Improving Limb Salvage in Critical Ischemia with Intermittent Pneumatic Compression: A Controlled Study with 18-Month Follow Up

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Background: Intermittent pneumatic compression (IPC) is an effective method of leg inflow enhancement and amelioration of claudication in patients with peripheral arterial disease. This study evaluated the clinical efficacy of IPC in patients with chronic critical limb ischemia, tissue loss, and nonhealing wounds of the foot after limited foot surgery (toe or transmetatarsal amputation) on whom additional arterial revascularization had been exhausted.

Methods: Performed in a community and multidisciplinary health care clinic (1998 through 2004), this retrospective study comprises 2 groups. Group 1 (IPC group) consisted of 24 consecutive patients, median age 70 years (interquartile range [IQR], 68.7 – 71.3 years), who received IPC for tissue loss and nonhealing amputation wounds of the foot attributable to critical limb ischemia in addition to wound care. Group 2 (control group) consisted of 24 consecutive patients, median age 69 years (IQR, 65.7 – 70.3 years), who received wound care for tissue loss and nonhealing amputation wounds of the foot due to critical limb ischemia, without use of IPC. Stringent exclusion criteria applied. Group allocation of patients depended solely on their willingness to undergo IPC therapy. Vascular assessment included determination of the resting ankle-brachial pressure index, transcutaneous oximetry ($TcPO_2$), duplex graft surveillance, and foot radiography. Outcome was considered favorable if complete healing and limb salvage occurred, and adverse if the patient had to undergo a below knee amputation subsequent to failure of wound healing. Follow-up was 18 months. Wound care consisted of weekly débridement and biologic dressings. IPC was delivered at an inflation pressure of 85 to 95 mmHg, applied for 2 seconds with rapid rise (0.2 seconds), 3 cycles per minute; three 2-hourly sessions per day were requested. Compliance was closely monitored.

Results: Baseline differences in demography, cardiovascular risk factors (diabetes mellitus, smoking, hypertension, dyslipidemia, renal impairment), and severity of peripheral arterial disease (ankle-brachial indices, $TcPO_2$, prior arterial reconstruction) were not significant. The types of local foot amputation that occurred in the two groups were not significantly different. In the control group, foot wounds failed to heal in 20 patients (83%) and they underwent a below knee amputation; the remaining four (17%, 95% confidence interval [CI], 0.59%-32.7%) had complete healing and limb salvage. In the IPC group, 14 patients (58%, 95% CI, 37.1%-79.6%) had complete foot wound

healing and limb salvage, and 10 (42%) underwent below knee amputation for nonhealing foot wounds. Wound healing and limb salvage were significantly better in the IPC group ($P < .01$, X^2). Compared with the IPC group, the odds ratio of limb loss in the control group was 7.0. On study completion, $TcPO_2$ on sitting was higher in the IPC group than in the control group ($P = .0038$).

Conclusions: IPC used as an adjunct to wound care in patients with chronic critical limb ischemia and nonhealing amputation wounds/tissue loss improves the likelihood of wound healing and limb salvage when established treatment alternatives in current practice are lacking. This controlled study adds to the momentum of IPC clinical efficacy in critical limb ischemia set by previously published case series, compelling the pursuit of large scale multicentric level 1 studies to substantiate its actual clinical role, relative indications, and to enhance our insight into the pertinent physiologic mechanisms.