

Anatomic Predisposition to Carpal Tunnel Syndrome

By Warren Hammer, MS, DC, DABCO

Many doctors and therapists treating carpal tunnel syndrome (CTS) pay most of their attention to the transverse carpal ligament that encloses the median nerve. We have all seen numerous patients for whom this ligament was operated on with less than positive results.

An excellent article by Singer and Ashworth¹ explains why in many cases, localized operation to the transverse carpal ligament is not a total answer: "Today, carpal tunnel release often is done through very small incisions or endoscopically."

Rarely is time spent looking for anatomic variation in surrounding or distant areas. This information also explains why manual treatment to outlying areas, along with the transverse carpal ligament, often relieves pressure on the median nerve. As usual, the question is: "Where is the source of the problem?"

Singer and Ashworth¹ evaluated 147 consecutive hands that underwent primary carpal tunnel release between 1983 and 1993. They found anatomic soft tissue variations in 41 percent of the hands that predisposed the median nerve to compression. They divided the variations: into those that were space-occupying lesions of muscular, bony or varied soft tissue origin, and those that were extrinsic (muscular) or overlying the transverse carpal ligament. Some of the intrinsic anatomic variations were proximal lumbrical insertions and *flexor digitorum superficialis* muscle fibers. These space-occupying abnormal muscle origins increase pressure within the carpal canal or cause direct pressure on the median nerve. The lumbrical muscles usually originate from the radial sides of the tendons of the *flexor digitorum profundus* at the level of the metacarpals, which is distal to the carpal tunnel. When the lumbrical muscle origin is more proximal than normal in the canal, one study² showed that in a patient with repetitive hand motions, the lumbrical muscles had hypertrophied and compressed the median nerve.

Cobb³ used a fist test where 45 seconds of sustained fist position caused numbness in the median nerve distribution, a result of lumbrical muscle incursion that increased carpal tunnel pressure.

The normal distal insertion of the *flexor digitorum superficialis* muscle belly usually becomes four tendons proximal to the carpal tunnel through which it enters as tendons. An anatomic variant can occur when the belly of this muscle extends into the palm. A literature review by Willis, et al.,⁴ found the *flexor digitorum superficialis* muscle belly of the index finger the most common anatomic variation reported to cause carpal tunnel syndrome.

Extrinsic anatomic variations that cause CTS by increasing pressure on the median nerve are: accessory muscles that arise from the *palmaris longus* and insert into the hypothenar or thenar region; and muscle fibers that originate from the thenar or hypothenar group and insert more distal than the usual, leaving an abnormal amount of muscle fiber directly over the carpal ligament.

The above may explain why some people at the same job develop CTS and others do not. The surrounding *palmar fascial aponeurosis* (with possible aberrant muscle attachments and its connections with the flexor retinaculum that overly the carpal tunnel, and the antibrachial fascia over the *flexor digitorum superficialis*) represent areas where fascial release, friction massage and, most recently, Graston technique has shown to be beneficial in the treatment of CTS.

It is becoming more and more evident that local pain must be evaluated from the standpoint of all the possible "connections," including possible congenital abnormal connections. After dissecting 34 adult human bodies solely for the purpose of examining the fascial connections, B.B. Gallaudet⁵ stated in 1931 that "planes of fascia in one region of the body are directly continuous with the same planes in all other regions." He felt at that time that the law of continuity of fascial planes was not stressed. He could have written the book this year and reached the same conclusion.

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