

ACUTE EFFECTS OF INTERMITTENT PNEUMATIC FOOT AND CALF COMPRESSION ON LOWER LIMB VENOUS HEMODYNAMICS

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Introduction: Intermittent pneumatic compression has been widely used in the prevention of deep vein thrombosis. Recently, it has also been used to treat patients with peripheral arterial vascular disease. This study was undertaken to evaluate the effect of intermittent pneumatic foot and calf compression (IPFCC) on lower limb venous hemodynamics.

Methods: Eleven limbs in 11 symptom-free volunteers with no evidence of arterial or venous disease were examined in the sitting position with the knee flexed to an angle of 120 to 150 degrees. Three veins from the superficial (greater saphenous), muscular (medical gastrocnemius) and deep (popliteal) systems were imaged longitudinally using a 7.5/5.5 MHz trapezoid linear array transducer. Venous volume flow was determined by the cross-sectional area and the mean venous velocity of three consecutive measurements before and during the application of IPFCC. The IPFCC (ArtAssist® AA 1000, ACI Medical, San Marcos, CA) presets were three cycles per minute at 120 mmHg maximum inflation pressure and 0 mmHg minimum deflation pressure.

Results: The coefficient of variation before and during IPFCC application for the diameter measurement in the three veins ranged from 5-25% for the mean velocity from 12-34% and for the flow from 12-58%. The effect of IPFCC on the venous flow (ml/min) in the three different veins is shown below.

	Popliteal		Gastrocnemius		Greater Saphenous	
	Rest	IPFCC	Rest	IPFCC	Rest	IPFCC
Mean	158	1229*	27	132*	22	123*
SD	51	706	13	72	14	71
Range	104-280	450-2388	10-50	39-221	0-45	25-257

*P<001

Conclusion: Duplex ultrasound-derived flow measurements in the lower limb veins exhibit moderate to severe variation. The application of IPFCC greatly enhances the venous flow of superficial, muscular and deep veins at the knee level. This flow increase is well above the variation of the measurement. Our findings may explain the beneficial acute hemodynamic effects of intermittent pneumatic compression on lower limb venous and arterial disease. Potential benefits from endothelium-released mediators that enhance vasodilatation and local or systemic fibrinolytic activity will be studied.

**Presented at the Society of Vascular Technology
Twentieth Annual Conference
San Francisco, CA
July 23-27, 1997**

