Effect of Intermittent Pneumatic Foot Compression on Popliteal Artery Haemodynamics

K T Delis, N Labropoulos, A N Nicolaides, B Glenville, and G Stansby
Imperial College School of Medicine, St Mary's Hospital, London, UK.

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Purpose: The aim was to investigate the effect of intermittent pneumatic foot compression (IPCfoot) on popliteal artery haemodynamics in normal individuals and in patients with intermittent claudication due to peripheral vascular disease (PVD) (Fontaine stage II).

Material and Methods: Popliteal artery volume flow [vFI], pulsatility index [PI], mean velocity [mV], peak systolic [PSV] and end diastolic velocity [EDV], in 25 limbs of 20 normal subjects and 40 limbs of 32 stable claudicants were obtained in the sitting position before, during and within 30 seconds after the application of IPCfoot (applied pressure: 120mmHg; inflation time: 3 seconds; deflation time: 17 seconds) using colour-flow duplex imaging (CFDI). The reproducibility of flow velocity estimations using CFDI in the horizonal [hor] (recovery) and sitting [sit] positions was evaluated in 20 limbs of normal controls and 20 limbs of claudicants.

Results: Popliteal artery vFl, mV, PSV and Pl measurements were performed with a coefficient of variation (CV) of less than 14.6% among claudicants and of less than 13.3% in normal subjects. EDV is the least reproducible parameter with an overall CV range of 10.2-21.5% in normal controls and 9.1-18.6% in arteriopaths. On application of IPCfoot, popliteal artery vFl increased by 111% in the control group ($p<0.001$) and by 51% in the claudicants ($p<0.001$). Within 30 seconds of the cessation of pump action flow decreased significantly in both groups ($p<0.001$), but maintained a significantly higher level than that at baseline ($p<0.001$, in both groups). The mV, PSV and EDV showed a similar pattern of significant changes. Both in normals and claudicants, the PI decreased with IPCfoot($p<0.001$) and increased post-compression; however, it was significantly lower than baseline ($p<0.005$) within 30 seconds of impulse delivery.

Conclusions: Current CFDI technology enables a reproducible estimation of popliteal artery flow velocities. IPCfoot can significantly augment arterial calf inflow on an acute basis both in normals and claudicants. The increase of EDV and decrease of PI indicate that attenuation of peripheral resistance to flow is the main mechanism underlying the popliteal artery vFI enhancement on application of IPCfoot. Prospective trials on the long-term effect of IPCfoot in the management of patients with PVD are indicated from the results of this study.