The Effect of Vibratory Stimulation on Protective Sensation within the Foot

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Statement of Purpose and Literature Review

Within the daily scope of a foot and ankle physician’s practice, it is entirely common patients will present in need of interventions that can elicit pain or discomfort such as an injection or debridement. A podiatric physician has some options to manage pain during in-office procedures such as the use of topical anesthetics and vapocoolant spray. Recently, there has been interest in utilizing vibratory stimulation to arouse Aβ fibers which reduce pain via the pain gating phenomenon. Previous studies have shown promising results in both pediatric and adult subject groups in a non-podiatric setting. If a vibratory stimulus is able to produce a transient loss of protective sensation, then this modality may prove to be of use for painful interventions or on sensitive patients. In this study, we attempted to validate the level of effectiveness of a pedal vibratory device (Buzzy®, MMJ labs, Atlanta, GA) by way of a standard protective sensation screening protocol.

As of this writing, there have been no studies performed investigating the effect of vibratory stimulation on protective sensation. The objective of this investigation was to examine the ability of vibratory stimulation in producing a transient impairment in sensation in the feet.

Methodology

The design of this study was a prospective clinical trial using 44 volunteers at the Temple University School of Podiatric Medicine. Consent to participate in the study was obtained. No medical intervention was rendered after the test was performed.

Subject Population: Inclusion criteria: Nondiabetic subjects. Exclusion criteria: skin compromise over the Buzzy® application site, history of peripheral neuropathy, fibromyalgia, or CRPS.

Procedure: After consent the investigator blinded-did the volunteer and assessed protective sensation using a 0-4g monofilament touching 10 points on the foot (see figure 1). The right foot was always designated to be the control side (ie, without vibratory device); the control was assessed once and a second time. The left foot was assessed in the same manner after the right foot; however for one trial the Buzzy® unit would be applied over the tarsal tunnel with an aim to target the Tibial nerve distributions, and then for the second trial, placed on the dorsum of the foot with an aim to target Common peroneal nerve distributions. Volunteers were asked to reply “Yes” for each touch of the monofilament they felt. We tabulated each touch out of potentially ten touches the subject reported feeling.

Instruments: Vibratory stimulation was delivered via the use of a Buzzy® XL Healthcare unit which is applied using a Velcro strap (see figure 2). A graded monofilament weight set including 0.4 gram monofilament up to 300 gram monofilament.

Results

• Utilizing the paired t test there was a significant difference found between the amount of stimuli detected between the control trials versus the intervention with the Buzzy® over the dorsum of the foot and over the tarsal tunnel. Both comparisons yielded p values of under 0.00001. Of note there is no significant difference comparing the results of the Buzzy® over the dorsum vs. the tarsal tunnel with p=0.05564.
• Sensory threshold in healthy subject in the foot has been previously demonstrated the 0.4g monofilament as minimum sensory threshold. This study has demonstrated external vibratory sensation is capable of producing a transient diminished sensation.
• The loss of protective sensation (LOPS) leading to the insensate foot is a common patients will present in need of interventions that can elicit pain or discomfort such as an injection or debridement.

Discussion

The authors welcome further studies to determine if there are ways to optimize this modality, such as ring block type vibratory ankle sleeve, to yield more significant results. We are interested in this idea.

• The limitations of this study are as follows: Entirely healthy cohort.

References