Enhancing Venous Outflow in Lower Limb with Intermittent Pneumatic Compression. A Comparative Haemodynamic Analysis on the Effect of Foot vs. Calf vs. Foot and Calf Compression

K.T. Delis, G. Slimani, H. M. Hafez and A. N. Nicolaides

Irvine Laboratory for Cardiovascular investigation and Research, Academic Vascular Unit, Imperial College School of Medicine, St Mary’s Hospital, Paddington, London, U.K..

Eur J Vasc Endovasc Surg 19, 250-260 (2000)
Complete article available online at http://www.idealibrary.com

Objectives: intermittent pneumatic compression (IPC), an established method of deep-vein thrombosis prophylaxis, is also an effective means of leg inflow enhancement, improving the walking capacity and ankle pressure of claudicants, long-term. This study, using duplex ultrasonography, compares the haemodynamic effect of IPC of the (a) foot (at 120mmHg [IPC_foot/120mmHg], and 180mmHg [IPC_foot/180mmHg]), (b) calf (IPC_calf, 120mmHg) and (c) both simultaneously (IPC_foot+calf, 120mmHg), on the venous outflow of 20 legs of normals and 25 legs of claudicants.

Results: the peak and mean velocities, volume flow and pulsatility index in the superficial femoral and popliteal veins of both groups increased significantly with all IPC modes (p<0.001). IPC_foot+calf produced the highest enhancement followed by IPC_calf (p<0.01), which was more effective (p<0.001) than either IPC_foot/180 mmHg or IPC_foot/120 mmHg. The venous volume expelled with IPC_calf and IPC_foot+calf was 2-2.5 and 3-3.5 times that with IPC_foot/180mmHg respectively. Velocity enhancement with IPC was similar between groups and the superficial femoral and popliteal veins. IPC_foot/180 mmHg produced higher (p<0.01) flow velocities than IPC_foot/120mmHg in both groups and veins examined; however, differences were limited.

Conclusions: all IPC modes proved effective, IPC_foot+calf generating the highest venous outflow enhancement. Higher venous volumes expelled with IPC_foot+calf explain its reported superiority on leg inflow over the other modes. Increase of applied pressure from 120 to 180mmHg with IPC_foot offered only a small outflow improvement. Venous haemodynamics at rest and with IPC in claudicants do not differ significantly from those in healthy subjects.