Median Nerve Superficial to the Transverse Carpal Ligament

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abstract

Recurrent carpal tunnel syndrome occurs in up to 12% of cases after carpal tunnel release. Recurrent carpal tunnel syndrome is defined as recurrence of classic symptoms confirmed by electrodiagnostic studies after a symptom-free interval of a minimum of 6 months, as opposed to persistent carpal tunnel syndrome, where a symptom-free interval never occurs after carpal tunnel release, which is attributed to incomplete release of the transverse carpal ligament. The most common causes of recurrent carpal tunnel syndrome requiring reoperation are incomplete release of the transverse carpal ligament and scarring of the median nerve to the surrounding structures. Surgical exploration, release of the reconstituted transverse carpal ligament, and freeing of the median nerve from constricting scar will usually result in symptom relief. The authors describe an unusual presentation of recurrent carpal tunnel syndrome with healing of the transverse carpal ligament dorsal to the median nerve, trapping the median nerve in the subcutaneous tissue. Hand surgeons must be aware of this anomalous location when performing revision carpal tunnel release. The surgeon must locate the median nerve proximally in normal tissue before proceeding distally to avoid iatrogenic injury during revision carpal tunnel release. [Orthopedics. 2015; 38(1):e72-e74.]

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CARPAL TUNNEL SYNDROME IS THE MOST COMMON NERVE COMPRESSION SYNDROME IN THE UPPER EXTREMITY AND IS A CONDITION FAMILIAR TO ALL HAND SURGEONS. SURGICAL TREATMENT WITH CARPAL TUNNEL RELEASE EFFECTIVELY RELIEVES THE SYMPTOMS OF NUMBNESS, PARESTHESIAS, AND PAIN.\(^1\)\(^{-}\)\(^3\) BOTH OPEN AND ENDOSCOPIC CARPAL TUNNEL RELEASE PROCEDURES ARE EFFECTIVE, BUT SYMPTOMS REQUIRING REOPERATIONrecur IN 12% OF CASES AFTER CARPAL TUNNEL RELEASE.\(^4\) THE MOST COMMON CAUSE OF RECURRENT CARPAL TUNNEL SYNDROME REQUIRING REOPERATION IS INCOMPLETE RELEASE OF THE TRANSVERSE CARPAL LIGAMENT (RANGE, 32%-54%). LESS COMMON CAUSES INCLUDE SCARRING, TETHERING, AND ADHESIONS (23%); IATRISTIC NERVE LACERATION (2%); TUMORS (2%); AND IDIOPATHIC CAUSES (7%).\(^1\)\(^{-}\)\(^3\) RECURRENT CARPAL TUNNEL SYNDROME IS DEFINED BY THE RECURRENCE OF CLASSIC SYMPTOMS CONFIRMED BY ELECTRODIAGNOSTIC STUDIES AFTER A SYMPTOM-FREE INTERVAL OF AT LEAST 6 MONTHS. PERSISTENT CARPAL TUNNEL SYNDROME IS DEFINED BY THE LACK OF A SYMPTOM-FREE INTERVAL AFTER CARPAL TUNNEL RELEASE AND IS ATTRIBUTED TO INCOMPLETE RELEASE OF THE CARPAL LIGAMENT.\(^1\) A HAND SURGEON USUALLY PERFORMS REVISION CARPAL TUNNEL RELEASE. REOPERATION USUALLY INVOLVES EXTENDING THE INCISION PROXIMALLY TO IDENTIFY THE MEDIAN NERVE IN NORMAL ANATOMY, FOLLOWED BY DISTAL DISSECTION THROUGH THE AREA OF SCARRING OR INCOMPLETE RELEASE.

