Variations in digital sensory patterns: A study of the ulnar nerve–median nerve palmar communicating branch

Eighty percent of 50 dissected cadaver palms showed a communicating branch between the fourth and third common digital nerves (ulnar and median origins, respectively). The branch commonly crossed the palm with the superficial arterial arch and usually provided sensory fibers from a branch of the superficial ulnar nerve into the ring finger radial digital nerve. Caution should be taken during carpal tunnel release or other surgery along the axis of the fourth ray to avoid injury to this structure. (J Hand Surg 8:411-14, 1983.)

Roy A. Meals, M.D., and Martin Shaner, M.D., Los Angeles, Calif., and Seattle, Wash.

Sensibility of the palmar surfaces of the hand is shared by the median and ulnar nerves with secondary classical being the midline of the ring flexor. Variations of this division exist, and this information has usually come from examination of patients with injury to either the median or ulnar nerve.1 A connection between the fourth common digital nerve and the third common digital nerve (median) is described in some anatomy books and can explain observed variations in digital sensory patterns. Mannerly found the presence of such a communicating branch in each of 16 dissected palms, and Sunderland3 found that this "loop" was constant. In a study of 80 hands Hirasawa found some type of communicating branch between the median and ulnar nerves in all. None of these authors specified the location or nature of the branch and only Hirasawa described the formation of the fibers. This sensory connection is a variant from the more commonly described Martin–Richter–Cannieu motor nerve connections in forearm and hand.

Recent case report of injury to a communicating branch between the median and ulnar nerves during carpal tunnel release2 was a stimulus to undertake the present anatomical study.

Materials and methods

We dissected 50 palms to study the surgical anatomy of this communicating branch. Thirty-five specimens were unprepared and frozen until shortly before the dissections, and 15 hands were preserved in formalin. We first exposed the palmar fascia and then carefully removed it. The transverse carpal ligament was opened along its radial margin and Guyon's canal was unroofed while avoiding disturbance of its contents. The remaining dissection was aided by the use of a 6X operating microscope.

Results

A communication between the ulnar and median nerves was present in 40 of the 50 dissected palms (80%). Generally it was immediately deep to the superficial arterial arch and took an angular course across the palm upon exit from Guyon's canal (Fig. 1). In some specimens the ramus was close to the distal edge of the transverse carpal ligament and crossed the ring finger flexor tendons almost perpendicularly (Fig. 2). In some specimens it ran almost parallel to the ring finger flexor tendons to enter the third common digital nerve at the level of the distal palmar flexion crease (Fig. 3). Most branches were a single bundle but some formed a network (Figs. 1 and 3). In 38 of the 40 palms in which a communicating branch was present, it originated proximally from the fourth common digital nerve (ulnar) and proceeded distally to enter the third common digital nerve (median). Following gentle dissection of the third common digital nerve it was clear that in 23 of these connections all of
Fig. 1. In a left hand, the superficial arterial arch has been removed. Immediately deep to it a sensory nerve connection is illustrated crossing the ring finger flexor tendons.

Fig. 2. In a left hand, a communicating branch sensory nerve is shown just distal to the transverse carpal ligament (arrow).

The diameter of the branch averaged 25% (range 17 to 80%) of a proper digital nerve's diameter at the finger base. Fig. 5 summarizes possible patterns of ulnar sensory distribution based on the preceding data.
Fig. 3. In a left hand, a sensory connection which nearly parallels the ring finger flexor tendon is illustrated. Fibers from the median nerve join the communication at 3 levels.

Fig. 4. Variations in connection configurations.

Of the 21 specimen pairs, 14 had communicating branches bilaterally, 6 had a communicating branch in only one hand, and one had no connection on either side. There were no left/right or male/female differences noted with respect to incidence, location, or pattern of the communicating branch. Variations in the arterial anatomy could not be correlated with variations in the nerve anatomy. Representative communicating branches were examined histologically to confirm the presence of nerve tissue.

In all palms a wide variation in the number of sympathetic fibers passing from nerve trunks to the superficial arterial arch was observed, regardless of whether sensory communications were present. In some instances no sympathetic fibers were seen, whereas in other palms a dense network was observed.

Discussion

Berrettini’s anatomical drawings of 1741 are the earliest record we could find describing or depicting this communicating branch. Gehwolf, in this century, brought attention to the occasional plexiform nature of the communication. Hirasawa from Japan reported the only other series of dissections. He found median to ulnar communications in 28% of his dissections, a frequency equal to that of his ulnar to median ones. In the remaining dissections he found a branch pattern identical to our type 3 case.
An awareness of the communicating branch between the ulnar and median nerves in the palm helps explain sensory findings that do not conform to the classic 3½ to 1½ median-ulnar supply to the fingers. For instance, if a patient has a communicating branch he may have persistent sensibility in his long finger following a complete median nerve laceration at the wrist. If this persistent sensibility is not recognized before nerve repair, the surgeon may erroneously interpret the subsequent presence of sensibility in this area as "immediate return" in defiance of the basic tenets of axon regeneration. Also, if a lacerated communicating branch is overlooked, there will be a permanent sensory deficit even if good recovery occurs in adjacent lacerated and repaired nerves. The median-ulnar sensory connection is at maximum surgical risk with carpal tunnel release, ring finger flexor tendon surgery, Dupuytren's fasciectomy, and mobilization of neurovascular island flaps. Unrecognized lacerations of this communication may account for some cases of palmar pain with perhaps only subjective distal sensory loss, findings that otherwise may be attributed to traction, scarring, or other non-specific causes.

REFERENCES


Radial tunnel syndrome: A spectrum of clinical presentations

A variety of symptoms associated with 15 cases of resistant tennis elbow and resistant radial tunnel pain are described. These included sensations of popping, paresthesias, and paresis. The duration of symptoms averaged 2.3 years before a definitive diagnosis of radial tunnel syndrome was made. Two unique anomalies were contributing factors in the radial nerve entrapment; one case demonstrated a completely tendinous proximal border of the extensor carpi radialis brevis and the other a bifid extensor carpi radialis brevis origin. Excellent pain relief, elimination of popping, and improvement of the paresthesias and paresis was achieved by release of the radial tunnel in cases unresponsive to conservative treatment. (J HAND SURG 8:414-20, 1983.)

Steven H. Moss, M.D., and Hugh E. Switzer, M.D., Jacksonville, Fla.

Chronic tennis elbow is a recurrent problem that has received considerable attention in the literature. However, since racquet sports have become increasingly popular and, as Capener suggests, "occupational" tennis elbow may occur, a closer look is warranted. It is often difficult to differentiate between simple lateral epicondylitis due to local inflammation and trauma and the early stage of radial tunnel syndrome due to radial nerve compression and "referred" lateral epicondyle pain. This article describes the clinical presentation in a series of cases of the radial tunnel syndrome.