SNI
SURGICAL NEUROLOGY INTERNATIONAL
SNI: Review of Randomized Controlled Trials
OPEN ACCESS
For entire Editorial Board visit : http://www.surgicalneurologyint.com
Editor: Benjamin W. Y. Lo, MD Montreal Neurological Institute & Hospital, McGill University, Quebec, Canada

Letter to the Editor

Randomized clinical trials in carpal tunnel release: A double-edged sword

Hussam Abou-Al-Shaar, Mark A. Mahan

Department of Neurosurgery, Clinical Neurosciences Center, University of Utah, Salt Lake City, Utah, USA

E-mail: Hussam Abou-Al-Shaar - aboualshaar.hussam@gmail.com; *Mark A. Mahan - mark.mahan@hsc.utah.edu
*Corresponding author

Received: 19 September 17 Accepted: 08 December 17 Published: 21 February 18

Dear Editor,

Carpal tunnel syndrome (CTS) is the most common compressive neuropathy with significant societal implications. It accounts for 90% of all nerve compression syndromes.[6] The condition has a prevalence of 2.7% among people aged between 25 and 74 years old, as diagnosed by clinical examinations and nerve conduction studies.[1] CTS has a significant association with workers. A study in 2010 documented the prevalence of work-related CTS to be 2%, with 3.1 million cases of work-related CTS.[11] CTS also causes the highest median number of days away from work among major disabling workplace injuries and illnesses in the US.[4] Furthermore, more than 1 out of 10 patients stop working after CTS treatment; thus, CTS carries a huge socioeconomic burden.[3] Although conservative treatment measures are available, when they fail, surgical release often provides meaningful benefit. In 2006 alone, carpal tunnel release was performed more than 577,000 times in the United States.[7] Because of this frequency in the employed population, demand for faster recovery has spurred minimally invasive procedures such as the endoscopic carpal tunnel release.

Yet, innovation is not always better. The possible superiority of open carpal tunnel release versus the endoscopic technique, or vice versa, has been a controversial topic for the past two decades. Early retrospective studies showed large heterogeneity in outcomes, favoring one technique over the other.[10,12] Thus, the need for randomized clinical trials (RCTs) was clearly indicated to definitively address the question.

Unfortunately, differing RCTs found contradictory results and concluded favoring one approach over the other; this created more confusion and continued the debate over which approach constitutes the best modality for carpal tunnel release. These opposing findings led researchers to conduct more RCTs using very rigorous and limiting methodological criteria to compare the two approaches to provide a clearer evidence-based answer. Although the results of these trials demonstrated similar success, satisfaction, and complication rates,[2,5,14,15] the rigorous methodological criteria have created latent design biases that can influence the outcomes of one approach over another, thus generating mere statistical data that do not apply to the broad array of clinical patients. In fact, most criteria used in these trials do not take into account the conditions that peripheral nerve surgeons face in their daily practice, as most exclude patients with diabetes, inflammatory conditions, previous hand trauma, osteoarthritis, endocrinopathies, and various other comorbidities that are quite frequently encountered. When we applied these criteria to our patients with CTS who underwent carpal tunnel release, only approximately 60% fit common inclusion criteria (unpublished data).

Access this article online

Quick Response Code:

Website: www.surgicalneurologyint.com

DOI: 10.4103/sni.sni_355_17

How to cite this article: Abou-Al-Shaar H, Mahan MA. Randomized clinical trials in carpal tunnel release: A double-edged sword. Surg Neurol Int 2018;9:42. http://surgicalneurologyint.com/Randomized-clinical-trials-in-carpal-tunnel-release:-A-double-edged-sword/

Moreover, many of those RCTs fail to address potentially biasing factors related to their study designs and follow-up methodologies.

It is, therefore, worth shedding light on a few of these potential biases in CTS RCTs. Allocation concealment is one of the most important selection biases encountered among CTS trials. Allocation concealment occurs when randomization is not adequately protected, resulting in a breach in blinding of investigators and/or participants.[16] This type of bias frequently leads to other biases, including Pygmalion effect (observer-expectancy bias), in which the investigators' expectations affect the outcomes of the study, as well as detection bias, in which the investigators alter the determination and interpretation of outcomes between study groups. To overcome this group of biases, the researchers should be strict in their randomization and blinding processes to avoid any confounders and hidden biases. While blinding patients to surgical procedures, e.g., using multiple skin incisions to hide the actual approach, is unethical, blinding evaluators is essential. Objective outcome assessment is dependent on trained, independent evaluators who are blinded to different treatment modalities. Another set of biases encountered in CTS trials encompass reporting and attrition biases, in which investigators report subjective outcomes that favor one treatment modality over others or they fail to correctly collect/report outcome data, respectively.[8] These biases are commonly present in CTS clinical trials, which might in part explain the variation in results/outcomes across different CTS trials. Therefore, applying a paradigm from these RCTs in conventional practice will likely produce widely different results. It is also essential to recognize the conflicts of interests and pharmaceutical funding in studies that might sway investigators from objectively reporting their outcomes.

