

Ovarian Hormones and Cerebral Hemodynamics During Upright Tilt

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Int J Exerc Sci 2(1): S20, 2009. The cerebral vasculature is a specific target for ovarian hormones. Estrogens in particular activate endothelial factors that decrease vessel tone and increase blood flow. Changes in cerebral blood flow across the menstrual cycle could underlie the observation that women experience orthostatic instability more often than men, but the influence of ovarian hormone levels on cerebral hemodynamics in the upright posture is unclear. **PURPOSE:** To test the hypothesis that cerebral blood velocity and cerebral autoregulatory capacity change in parallel with ovarian hormone concentrations. **METHODS:** Nine healthy eumenorrheic women (mean age 24 ± 1 yr, height 166 ± 3 cm, weight 68 ± 2 kg; mean \pm SE) were studied during the early and late follicular (EF and LF) and early and late luteal (EL and LL) phases of the menstrual cycle. We recorded the ECG, beat-by-beat arterial pressure, end-tidal CO₂, and cerebral blood velocity from the middle cerebral artery (transcranial Doppler). Plasma ovarian hormone concentrations were assessed with high performance liquid chromatography. Subjects breathed in time to a metronome for 10 min (15 breaths/min) in the supine position, and were then tilted head-up to 70° for an additional 10 min of controlled breathing. Cerebral autoregulation was assessed in the frequency domain with cross-spectral analysis of mean arterial pressure (MAP) and mean CBV within the frequency range of 0.07-0.2 Hz. **RESULTS:** Upright tilt decreased CBV (supine 74 ± 1.7 ; tilt 65 ± 1.8 cm · s⁻¹; $P=.005$ pooled across phases) and end-tidal CO₂ ($P<.001$) but did not affect MAP. Coherence increased from $.45 \pm .02$ to $.67 \pm .03$ with tilt ($P<.001$ pooled across phases) and was significantly higher during LF ($.61 \pm .03$) compared with LL ($.48 \pm .03$; $P = .04$). Lower coherence during LL compared with LF was associated with higher concentrations of progesterone ($P < .001$). **CONCLUSIONS:** Upright tilt decreases CBV, and the magnitude of reduction is not related to ovarian hormone concentrations. Lower coherence during LL compared with LF suggests improved autoregulatory capacity mediated by higher concentrations of progesterone. These results have implications for orthostatic stability in women.

