SHORT REPORT

ABSTRACT: We describe a maneuver that eases or abolishes paresthesias in carpal tunnel syndrome. With the affected hand palm up, the distal metacarpal heads are gently squeezed together; in some instances stretch of digits III and IV is also required. This maneuver may help in the clinical diagnosis of carpal tunnel syndrome, can be useful as a means of relieving symptoms, and provides the basis for the design of an innovative splint.
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A RELIEF MANEUVER IN CARPAL TUNNEL SYNDROME

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Carpal tunnel syndrome (CTS) is the most frequent entrapment neuropathy, with an incidence of 88–125 cases per 100,000 and a prevalence of 9.2% in women and 0.6% in men.[2,7] In the quest for a provocative test to aid in its diagnosis, we noticed that squeezing the distal heads of the metacarpal bones together had the opposite effect and actually relieved, when present, paresthesias and other positive symptoms of CTS. On the basis of this observation we developed a maneuver that we call the carpal tunnel syndrome relief maneuver (CTS-RM). In the basic maneuver, the affected hand is maintained with palm up and the distal heads of metacarpal bones (excluded the first) are gently squeezed inducing a slight adduction of digits II and V, so as to occlude the II and IV interdigital spaces (Fig. 1). When this is not sufficient to relieve symptoms, we turn the palm down and also stretch digits III and IV (Fig. 1). The aim of this study was to investigate the sensitivity, specificity, and efficacy of CTS-RM.

Abbreviations: CTS, carpal tunnel syndrome; CTS-RM, carpal tunnel syndrome relief maneuver; DML, distal motor latency; EMG, electromyography; MRI, magnetic resonance imaging; SCV, sensory conduction velocity

Key words: carpal tunnel syndrome; relief maneuver; neurophysiological classification

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MATERIALS AND METHODS

We examined 200 hands of 120 consecutive patients (101 women) referred to the EMG laboratory for hand paresthesias in the median nerve cutaneous distribution and pain exacerbation during the night. Mean age was 53.8 years (range 28–76 years). Duration of symptoms was 13.1 months (range 2 weeks to 7 years). At the time of clinical examination, 71 patients complained of positive symptoms such as paresthesias (tingling, "pins and needles," or a swollen sensation of the hands) or pain in a total of 112 hands.

In these 112 hands we performed two maneuvers: (1) the basic relief maneuver combined, when symptoms were unaffected, with stretch of digits III and IV (Fig. 1); and (2) Phalen's test (extreme flexion of the wrist for 30 s). Patients were asked to indicate whether the maneuvers: (1) worsened; (2) did not change; (3) improved; or (4) abolished their symptoms. The patients were blinded to the possible effects of the maneuvers and the order of the maneuvers was random.

At least 5 min after the maneuvers patients were studied electrophysiologically by determination of median sensory conduction velocity (SCV) from wrist to digit 2 (normal: $\geq$47 m/s) and median distal motor latency (DML) (normal: $\leq$4.2 ms). When these studies were normal, a median-to-ulnar comparison on stimulating the ring finger (normal median–ulnar latency difference: $\leq$0.5 ms) or a seg-

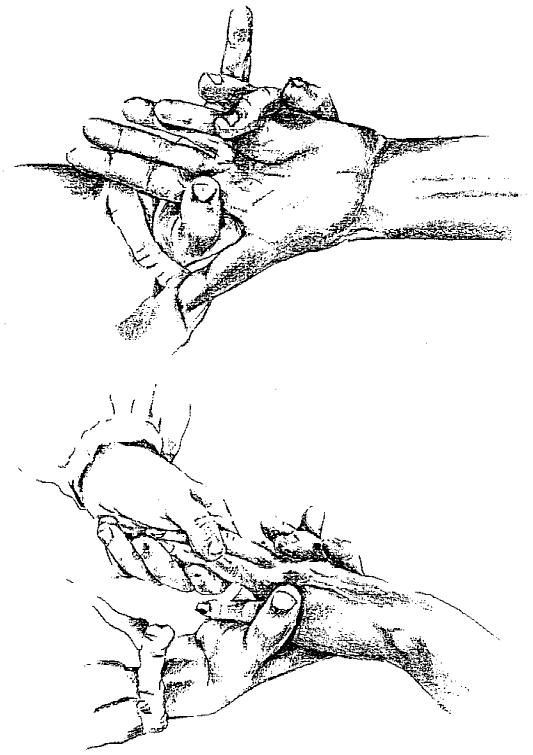

FIGURE 1. (Top) Basic maneuver for relief of carpal tunnel syndrome. With the hand of the patient palm-up, the examiner gently squeezes the distal heads of metacarpal bones, inducing a slight adduction of digits II and V. **(Bottom)** When the basic maneuver is not sufficient to relieve symptoms, the examiner pronates the patient's hand while simultaneously stretching digits III and IV.

