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Subclinical Atherosclerotic Risk in Endurance-Trained Premenopausal Amenorrhoeic Women

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ABSTRACT

Purpose: In premenopausal women, amenorrhea contributes to endothelial dysfunction. It is unknown whether this vascular functional change is associated with vascular structural change.

Methods: This study examined regional and systemic vascular structure and function to gain insight into subclinical atherosclerotic risk in 10 amenorrheic athletes, 18 eumenorrheic athletes, and 15 recreationally active controls. Brachial flow-mediated dilation (FMD) and low flow mediated constriction (L-FMC) were used to measure global endothelial function. Carotid-femoral pulse wave velocity (PWV) was used to measure aortic stiffness. Doppler-ultrasound of the superficial femoral artery (SFA) was used to assess intima-media thickness (IMT) and vessel diameter as indicators of vascular remodeling.

Results: Amenorrheic athletes had significantly lower brachial FMD adjusted for shear stimulus (6.9 ± 1.3 %) compared with eumenorrheic athletes (11.0 ± 1.0 %) and controls (11.0 ± 1.1 %, $p=0.05$). Brachial L-FMC (-1.8 ± 4.3 %) and aortic PWV (5.0 ± 1.0 m/s) of amenorrheic athletes were similar to those of eumenorrheic athletes (L-FMC, -1.6 ± 4.6 %; PWV, 4.6 ± 0.5 m/s) and controls (L-FMC, -1.5 ± 2.8 %, $p=0.98$; PWV, 5.4 ± 0.7 m/s, $p=0.15$). SFA diameters were similar in amenorrheic athletes (5.7 ± 0.7 mm) and eumenorrheic athletes (5.7 ± 0.7 mm), but amenorrheic athletes had larger SFA diameters compared with controls (5.1 ± 0.6 mm, $p=0.04$). In amenorrheic athletes, SFA IMT (0.31 ± 0.03 mm) was similar to that of eumenorrheic athletes (0.35 ± 0.07 mm) but significantly thinner compared to that of controls (0.38 ± 0.06 , $p=0.01$).

Conclusion: Vascular dysfunction in female amenorrheic athletes is not systemic. Parenthetically, amenorrhea may not prevent favorable peripheral vascular structural adaptations to habitual exercise training.

Keywords: flow-mediated dilation; arterial stiffness; vascular remodeling; shear stress; premenopausal women

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