

Measurement of blood flow in the deep veins of the lower limb using the geko™ neuromuscular electro-stimulation device.

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Background

A previous study using electrical stimulation of the common peroneal nerve (geko™) to activate the venous muscle pump measured blood flow in both the femoral and popliteal veins. Increased blood flow by as much as 60% was demonstrated in the femoral vein. Such an increase is assumed to be as a result of an increase in venous flow from the deep calf veins; however this has yet to be confirmed. The aim of this study was to conduct direct measurements in these deep calf veins to confirm this assumption in healthy individuals.

Methods

This was a single centre open-label intra-subject healthy volunteer comparison of blood flow in the peroneal, posterior tibial and gastrocnemial veins with and without the geko™ device. The device was applied to 18 volunteers. Peak venous velocity (PV) and ejected volume per individual stimulus (VS) and volume flow (VF) was determined using ultrasound.

Results

Peak velocity (PV) increased 216% in the peroneal vein, by 112% in the posterior tibial vein and by 137% in the gastrocnemial vein ($P < 0.001$). Ejected volume per stimulus increased by 113% in the peroneal vein, by 38% in the posterior tibial vein and by 50% in the gastrocnemial vein ($P < 0.003$). Associated volume flows during the muscle contraction were increased by 36%, 25% and 17%, respectively ($P = 0.05$).

Conclusions

This is the first time that neuromuscular electro-stimulation has been shown to be an effective method of increasing flow in the axial deep veins of the calf. Significant increases in velocity and volume flow in response to the electrical stimulus were seen in all three veins studied. Enhancements of both blood velocity and volume flow are key factors in the prevention of venous stasis and ultimately deep vein thrombosis (DVT). Further studies are justified to determine the efficacy of the device in the prevention of DVT.