ABSTRACT: The effect of intermittent pneumatic compression of legs on the levels of nitric oxide related species in blood and on arterial function in the arm

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Background: Intermittent pneumatic compression (IPC) of legs exerts beneficial local vascular effects, possibly through local release of nitric oxide (NO). However, studies demonstrating systemic transport of nitrogen oxide species and release of NO prompt the question of whether IPC could also exert nonlocal effects. We tested whether IPC (1) affects systemic levels of nitrite, S-nitrosothiols and red blood cell (RBC) NO, and (2) exerts vasoactive effects in the brachial artery (BA), although this hypothesis-generating pilot study did not investigate cause and effect relationship between (1) and (2).

Methods: In 10 healthy subjects, ages 24–39 years, we measured plasma nitrite, plasma S-nitrosothiols and RBC-NO from venous blood samples drawn before and after IPC treatment. We also measured BA responses to 5 min of upper arm occlusion at rest and during 1 h of leg IPC.

Results: There was a significant decrease in plasma nitrite (112 ± 26 nM to 90 ± 15 nM, $p = 0.0008$) and RBC-NO (129 ± 72 nM to 102 ± 41 nM, $p = 0.02$). Plasma S-nitrosothiols were unchanged (5.79 ± 4.81 nM to 6.27 ± 5.79 nM, $p = 0.3$). BA occlusion-mediated constriction (OMC) was significantly attenuated with IPC treatment (-43 ± 13% to -33 ± 12%, $p = 0.003$). High-flow mediated BA dilation was unchanged (13.3 ± 9.4% to 11.5 ± 7.2%, $p = 0.2$).

Conclusion: Plasma nitrite, RBC-NO, and BA OMC decreased with leg IPC. We hypothesize that this decrease in circulatory pool of plasma nitrite and RBC-NO may result from the transfer of their NO-bioactivity from blood to the hypoxic arm tissue, to be stored and released under hypoxic stress and oppose OMC. Future studies should investigate whether IPC-induced decreases in brachial OMC are caused by the changes in systemic NO activity, and whether leg IPC could benefit distant arterial function in systemic cardiovascular disease.