INTERMITTENT CALF AND FOOT COMPRESSION INCREASES LOWER EXTREMITY BLOOD FLOW

Augustine R. Eze, MD, Anthony J. Comerota, MD, Paul L. Cisek, MD, Burt S. Holland, PhD, Robb P. Kerr, BA, RVT, Ravi Veeramasuneni, BS, Anthony J. Comerota, Jr., Philadelphia, PA

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Purpose: The purpose of this study was to evaluate whether calf and foot compression applied separately and simultaneously increase popliteal artery blood flow and/or foot skin perfusion, and to assess the relative merits of compression in patients with superficial femoral artery occlusion.

Methods: Twenty-two legs from 12 normal volunteers with ankle/brachial indices (ABIs) > 0.96, and 10 legs from 7 claudicator patients with angiographically documented superficial femoral artery (SFA) occlusion and patent popliteal arteries with AIBs < 0.08 were studied in the sitting position. Calf and foot cuffs connected to a rapidly inflating and deflating timed-pressure pump (ArtAssist®-AA 1000; ACI Medical, Inc., San Marcos, CA USA) were applied to the subject in the sitting position. Skin blood flow of the great toe was measured with a laser doppler and popliteal artery blood flow was measured using duplex ultraonography. Foot and calf compression was applied separately and simultaneously at 120mmHg pressure, with a 10-second inflation and 20-second deflation cycle. Popliteal artery blood flow and foot skin perfusion were recorded and the mean of 6 cycles calculated.

Results: Precompression popliteal artery blood flow (mL/min) for volunteers was 38.86 ± 3.94, and for patients was 86.30 ± 14.55 (P=0.001). Precompression foot skin perfusion (mL/min/100/g tissue) for volunteers was 1.67 ± 0.29, and for patients was 4.00 ± 0.92 (P=0.01). With the application of calf, foot, and simultaneous calf and foot compression, the popliteal artery blood flow increased in volunteers by 124%, 54%, and 173%, respectively, and in patients by 76%, 13%, and 50%. Foot skin perfusion increased in volunteers by 260%, 500%, and 328%, respectively, and in patients by 116%, 246%, and 188%. Relative increases in popliteal artery blood flow and foot skin perfusion were higher in volunteers compared with patients during compression; however, the absolute values for foot skin perfusion and popliteal artery blood flow were consistently higher in patients.

Conclusions: Measured in the sitting position, the resting popliteal artery blood flood and foot skin perfusion are greater in patients with SFA occlusion compared with normal volunteers. Following compression, popliteal artery blood flow and foot skin perfusion increased in both groups, but relatively more in volunteers. Increases in popliteal artery blood flow are significantly higher with calf compression than with foot compression for both groups. A patent SFA allows for additive increases in popliteal artery blood flow with simultaneous foot and calf compression in normal persons, whereas this is not observed in patients. However, the increases in foot skin perfusion in patients with an occluded SFA parallel the increases shown in normal volunteers, with separate and simultaneous foot and calf compression.