The effect of upright posture on endothelial function in men and women

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Orthostatic hypotension (OH) is a form of autonomic dysfunction where the cardiovascular system is unable to maintain blood pressure during upright posture. The prevalence of OH in women is 2-fold higher than in men, and the mechanisms are still unclear. The purpose of this study is to assess vasodilatory capacity while upright via measurements of brachial flow-mediated dilation (FMD) and via reactive-hyperemia peripheral arterial tonometry (RH-PAT; an index of microvascular function). We hypothesize that 1) FMD% will be lower in the upright posture because of decreased shear stress, 2) women will have a higher FMD% because of increased vasodilatory capacity, 3) RH-PAT measurements will be lower while upright because of the increased sympathetic activation, and 4) men will have a lower RH-PAT measurement in the upright posture in comparison to women because of their higher sympathetic activity. For the FMD protocol, ten women (20.3±1.5 years, 26.9±4.6 kg/m²) and eight men (21.4±1.7 years, 27.1±7.8 kg/m²) were recruited. Women were tested in the low hormone phase of the menstrual cycle (days 2-5) and were not taking hormonal contraceptives. All participants completed 2 randomized FMD protocols in supine posture and 70° head-up tilt consisting of ultrasound imaging of the brachial artery during 5 minutes of right forearm occlusion and 3 minutes of reperfusion. For the RH-PAT protocol, seven women (22.1±2.7 years, 22.8±2.8 kg/m²) and five men (21.0±2.2 years, 25.1±7.9 kg/m²) were recruited. Each participant underwent 2 randomized RH-PAT trials (supine and upright) consisting of 5 minutes of forearm occlusion and 5 minutes of reperfusion. Pulse pressure waveforms from finger cuffs were relayed to the ENDOPAT 2000 device to quantify the reactive hyperemia index (RHI) and the natural logarithm of the reactive hyperemia index (Ln-RHI). In the upright posture, FMD % scores were significantly higher in comparison to the supine posture (10.3±4.7 vs 15.2±4.7, \(P=0.005\)), and there was a trend for a reduction of LnRHI compared to the supine posture (0.62±0.29 vs 0.47±0.38, \(P=0.07\)). No sex differences were observed in the FMD% or the RH-PAT protocols. We suggest that greater metabolite production from upright posture is increasing FMD% while greater sympathetic activity from orthostatic stress is decreasing the LnRHI.