

**Title:** Influence of temperature on sonographic images of the median nerve for the diagnosis of carpal tunnel syndrome: a case control study

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**Reviewer:** Norman Kettner

**Reviewer's report:**

General

Carpal tunnel syndrome (CTS) is the most common peripheral neuropathy of the upper extremity. Ultrasonography (US) plays a central role in its imaging diagnosis. This cross-sectional study evaluated the impact of three grades of local skin temperature on median nerve CSA and intraneural blood flow by power Doppler in CTS patients. The sample included 50 CTS and 50 healthy controls. The CTS patients demonstrated increased CSA at all 3 grades of temperature while intraneural vascularity of the median nerve was not seen at the highest skin temperature 34°C. The study findings contribute to the role of US in the CTS diagnosis and may serve to improve its specificity. The manuscript is of appropriate length, well organized and clearly written. A few points of clarification would improve an already high quality manuscript.

Specific

Abstract

The abstract is structured and reflects the content of the main text.

Introduction

The aims of the study and research question are clearly stated and referenced. Local skin temperature increase is known to vary the sensory and motor conduction during NCS examinations. The CSA and intraneural blood flow using US have not been studied as a function of skin temperature variations, a clinically relevant question which may impact testing performance measures.

Methods

The inclusion and exclusion criteria for CTS patients and controls are identified and appropriate for the study aims. The evaluation protocol for CTS reflected the standard of care e.g. clinical, sensory testing, NCV and US with one possible exception, the exclusion of the Boston Carpal Tunnel Questionnaire. This questionnaire is validated and widely utilized in clinical and research settings for CTS.

Under physical examination section, the paragraph addressing Semmes Weinstein monofilament (SWM) sensory test makes use of the reference to a “positive test” when participants could identify which finger is being tested, this is probably a typo. Please revise (1). In the conventional SWM method a positive test is when the recorded threshold value of a radial digit is higher than 2.83. Please revise (2).

Please clarify (3) how long, following the hot pad application, did the skin temperature remain at the target temperature?

The use of a customized segmentation algorithm is a novel approach to acquire precise intraneural blood flow and constitutes a major strength of the study design. Please (4) indicate why the area of intraneural blood flow data was not included in the results section of the manuscript.

The statistical model is appropriate to address the study aims.

## Results

The study results are clearly described in the text and are accompanied by 3 tables clearly displaying the relevant data.

## Discussion

There is a useful and informative discussion of vascular pathological mechanisms and thermal effects to explain the study findings.

Please comment (5) in the discussion on the role of maladaptive cortical neuroplasticity in the pathophysiology of CTS.

Please discuss (6) the future directions of this research.

## Conclusion

The stated conclusion is commensurate with the study data.

## References/Tables/Figures/Appendix

The references are relevant and appropriate in number. There are two high resolution US figures displaying short and long axis images of the median nerve in B-mode and power Doppler. The appendix displays two figures, the HSV color space model and color segmentation results.

## Summary

The study question is clinically relevant and the design appropriate to address the aims. The methods employed a novel algorithm to quantitatively establish the intraneural blood flow, a major strength of the study. The study results have translational value.