

## Use of a Novel Intermittent Compression Shoe in Reducing Lower Limb Venous Stasis

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**Abstract :** This pilot study investigated the efficacy of a newly designed shoe which will act as an intermittent pneumatic compression device to augment venous flow in the lower limb. The aim was to assess the degree with which a wearable intermittent compression device can increase the venous flow in the popliteal vein. Background: Deep venous thrombosis and chronic venous insufficiency are relatively common problems with significant morbidity and mortality. While mechanical and chemical thromboprophylaxis measures are in place in hospital environments (in the form of TED stockings, intermittent pneumatic compression devices, analgesia, antiplatelet and anticoagulant agents), there are limited options in a community setting. Additionally, many individuals are poorly tolerant of graduated compression stockings due to the difficulty in putting them on, their constant tightness and increased associated discomfort in warm weather. These factors may hinder the management of their chronic venous insufficiency. Method: The device is lightweight, easy to wear and comfortable, with a self-contained power source. It features a Bluetooth transmitter and can be controlled with a smartphone. It is externally almost indistinguishable from a normal shoe. During activation, two bladders are inflated -one overlying the metatarsal heads and the second at the pedal arch. The resulting cyclical increase in pressure squeezes blood into the deep venous system. This will decrease periods of stasis and potentially reduce the risk of deep venous thrombosis. The shoe was fitted to 2 healthy participants and the peak systolic velocity of flow in the popliteal vein was measured during and prior to intermittent compression phases. Assessments of total flow volume were also performed. All haemodynamic assessments were performed with ultrasound by a licensed sonographer. Results: Mean peak systolic velocity of 3.5 cm/s with standard deviation of 1.3 cm/s were obtained. There was a three fold increase in mean peak systolic velocity and five fold increase in total flow volume. Conclusion: The device augments venous flow in the leg significantly. This may contribute to lowered thromboembolic risk during periods of prolonged travel or immobility. This device may also serve as an adjunct in the treatment of chronic venous insufficiency. The study will be replicated on a larger scale in a multi-centre trial.

**Keywords :** venous, intermittent compression, shoe, wearable device

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