HEART RATE VARIABILITY AS BIOMARKER FOR EFFECTIVE TRANSCUTANEOUS AURICULAR VAGAL NERVE STIMULATION: DIFFERENTIATING VAGAL VERSUS SYMPATHETIC ACTIVITY

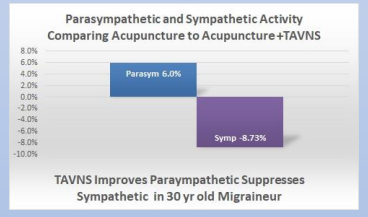
K. Sparrow, MD Clinical Physician San Francisco, California

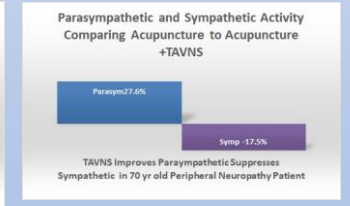
Hypothesis and Introduction

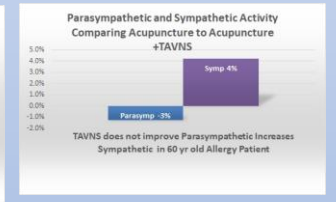
Acupuncture triggers anti-inflammatory, immune feedback using the Neuroendocrine Immune system, whereby needling activates pain fibers that signal the vagus to dampen cellular inflammatory processes via the brainstem. Heart Rate Variability (HRV), a noninvasive monitor, can capture these alterations in autonomic balance. Vagal activity is increased with acupuncture, especially in patients who have successful clinical outcomes. This study is part of an effort to refine HRV as a potential biomarker for successful treatment and to evaluate potential adjuncts to traditional treatment.. Of interest are modalities suitable for home use to enhance and reinforce clinical treatment. Stimulation parameters and patient variability can significantly impact autonomic response to Acupuncture and TAVNS·

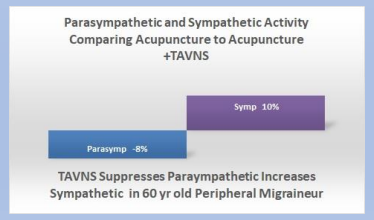
The hypothesis here is that TAVNS added to acupuncture treatment would further improve autonomic balance and be captured by HRV analysis.

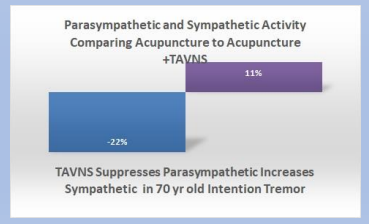
Results











Website and contact info

Conclusion: In this study, there was no consistent evidence that TAVNS improved HRV when added to acupuncture treatment. This concurs with a recent review of the literature that found that HRV is not a reliable biomarker for TAVNS effects.

Materials and Methods

Patients' HRV monitored using Vivosense softward, nonin pulse oximeter in supine position for 3 minutes baseline and for entire treatment including TAVNS (when used), needling, and resting with needles retained 20 minutes. HRV analyzed in 1 minute segments for LF/HF, LF, HF. TAVNS clip electrode applied to cymba concha left ear, 1hz. Standard TCM Acupuncture body treatment according to condition used. Patients presented here had significant clinical improvement. In each case 5 visits with TAVNS were compared to 5 treatments with acupuncture only.

Discussion

Recent research has helped to define best parameters for TAVNS treatment. Acupuncture also improves autonomic balance, which may be partially responsible for Acupuncture's results.

In this study, improved vagal activity with the addition of TAVNS was only shown in 2 out of 5 patients. Bedside HRV analysis may not be adequate to measure the additional impact of TAVNS on autonomic balance in the acupuncture clinic. Indeed, a recent literature review showed that HRV could not reliably measure TAVNS effects on autonomic balance. In that study they postulated that the right ear might be a more suitable site for TAVNS stimulation, rather than the left, as used here. Other studies indicate that persistent use of TAVNS over days has more pronounced effect on autonomic balance. The short time monitored in the clinic is insufficient to identify responders suitable for TAVNS treatment at home. It's possible that with further refinement of TAVNS protocols, HRV will be a useful monitor

References

Ulloa L[1], Quiroz-Gonzalez S[2], Torres-Rosas R[3]. Nerve Stimulation: Immunomodulation and Control of Inflammation. Trends Mol Med. 2017 Dec;23(12)

Li Y, Yang M, Wu F, Cheng K, Chen H, Shen X, Lao L. Mechanism of electroacupuncture on inflammatory pain: neural-immune-endocrine interactions. J Tradit Chin Med. 2019 Oct;39(5):740-74

Liu, S., Wang, Z., Su, Y. et al. A neuroanatomical basis for electroacupuncture to drive the vagal–adrenal axis. Nature 598, 641–645 (2021)

Wolf, V., Kühnel, A., Teckentrup, V., Koenig, J., & Kroemer, N. B. (2021). Does transcutaneous auricular vagus nerve stimulation affect vagally mediated heart rate variability? A living and interactive Bayesian meta-analysis. Psychophysiology, 58, e13933.