# Evidence in Action

## Does Therapeutic Ultrasound Provide an Effective Treatment Outcome for Carpal Tunnel Syndrome?

*By Theresa L. Whitney, BEd, DC*

*A 52-year-old woman comes to your clinic with a report of pain and paresthesias into her right hand.*

The Condition History

Your patient, a healthy, fit, 52-year-old female, has recently started training with her friends for an upcoming long-distance cycling trip through Holland, scheduled for three months out. Prior to one month ago, she bicycled only 30 minutes a day on her 15-minute commute to and from work. In this past month, her training sessions have included a daily one-hour ride during the workweek and a four-hour ride one day each weekend.

The pain, numbness, and tingling at her right thumb, forefinger, and middle finger have been noticeable for almost a month. Concern over hand numbness has elevated in the past week when she began dropping items held in her right hand unless she made a conscious effort to carefully position them to ensure a strong, full-hand grasp. She reports she has once or twice taken ibuprofen, with little or no relief. She denies having tried anything else to relieve the symptoms. She notes that the symptoms subside if she shakes her hand.

The Physical Examination

Examination includes a cervical and upper-extremity evaluation. You find the cervical exam to be negative.

The upper-extremity exam reveals hypalgesia (a lessened sensitivity to painful stimuli) along the median nerve distribution in the right hand, and a decrease in sensation noted at the palmar surface of the right thumb and index finger when compared with the fifth digit of the right hand. Weak right thumb abduction is also noted. Your patient presents with a Square Wrist Sign of 0.8 and a positive Closed Fist Sign relieved with inherent demonstration of the Flick Sign.[1]

Treatment

Your patient is dedicated to her health and fitness. Because of your history with this patient, you know she will follow your recommendations. Your dilemma is determining the most effective treatment plan for a woman who is busy at work and busy training for her bike tour. Would she benefit most from regular in-office treatment using therapeutic ultrasound or from directed supportive at-home care?

Your next step is to turn to the literature. You go to PubMed with the search prompts of "carpal tunnel syndrome AND treatment" and find "Therapeutic Ultrasound for Carpal Tunnel Syndrome," a very recent article that addresses effective treatment of carpal tunnel syndrome (CTS) using therapeutic ultrasound compared with other non-surgical intervention, placebo, or no treatment. Your confidence in this article is elevated because it is a meta-analysis from the highly respected Cochrane Library, MEDLINE, and others.[2]

*Review of the Page et al. article*[3]

Page et al. understood the uncertainty of the effectiveness and duration of benefit of therapeutic ultrasound for patients with mild-to-moderate symptoms of CTS. Their research objective was to review the effect of no treatment, placebo, or other non-surgical intervention vs. therapeutic ultrasound on CTS patients.

**Methods:** The authors searched in the Cochrane Neuromuscular Disease Group Specialized Register (22 February 2011), the Cochrane

Central Register of Controlled Trials (CENTRAL) (The Cochrane Library, 2011, Issue 1), MEDLINE (January 1966 to February 2011), EMBASE (January 1980 to February 2011), CINAHL Plus (January 1937 to February 2011), and AMED (January 1985 to February 2011) for randomized, controlled trials (RCTs) that compared no treatment, placebo, or other non-surgical intervention with any regimen of therapeutic ultrasound for patients with CTS.

Risk ratio (RR) and mean difference (MD) with 95% confidence intervals (CIs) for primary and secondary outcomes were calculated. (See below for definitions of terms.)

**Results:** Eleven studies randomizing 443 patients were used in the review. The authors concluded that there is insufficient evidence to support one therapeutic ultrasound regimen over another. The differences were generally small and not statistically significant for symptoms, function, and neurophysiologic parameters among groups receiving differing ultrasound frequencies and intensities, and between ultrasound as part of a multicomponent intervention and other non-surgical interventions.

Only two studies reported the primary outcome of interest, being short-term overall improvement measured by a global rating of improvement or satisfaction with treatment within three months post-treatment. One trial found that when compared with placebo, therapeutic ultrasound may increase the chance of experiencing short-term overall improvement at the end of seven weeks of treatment (RR 2.36; 95% CI 1.40 to 3.98). Losses to follow-up in this study suggest that these data should be interpreted with caution.

