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Brief report

Modifications of baropodograms after transcutaneous electric stimulation of the abductor hallucis muscle in humans standing erect

Jean-Claude Gaillet ^{a,*}, Jean-Claude Biraud ^a, Monique Bessou ^{b,c}, Paul Bessou ^d

^a *Cabinet de Podologie, 85, rue de Venise, 51100 Reims, France*

^b *Laboratoire de Biophysique, CHU Rangueil, Toulouse, France*

^c *Faculté de Médecine, Centre de Recherche Cerveau et Cognition, UMR 5549/CNRS, 31062 Toulouse, France*

^d *Service d'Exploration Fonctionnelle Sensorielle et Motrice, CHU Rangueil, Toulouse Cedex, France*

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Abstract

Background. Objective data on abductor hallucis muscle biomechanical function in the loaded foot (subject standing erect on both legs) are unavailable.

Objective. To evaluate the effects of electrical stimulation of the abductor hallucis muscle in the loaded foot on the change of plantar pressures, as measured by digital baropodograms.

Design. Six indices were defined to compare baropodograms.

Methods. The abductor hallucis muscle in 1 foot was subjected to transcutaneous electrical stimulation (20 min) while the subject was standing erect on the floor. Baropodograms were recorded before, immediately thereafter, then 15 days and 2 months later. Differences between baropodogram indices were subjected to one-way ANOVA.

Results. Electrical abductor hallucis muscle stimulation induced, on the stimulation side, a post-contraction state easily detected on baropodograms as the increased plantar pressure on the anterior-medial part of the sole, and lateral displacements of the anterior maximal pressure point and the foot thrust center. These mechanical signs, consistent with foot inversion, induce external rotation of the leg and pelvic rotation on the stimulated side, leading to contralateral plantar-pressure changes: decreased maximal pressure point and thrust in the posterior part of the footprint and lateral displacement of the foot thrust center.

Conclusions. Electrical stimulation of the abductor hallucis muscle in the loaded foot induces immediate specific changes in baropodogram indices, some of which persist 2 months later.

Relevance

The mechanical effect of abductor hallucis muscle stimulation (foot inversion) and its post-contraction state could be useful in podiatric and postural rehabilitation.

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Keywords: Abductor hallucis muscle; Digital baropodogram; Pes varus; Post-contraction; Electrical stimulation; Pressure; Electronic pressure platform (baropodograph)