Exercise training restores the endothelial progenitor cells number and function in hypertension: implications for angiogenesis.

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Abstract

OBJECTIVES: Aerobic exercise training has been established as an important nonpharmacological treatment for hypertension. We investigated whether the number and function of endothelial progenitor cells (EPCs) are restored after exercise training, potentially contributing to neovascularization in hypertension.

METHODS: Twelve-week-old male spontaneously hypertensive rats (SHRs, n = 14) and Wistar-Kyoto (WKY, n = 14) rats were assigned to four groups: SHR; trained SHR (SHR-T); WKY; and trained WKY. Exercise training consisted of 10 weeks of swimming. EPC number and function, as well as the vascular endothelial growth factor (VEGF), nitrotyrosine and nitrite concentration in peripheral blood were quantified by fluorescence-activated cell sorter analysis (CD34+/Flk1+ cells), colony-forming unit assay, ELISA and nitric oxide (NO) analyzer, respectively. Soleus capillary/fiber ratio and protein expression of VEGF and endothelial NO synthase (eNOS) by western blot were assessed.

RESULTS: Exercise training was effective in reducing blood pressure in SHR-T accompanied by resting bradycardia, an increase in exercise tolerance, peak oxygen uptake (VO2) and citrate synthase activity. In response to hypertension, the amount of peripheral blood-EPC and number of colonies were decreased in comparison with control levels. In contrast, exercise training normalized the EPC levels and function in SHR-T accompanied by an increase in VEGF and NO levels. In addition, oxidative stress levels were normalized in SHR-T. Similar results were found in the number and function of bone marrow EPC. Exercise training repaired the peripheral capillary rarefaction in hypertension by a signaling pathway VEGF/eNOS-dependent in SHR-T. Moreover, improvement in EPC was significantly related to angiogenesis.

CONCLUSION: Our data show that exercise training repairs the impairment of EPC in hypertension, which could be associated with peripheral revascularization, suggesting a mechanism for its potential therapeutic application in vascular diseases.

Comment in

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