Although RCTs can constitute the highest level of evidence-based medicine, many RCTs are not, in fact, level 1 evidence. Thus, various strategies and approaches were established and developed to overcome methodological limitations related to randomized clinical design and conduct of RCTs, including CTS trials. Those strategies include (1) using propensity score analysis techniques for patient databases to examine matched cohorts of similar characteristics, without having to exclude patients frequently encountered in daily practice;[13] (2) using objective measures of neurophysiological parameters for diagnosis and treatment follow-up; (3) blinding of outcome assessors; and (4) statistical analysis accounting for presence of confounders, such as presence of work-related disability.[9]

In the most recent Cochrane review, the authors concluded that the "overall risk of bias in studies that contribute data to these results is rather high … the quality of evidence in this review may be considered as generally low."[15] We agree that latent bias and limited outcome measurements restrict the application of these trials. It is, therefore, always important to keep in mind that the results of the trials reflect the selection criteria of the trials and favored outcome assessments, not real-world conditions. Broad application of a trial and its results, without consideration of the real and latent biases, is therefore not advised.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

REFERENCES

1. Atroshi I, Gummesson C, Johnsson R, Ornstein E, Ranstam J, Rosén I. Prevalence of carpal tunnel syndrome in a general population. JAMA 1999;282:153-8.
2. Atroshi I, Hofer M, Larsson GU, Ranstam J. Extended follow-up of a randomized clinical trial of open vs endoscopic release surgery for carpal tunnel syndrome. JAMA 2015;314:1399-401.
3. Bekkelund SI, Pierre-Jerome C, Torbergsen T, Ingebrigtsen T. Impact of occupational variables in carpal tunnel syndrome. Acta Neurol Scand 2001;103:193-7.
4. Bureau of Labor Statistics. 1999 [04-02-2001]; Available from: http://www.bls.gov/opub/ted/2001/apr/wk1/art01.htm. [Last accessed on 2017 Aug 08].
5. Hu K, Zhang T, Xu W. Intraindividual comparison between open and endoscopic release in bilateral carpal tunnel syndrome: A meta-analysis of randomized controlled trials. Brain Behav 2016;6:e00439.
6. Ibrahim I, Khan WS, Goddard N, Smitham P. Carpal tunnel syndrome: A review of the recent literature. Open Orthop J 2012;6:69-76.
7. Jain NB, Higgins LD, Losina E, Collins J, Blazar PE, Katz JN. Epidemiology of musculoskeletal upper extremity ambulatory surgery in the United States. BMC Musculoskelet Disord 2014;15:4.
8. Lewis SC, Warlow CP. How to spot bias and other potential problems in randomised controlled trials. J Neurol Neurosurg Psychiatry 2004;75:181-7.
9. Little RJ, Rubin DB. Causal effects in clinical and epidemiological studies via potential outcomes: Concepts and analytical approaches. Annu Rev Public Health 2000;21:121-45.
10. Louie DL, Earp BE, Collins JE, Losina E, Katz JN, Black EM, *et al*. Outcomes of open carpal tunnel release at a minimum of ten years. J Bone Joint Surg Am 2013;95:1067-73.
11. Luckhaupt SE, Dahlhamer JM, Ward BW, Sweeney MH, Sestito JP, Calvert GM. Prevalence and work-relatedness of carpal tunnel syndrome in the working population, United States, 2010 National Health Interview Survey. Am J Ind Med 2013;56:615-24.
12. Oertel J, Schroeder HW, Gaab MR. Dual-portal endoscopic release of the transverse ligament in carpal tunnel syndrome: Results of 411 procedures with special reference to technique, efficacy, and complications. Neurosurgery 2006;59:333-40; discussion 333-340.
13. Rosenbaum PR, Rubin DB. The central role of the propensity score in observational studies for causal effects. Biometrika 1983;70:41-55.
14. Sayegh ET, Strauch RJ. Open versus endoscopic carpal tunnel release: A meta-analysis of randomized controlled trials. Clin Orthop Relat Res 2015;473:1120-32.
15. Vasiliadis HS, Georgoulas P, Shrier I, Salanti G, Scholten RJ. Endoscopic release for carpal tunnel syndrome. Cochrane Database Syst Rev 2014;1:CD008265.
16. Viera AJ, Bangdiwala SI. Eliminating bias in randomized controlled trials: Importance of allocation concealment and masking. Fam Med 2007;39:132-7.