No Influence of Ovarian Hormones on Cerebrovascular Responses to the Valsalva Maneuver

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Cerebral blood flow is modulated in part by arterial perfusion pressure and autonomic neural activity. Valsalva straining drives increases in cerebral perfusion pressure that may challenge cerebrovascular regulatory mechanisms. These challenges may be even greater during the normal menstrual cycle due to vasoactive influences of ovarian hormones. **PURPOSE:** To test the hypothesis that cerebral vascular responses to Valsalva straining are enhanced with increased plasma concentrations of estrogen and progesterone. **METHODS:** Twelve healthy eumenorrheic females (mean age 25 ± 1 yr; height 165 ± 3 cm; weight 66 ± 2 kg; mean ± 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 (Finometer), end-tidal CO_2, and cerebral blood velocity (CBV) from the middle cerebral artery (transcranial Doppler ultrasound). Plasma ovarian hormone concentrations were assessed with high performance liquid chromatography. Supine subjects strained to an expiratory pressure of 40 mmHg for 15 seconds, and we recorded magnitudes of changes in arterial pressure and CBV. **RESULTS:** Compared with EF, estrogen was significantly higher during LF (111 ± 20 pg/ml) and EL (113 ± 27 pg/ml) (both $P<0.05$). During EL (12 ± 6 pg/ml) and LL (7 ± 2 pg/ml), progesterone was significantly higher when compared with EF(1 ± .3 pg/ml) and LF(1 ± .2 pg/ml) (both $P<0.05$). The magnitude of arterial pressure overshoot at the release of strain (an indirect indicator of peripheral sympathetic neural activation during straining) was significantly higher during LF (54 ± 9 mmHg) compared to EL and EF (both phases = 35 ± 4 mmHg; $P=0.003$). Changes in CBV during Valsalva straining and during release from strain were statistically identical across menstrual phases ($P>0.05$). **CONCLUSIONS:** Despite indirect evidence that sympathetic neural activity during the Valsalva maneuver is increased when plasma estrogen concentrations are high, responses of the cerebral vasculature to Valsalva straining are unaffected by cycling ovarian hormones.