**CASE REPORT**

A 62-YEAR-OLD WOMAN WITH A HISTORY OF BILATERAL CARPAL TUNNEL RELEASE PRESENTED TO THE AUTHORS’ CLINIC WITH PROGRESSIVE INTERMITTENT NIGHTTIME NUMBNESS AND TINGLING IN BOTH HANDS. SHE UNDERWENT LEFT OPEN CARPAL TUNNEL RELEASE 13 YEARS AGO AND RIGHT ENDOSCOPIC CARPAL TUNNEL RELEASE 11 YEARS AGO. SHE HAD A POSITIVE FINDING ON CARPAL COMPRESSION TEST AND TINEL’S SIGN AT THE WRIST BILATERALLY. NERVE CONDUCTION STUDIES AND ELECTROMYOGRAPHY SHOWED BILATERAL SENSORY SLOWING ACROSS THE WRIST, CONSISTENT WITH LEFT GREATER THAN RIGHT CARPAL TUNNEL SYNDROME. A TRIAL OF NIGHT SPLINTING AND PHYSICAL THERAPY CONSISTING OF MOIST HEAT AS WELL AS WRIST, THUMB, AND DIGITAL STRETCHING DID NOT RELIEVE THE SYMPTOMS. SHE PROVIDED CONSENT FOR LEFT OPEN REVISION CARPAL TUNNEL RELEASE.

At the time of surgery, the old carpal tunnel incision, which crossed the wrist crease in a zigzag fashion, was extended proximally. During the superficial dissection, the median nerve was encountered just ulnar to the palmaris longus tendon (Figure A). There was an obvious retinaculum dorsal to the median nerve, pushing the median nerve to a more volar position toward the subcutaneous tissue (Figure B). The median nerve was extensively mobilized to allow for exposure of the dorsal structures. The authors resected the stout retinaculum dorsal to the nerve, exposing the carpal tunnel containing the flexor tendons (Figure C). A small amount of synovitis was removed from the flexor tendons before irrigation and closure. Postoperatively, the patient had transient loss of thenar muscle function that resolved spontaneously after 6 weeks.

**DISCUSSION**

Carpal tunnel release is a relatively common procedure, performed as either open or endoscopic release of the transverse carpal ligament. Both procedures have low complication rates and similar efficacy in relieving the symptoms of carpal tunnel syndrome.\(^6\)\(^{\sim}\)\(^8\) INAdequate release of the transverse carpal ligament results in persistent carpal tunnel syndrome and ultimately requires reexploration and revision carpal tunnel release. Scar formation can result in a completely healed transverse carpal ligament as well as encasement of the median nerve.\(^1\) This reconstitution of the transverse carpal ligament can increase the pressure on the median nerve and cause recurrent symptoms. Surgical exploration, release of the reconstituted transverse carpal ligament, and freeing of the median nerve from a constricting scar usually results in symptom relief.\(^1\)\(^,\)\(^5\)\(^9\)\(^,\)\(^10\)

Electrodiagnostic studies do not recover in up to 25% of cases after carpal tunnel release.\(^11\) Hence, the characteristic signs and symptoms of carpal tunnel syndrome, in combination with abnormal electrodiagnostic findings, are used to diagnose recurrent carpal tunnel syndrome. The current patient had recurrent median nerve symptoms, including paresthesias and sensory slowing on electromyography, 13 years after open carpal tunnel release. Jones et al\(^1\) noted recurrent symptoms up to 8 years after initial carpal tunnel re-

**Figure:** Intraoperative photographs showing the median nerve in a superficial position just dorsal to the palmaris longus and volar to a healed transverse carpal ligament (A). Forceps grasping the healed transverse carpal ligament dorsal to the medial nerve (B). Resection of the healed transverse carpal ligament with the median nerve released and returned to its normal anatomic location adjacent to the flexor tendons (C).

**Figure A:** The median nerve was exposed through a zigzag skin incision and demonstrated to be compressed by the flexor tendons. **Figure B:** After resection of the transverse carpal ligament, the median nerve was repositioned and returned to its normal anatomic location adjacent to the flexor tendons. **Figure C:** The median nerve was released and returned to its normal anatomic location adjacent to the flexor tendons.
lease. The median nerve was encountered in a very superficial and subcutaneous position at the time of surgery, with the reconstituted transverse carpal ligament now dorsal to the nerve. Extensive dissection of the nerve, followed by resection of the dorsally reconstituted ligament, was required to allow the nerve to return to its normal anatomic location adjacent to the flexor tendons.

**CONCLUSION**

The authors describe an unusual presentation of recurrent carpal tunnel syndrome with healing of the transverse carpal ligament dorsal to the median nerve. Because of the superficial position of the nerve, along with scarring, the recurrent symptoms could be attributed to traction that directly affects the myelin sheath and therefore electrical signaling within the median nerve. Hand surgeons must be aware of this anomalous location when performing revision carpal tunnel release.

**REFERENCES**