nirschl and Pettrone (5) makes clinical sense to me. They advocate exposing the ECRB origin, incising it, and debriding any necrotic material underlying the tendon’s origin. This decorticates a slither of bone from the lateral epicondyle to encourage reattachment of the tendon origins. In 88 patients, 98% showed improvement and 85% achieved complete pain relief and return to work within 3 months.

REPRISE

There is no one good, quick treatment for tennis elbow. In fact, a great variety of methods are available to relieve its pain. One’s patient must be taught to understand there is no instant

cure and that the pain may take many weeks and even months to resolve. If cooperation is lacking, so will be a “cure.”

Finally, a comment on “litigants’ epicondylitis,” a phrase coined by Mr. Kay of Sheffield, England (10). In his excellent paper he discussed the problems in helping a patient who, following treatment, has not improved and has sought legal help.

He reviewed 108 consecutive patients with tennis elbow epicondylitis presented before a legal court. He saw 106 patients on behalf of the defense and 2 on behalf of the plaintiff. All individuals had support for the diagnosis by the other side’s medical expert. In this group, there were 44 men (41%) and 64 women (59%). The ages ranged from 23 to 70 years, with an average of 50 years. These patients had failed to respond to a range of treatments over a significant period of time. Symptoms had persisted for an average of 4.6 years; most cases had lasted for 2 or more years. One patient had symptoms for 19 years. Of the patients who were operated on, 50% stopped working, 29% changed jobs, and 9% retired. Only 12% returned to their preoperative employment. In the nonoperative patients, only 21% remained at their original job. These results “contrast markedly” with all other published surgical results. It would appear that the “social dimension” of causation and compensation affected these litigants with epicondylitis.

Mr. Kay concluded that a surgical cure is unlikely in patients whose “social dimension” includes litigation and compensation. He ended his paper by stating that the ethics of submitting these patients to surgery, which is unlikely to be successful, are questionable.

To repeat: Surgery is not the first modality to be offered to a patient with a first attack of epicondylitis. Rarely should it be offered to a litigious individual. When seeing a patient who has already been treated at “St. Elsewhere,” therein may be a disconsolate malingerer.

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