mental (wrist to palm) sensory conduction (normal: ≥45 m/s) were performed.[3,9] On the basis of the electrophysiological results, hands were classified according to the following neurophysiological classifications: *extreme CTS:* absence of median motor and sensory response; *severe CTS:* absence of median sensory response and prolonged DML; *moderate CTS:* slowed digit II–wrist SCV and abnormal DML; *mild CTS:* slowed median digit II–wrist SCV and normal DML; *minimal CTS:* normal digit II–wrist SCV and DML, but abnormal segmental or comparison tests; *negative:* normality of all tests.[6] In 5 hands belonging to the mild group, electrophysiological examination was performed before and immediately after maintenance of the relief maneuver for 3 min with stimulating and recording electrodes maintained in the same positions.

We also performed the CTS-RM in 12 patients with paresthesias and pain radiating from the neck to the hand and C-6 (4 patients) or C-7 (8 patients) radiculopathy diagnosed by magnetic resonance imaging (MRI) and electromyographic (EMG) studies.

RESULTS

In all 112 hands with positive symptoms at the time of examination, the CTS-RM was successful. In 23% there was the complete abolition, and in 77% an improvement of paresthesias within 30 seconds. The basic maneuver was effective in 91% of hands, whereas stretching of digits III and IV was also required to induce improvement in the remaining 9%. The CTS-RM also affected pain localized to the hand and wrist, sometimes radiating proximally. In all hands, symptoms reappeared immediately after the end of CTS-RM. The effects of CTS-RM in the 112 CTS hands grouped according to neurophysiological classification are summarized in Table 1. Benefit occurred, as long as positive symptoms were present, in all neurophysiological groups, even in the single hand with extreme CTS. In the other neurophysiological groups, CTS-RM abolished symptoms in 16–40% of hands and produced improvement in 60–84% of hands.

In the 5 hands with mild CTS, median DML and SCV were 4.0 ± 0.2 ms and 41 ± 2.8 m/s before the maneuver and 4.0 ± 0.2 ms and 40 ± 2.3 m/s, respectively (*P*-value nonsignificant for both DML and SCV) immediately after maintenance of the maneuver for 3 min.

Phalen's test did not change (24%) or worsened

Table 1. Effects of relief maneuver (CTS-RM) on 112 CTS hands with positive symptoms, grouped by neurophysiological classification.

	Total number of hands (n = 112)	Neurophysiological classification of CTS					
		Extreme (n = 1)	Severe (n = 6)	Moderate (n = 44)	Mild (n = 41)	Minimal (n = 5)	Negative (n = 15)
Effect of CTS-RM							
Abolition of symptoms*	26 (23%)	0	2 (33%)	7 (16%)	8 (20%)	2 (40%)	4 (27%)
Improvement*	86 (77%)	1 (100%)	4 (77%)	37 (84%)	33 (80%)	3 (60%)	11 (73%)
No change	0	0	0	0	0	0	0
Worsening	0	0	0	0	0	0	0

**In parentheses are the percentages of hands responding to the maneuver.*

(76%) the positive symptoms in all hands. CTS-RMN did not induce any improvement in the 12 patients with C-6 or C-7 cervical radiculopathy and sensory symptoms at the time of examination.

DISCUSSION

We have developed a maneuver that can induce relief in all CTS hands presenting positive symptoms at the time of examination. The effect of CTS-RM was rapid on paresthesias and slower, but as effective, on pain. However, practice is required by the physician intending to use the maneuver as squeezing below the metacarpal heads or squeezing excessively may worsen symptoms. Moreover, CTS-RM affects positive symptoms but not fixed hypoesthesia and numbness.

We found that CTS-RM was negative in patients with symptoms due to C-6 or C-7 radiculopathies. Although highly sensitive and specific, CTS-RM can be applied, for diagnostic purposes, only in patients with positive symptoms at the time of examination. Besides its use for confirming the diagnosis, the basic relief maneuver can be taught to patients to ameliorate symptoms during nocturnal exacerbations. Moreover, as several studies have demonstrated the efficacy of hand splinting in relieving CTS symptoms,[1,5] we have designed and developed, on the basis of CTS-RM, an innovative hand splint (patent pending) that we are currently evaluating for tolerability and efficacy.

It is generally agreed that the primary cause of CTS is chronic compression of the median nerve as it passes through the carpal tunnel. It is, however, unresolved whether mechanical deformation or circulatory disturbances of the nerve produce the characteristic symptoms.[4,8] We believe that CTS-RM functions by modifying the shape and dimensions of the carpal tunnel and the spatial relationship between the median nerve and the surrounding structures. The fast relief and equally fast return of symptoms at the end of the maneuver are compatible with the induction of mechanical or circulatory changes. MRI studies and pressure measurements may help to clarify the biomechanical effects of the maneuver and how it improves CTS symptoms.

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