

Augmentation of venous, arterial and microvascular blood supply in the leg by isometric neuromuscular stimulation via the peroneal nerve

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Abstract

BACKGROUND:

Deep vein thrombosis (DVT) is the formation of a blood clot within the deep veins. During periods of sitting, blood flow is decreased and this contributes to an increased risk of DVT. Trials have shown that 5% to 10% of passengers undertaking long-haul flights develop asymptomatic calf DVT.

AIM:

To investigate the safety and efficacy of a novel neuromuscular device that augments peripheral blood flow.

METHODS:

Thirty healthy volunteers were assessed while seated. Each subject had one leg connected to the stimulator and the other leg immobile acting as control. Fifteen sequential electrical stimulations were applied for 5 min each followed by a 10 min recovery phase. The following non invasive measurements were performed before, during and after the stimulation programs: photoplethysmography, strain gauge plethysmography, laser Doppler fluxmetry, transcutaneous oxygen tension, pulse oximetry, superficial femoral vein blood flow and vessel diameter (ultrasound); discomfort questionnaires were also administered.

RESULTS:

During neuromuscular stimulation, significant increases in blood volume flow and velocity and skin capillary blood flow were found; transdermal skin oxygen levels were maintained. No changes were observed in heart rate, blood pressure, oxygen saturation or femoral vein vessel diameter.

CONCLUSIONS:

Using a newly developed device, electrical nerve stimulation of the lower leg significantly increased blood flow; the device in the present study is, therefore, a promising tool for the development of a novel DVT prevention device. Because this method of electrical nerve stimulation is virtually pain free, the present study has significant implications for the prevention of DVT in hospitals, outpatient settings and community care settings, as well as in preventing travel-related thrombosis.