Arterial Stiffness is Decreased in Estrogen Deficient Physically Active Women with Functional Hypothalamic Amenorrhea

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Estrogen deficient physically active women with functional hypothalamic amenorrhea (FHA) demonstrate elevated vascular resistance and blunted endothelial function. To test the hypothesis that arterial stiffness is also altered in these women, two age-matched (pooled mean, 24±1 years; mean±SEM) groups of physically active women were studied: those with FHA (ExFHA; n=11) or eumenorrheic menstrual cycles (ExOv; n=12). Radial artery tonometry was used to assess arterial stiffness (augmentation index [AIx, %], AIx adjusted for heart rate [AIx75], and augmentation pressure [AP, mmHg]), and central mean arterial pressure (MAPc, mmHg). Doppler ultrasound measures of cardiac output (CO, L/min), stroke volume (SV, ml) and total peripheral resistance (TPR, dynes/sec/cm5) were calculated. All measures were recorded before and one hour after 45 minutes of moderate intensity dynamic exercise. Compared with ExOv, ExFHA demonstrated lower baseline ($p<0.05$) heart rate (48±2 vs. 54±1, beats/min), MAPc (66±2 vs. 72±2), CO (3.4±0.1 vs. 4.1±0.1), AIx75 (-10.6±2.8 vs. -0.6±3.3), and higher ($p<0.05$) TPR (1607±69 vs. 1400±47). Post-exercise, heart rate and CO were increased ($p<0.05$) and MAPc decreased ($p<0.05$) in both groups, yet values remained lower ($p<0.05$) in ExFHA. TPR decreased ($p<0.05$) in both groups but remained higher ($p<0.05$) in ExFHA. AIx and AIx75 were decreased ($p<0.05$) in ExOv (-2.5±3.5; -10.4±2.3; respectively), but were unaltered ($p>0.05$) in ExFHA. SV did not differ ($p>0.05$) pre- versus post-exercise within- or between-groups. Pre- and post-exercise, AIx and AP correlated positively ($p<0.05$) with TPR and inversely ($p<0.05$) with CO in ExFHA only. In conclusion, ExFHA women demonstrate low resting and post-exercise arterial stiffness in association with high vascular resistance and low CO. Although the role of estrogen deficiency per se is unclear, these findings suggest elevated vascular resistance may serve to low CO rather than increase arterial stiffness in ExFHA.