

# Effect of ultrasound-guided percutaneous neuromodulation in ankle instability: a case study

Rodríguez Rosal M.<sup>1</sup> Sánchez Sixto A.<sup>1</sup> Álvarez Barbosa F.<sup>1</sup> Yáñez Álvarez A.<sup>2</sup>

<sup>1</sup>CEU Cardenal Spínola, Sevilla, Spain

<sup>2</sup>Universidad de Sevilla, Sevilla, Spain

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## Abstract

**Background and Aims** Ankle proprioception can be tested in many ways. Some studies have found improvements in individuals with chronic ankle instability after receiving treatment and training proprioceptive acuity and speed. Currently, there is a scarcity of evidence concerning percutaneous neuromodulation. The first findings were reported in the post-surgical stage after total knee arthroplasty and in neural improvements and symptoms in patients with hyperactive bladder.

**Aim** To evaluate the effectiveness of percutaneous neuromodulation on the tibial nerve for the improvement of various proprioception parameters in patients with chronic ankle instability.

**Material and Methods** Five men (age:  $24.8 \pm 4.9$  years; height:  $1.78 \pm 0.08$  m; weight:  $86 \pm 9.8$  kg) with chronic ankle instability, who regularly practiced sports activities participated in the present study. People who had undergone an injury in the previous three months were excluded from the study. Currently, there is a scarcity of evidence concerning test before and immediately after percutaneous neuromodulation. A single leg balance test was performed with eyes open and closed, maintaining the single-legged position on a force plate during 30 seconds (Accupower; AMTI, Watertown, MA) registering 1000 Hz. The displacement of the center of pressure (DOT) was determined based on the distances of its antero-posterior axes (DOT\_AP) and medio-lateral (DOT\_ML). Furthermore, the amplitudes of anteroposterior and medio-lateral displacement were evaluated (ACPap and ACPml). The posterior tibial nerve was stimulated under ultrasound guidance using a 100 Vpp current, with a pulse width of 250  $\mu$ s and a repetition frequency of 2 to 10 Hz. The process was performed on three occasions during 30 seconds, with an intensity that was acknowledged by the patient but which did not go beyond a score of 3 in the visual analog scale (VAS). The means and standard deviations were calculated for all variables. The effect size was calculated establishing the confidence interval at 90% and the probability of the change being significant was qualitatively calculated.

## Keywords

- ▶ percutaneous neuromodulation
- ▶ ankle
- ▶ proprioception
- ▶ tibial nerve

**Results** A decrease was found in the ACPap (Pre-test eyes open:  $5.42 \pm 0.62$  and eyes closed:  $15.99 \pm 0.60$ ; Post-test eyes open  $4.05 \pm 0.36$  and eyes closed  $10.33 \pm 0.49$ ) after the neuromodulation intervention on the tibial nerve. This was a significant change and a “possible” effect size was found in the closed eyes condition ( $-0.54; \pm 0.72$ ), according to Hopkins. For the remaining variables, no significant differences were observed.

**Conclusions** A decreased displacement of the center of mass was found in the antero-posterior axis after performing the neuromodulation technique on the tibial nerve in patients with chronic ankle instability.