Another trial found that at three months post-treatment, therapeutic ultrasound plus splint increased the chance of short-term overall improvement, measured by patient satisfaction, compared with splint alone (RR 3.02; 95% CI 1.36 to 6.72). This same trial went on to show that therapeutic ultrasound plus splint decreased the chance of short-term overall improvement when compared with low-level laser therapy plus splint (RR 0.87; 95% CI 0.57 to 1.33). The fact that patients were not blinded to treatment and that there are questions related to adequate concealment of the random allocation sequence of subjects tested suggests caution with regard to our interpretation of this study.

**Conclusion:** Page et al.'s review of the literature revealed poor-quality evidence to suggest therapeutic ultrasound may be more effective than placebo for either short- or long-term symptom relief of patients with CTS. Further, their review of the literature did not reveal sufficient evidence to suggest that any regimen of therapeutic ultrasound may be more effective than another or more effective than other non-surgical interventions. The authors concluded that more studies are needed to assess the effectiveness of therapeutic ultrasound for CTS patients.

*Can you use this study to help your patient?*
Risk Ratio describes the relative benefit, not the absolute benefit. A significant RR >2 (or <0.5) may be considered to be strong, and RR >10 (or <0.2) indicates very strong evidence of benefit.[2]

The Confidence Intervals (calculated using a statistical program) provide information about the range of the true treatment effect. Wide Confidence Intervals in relation to the point estimate, or treatment effect, indicate instability. Narrow Confidence Intervals in relation to the point estimate tell you that the estimated value is relatively stable; that repeated treatment types would give approximately the same results.[4]

The Page et al. article provides a summation of a variety of research papers, with varying degrees of treatment effectiveness. When you consider the Risk Ratios and Confidence Intervals, the outcomes indicate that therapeutic ultrasound may not be the most beneficial approach in the treatment of CTS.

*Are the study findings applicable to your patient?*

Having read this article, you consider that your patient may better benefit from treatment protocols that do not include therapeutic ultrasound. Further, you consider the expense to your patient, in both time and money. You conclude that in this case, therapeutic ultrasound is not a viable option.

*What is your decision?*
After your clinical evaluation, you have several options to consider. You may consider carpal bone mobilization combined with myofascial release techniques, continuous low-level heat wrap therapy, or laser therapy. Your patient may need to modify her activity with more frequent breaks, stretches, yoga, and the use of a splint at night.[1] Consideration must be given to this patient's time and commitment, and willingness to follow through with home-care demands.

***Description of Tests/Terms:***
*Square Wrist Sign:* A ratio of the anteroposterior dimension of the wrist (measured at the distal wrist crease) to the mediolateral dimension of the wrist (measured at the distal wrist crease) of greater than 0.7 indicates a positive Square Wrist Sign.[1]

*Closed Fist Sign:* Paresthesias noted along the median nerve distribution upon active flexion of the fingers into a closed fist, which is held up to 60 seconds, indicates a positive Closed Fist Sign.[1]

*Flick Sign:* Quick flicks of the wrist and hand result in noted improvement in symptoms.[1]
*Meta-analysis:* A summary of the results of randomized controlled trials using quantitative methodology[2]

*Risk Ratio* (aka *Relative Risk*): The relative risk of an event among an exposed population (experimental group) to the risk among the unexposed (control group) [5]

*Confidence Interval:* The range of values within which it is probable that the true value of a parameter (e.g., a mean, a relative risk) is expected to lie; refers to the reliability of an estimate [5]

*Theresa Whitney, BEd, DC, is a part-time associate professor, clinician, and West Campus liaison of the Capstone Department at Palmer College of Chiropractic-West Campus, San Jose, Calif.*

**References**

1. DynaMed.
2. Nordenstrom, J. *Evidence-Based Medicine in Sherlock Holmes' Footsteps*, Malden, Maine: Blackwell Publishing Ltd.; 2007.
3. Page MJ, O'Connor D, Pitt V, Massy-Westropp N., School of Public Health & Preventive Medicine, Monash University, The Alfred Centre, 99 Commercial Road, Melbourne, Victoria, Australia, 3004, Therapeutic ultrasound for carpal tunnel syndrome. Cochrane Database Syst Rev. 2012 Jan 18;1:CD009601.
4. www.health.ny.gov/diseases/chronic/confint.htm
5. Guyatt G, Walter S, Cook D, Wyer P, Jaeschke R. Chapter 8. Confidence Intervals. In: Guyatt G, Rennie D, Meade MO, Cook DJ, eds. *Users' Guides to the Medical Literature: A Manual for Evidence-Based Clinical Practice*, 2nd ed., New York, NY: McGraw-Hill; 2008.