

Comparing the venous haemodynamic effect of a neuromuscular stimulation device to intermittent pneumatic compression in healthy subjects

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Introduction: Enhancement of peripheral circulation has been shown to be of benefit in many vascular disorders, and the clinical application of intermittent pneumatic compression (IPC) devices are well established in peripheral vascular disease. This study aims to compare the haemodynamic efficacy of a novel neuromuscular electrical stimulation (NMES) device, superficially applied over the common peroneal nerve (geko™, Firstkind Ltd, setting: 27 mA, 1 Hz) with IPC calf system (SCD Express™, Covidien, 11 second compression cycle/minute) in healthy subjects.

Methods: Ten healthy volunteers were screened for co-morbidities and vascular health before randomisation into one of two equal sized groups. Baseline measurements of superficial femoral venous velocity and volume flow were taken, then the subjects received bilateral therapy with the two devices in an interventional cross-over trial. Ten baseline readings were compared with ten taken after thirty minutes of therapy, then devices were swapped and measurements repeated. Tolerability was measured using a verbal rating score (VRS).

Results: 4 males and 6 females were screened and enrolled on the study, and successfully completed. Mean age was 27.1 and BMI 24.8 and ABPIs all lay between 0.9 and 1.1.

Two females were on the oral contraceptive pill. Overall Geko™ and IPC significantly increased the volume flow (46%, 7% respectively), peak velocity (42%, 19%), and TAMV (12%, 27% respectively). It was also noted that when IPC was used first in the cross-over, it significantly enhanced the effect of the geko™ device (volume flow p38%, peak velocity p28%, and TAMV p44%). However, when the geko™ device was used before IPC, the efficiency of the compression was significantly reduced (-7%, -48%, -88% respectively). Both devices were tolerated well, VRS was statistically lower for IPC than NMES (1.5 and 2.8, p<0.006) but both scored less discomfort than a standard blood pressure measurement.

Discussion: IPC is an established medical therapy for prevention and treatment of many vascular disorders. The geko™ device is equivalent and/or superior at enhancing the venous haemodynamic ultrasound parameters in healthy people; although its suitability for deep vein thrombosis prophylaxis has yet to be fully explored. However, it is noted that what has been seen in this study points to a potentially slightly different mechanism of action for electrical stimulation of the muscle pump over purely compressive methodologies. The geko™ device seems to be operating via a modality that affects the

flow properties of the vascular bed in the leg. This may be via a local pressure effect, neuronal or endogenous cytokine media, or other unknown local microvascular modification. Studies into the effect on the arterial system, and effects on subjects with vascular pathology are indicated.

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