EDITORIAL

Intermittent Pneumatic Compression (IPC) in the Treatment of Peripheral Arterial Occlusive Disease (PAOD) – A Useful Tool or Just Another Device?

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The effect of intermittent pneumatic compression (IPC) on arterial inflow to the lower limb has been explored by several investigators.[1-5] Independently, they concluded that there is physiological justification for investigating IPC as a therapy for patients with peripheral arterial occlusive disease (PAOD).[1-5]

There are several mechanisms by which a positive effect on the lower limb tissue perfusion is conferred by the use of IPC. These include emptying of the plantar venous plexus, reduction of the venous leg pressure, increase of the arterio-venous pressure gradients in dependent patients, increase of arterial flow, release of vasodilators (nitric oxide – NO, prostacyclins), reduction of local vascular resistance, and transient suspension of the arterio-venous reflex.[6,7]

In an extensive review of the literature 26 reports were identified between the years 1966 to 2001.[8] In this review they included the subject profile: age, clinical presentation, duration of symptoms, and resting ankle-brachial index (ABPI). They looked at treatment options like the type of pump used, duration of treatment, pattern of pump pressure cycles and whether or not the patients received aspirin. The measurement of vascular changes studied included: initial claudication distance (ICD), absolute claudication distance (ACD), post exercise ABPI, popliteal artery volume flow, peak venous velocity, skin blood flow and temperature, Laser Doppler flow, transcutaneous oxygen pressure and venous pressure via cannulation. Due to the individuality of each study direct comparison was difficult. However, the following trends were observed with the use of IPC:

i. Lower extremity arterial flow in the popliteal, anterior and posterior tibial and peroneal arteries, increased from between 13% to 240%.

ii. The flow of arterial blood measured by Laser Doppler increased from between 57% to 246%.

iii. The velocity of arterial flow increased from between 155% to 320%.

iv. Peak systolic and end diastolic velocities and pulse volume all increased but the results were reported using different parameters and therefore were not comparable.

v. Rest pain was relieved from 16% to 100%.

vi. ICD and ACD increased from 146% to 197% and from 106% to 212%, respectively. Some studies reported on the healing of ulcers. Resting ABPI increased between 17% to 26%.

The conclusion from the review was that the use of IPC for the treatment of PAOD appears to be promising and may be used in patients with severe PAOD who are not candidates for revascularization using PTA or surgery.

Consequently, several other investigators who considered clinical end points such as improvement in ICD and ACD, quality of life and haemodynamic measurements reported independently that IPC Had beneficial effect that was maintained up to a year.[9-14] Gardner *et al*., studied the effect of supervised exercised and found that compared to baseline, at 6 months, the ICD and ACD increased by 189% and 80% respectively ($p < .001$).[15] When they continued with the supervised exercise the initial benefit was sustained for an additional year. Kakkos *et al*., compared the effect of unsupervised exercise (n = 9), supervised exercise (n = 12) and IPC (foot and calf) (n = 13) on patients with stable claudication for longer than 6 months, due to superficial femoral artery occlusion.[10] Compared with unsupervised exercise both IPC and supervised exercise, increased ICD and ACD up to 2.83 times. IPC increased arterial inflow (< 0.05) at 6 weeks and ABPI. In both IPC and supervised exercise the quality of life score improved and at one year the clinical effectiveness was largely preserved.[10]

Recently, the Mayo clinic reported their experience on 48 patients who underwent minor foot amputation (toe, metatarsal, forefoot) during the years 1998 – 2004.[16] These patients were divided in two groups of 24 patients each. In the treatment group the patients received IPC prior to and after the minor foot amputation while in the control group no IPC treatment was offered. Twenty patients in the control group (83%) had to undergo a below knee amputation while in the treatment group this was needed in only 10 patients (42%). They concluded that the use of IPC as an adjunct to a standard wound care regiment in patients with chronic clinical limb ischemia who undergo local foot amputation it is associated with better wound healing and higher chances of foot salvage.

The optimal device appears to be the foot and calf IPC that gives 3 impulses per minute with a delay of 1 sec for calf compression and has an inflation pressure of 120 mmHg that lasts 4 seconds. The recommendation is to use the IPC daily, in a sitting position for a total duration of about 3 hours daily.[17]

Additional clinical effects of IPC are: the maintenance of flow in a failing lower limb graft, reduction of limb oedema and compartmental pressure after injury, elimination of tissue damage, alleviation of rest pain and prevention of venous thromboembolism. All the above may expand the indication for the use of IPC when balloon angioplasty is not possible, when the patient is high risk of peri-operative mortality, when distal arterial beds are unsuitable for graft implantation and in graft failure when the patient is not suitable for further surgery.

The advantage from the use of IPC is that it can be administered at home because the device is portable, the treatment is flexible and can be initiated at the most convenient time during the day for each patient, and therefore, it has high compliance while it is free of complications.

In conclusion, IPC not only could be an alternative in the treatment of PAOD, but it may be used as an adjunct to other treatment. A large multicentre, randomized trial with long follow-up is needed. The cost-effectiveness of such treatment should also be assessed.