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Reliability, asymmetry, and age influence on dynamic cerebral autoregulation measured by spontaneous fluctuations of blood pressure and cerebral blood flow velocities in healthy individuals.

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Abstract

BACKGROUND:

Cerebral autoregulation (CA) enables the brain to maintain stable cerebral blood flow (CBF). CA can be assessed noninvasively by determining correlations between CBF velocity (CBFV) and spontaneous changes in blood pressure. Postrecording signal analysis methods have included both frequency- and time-domain methods. However, the test-retest reliability, cross-validation, and determination of normal values have not been adequately established.

METHODS:

In 53 healthy volunteers, a transfer function analysis was applied to calculate phase shift (PS) and gain in the low frequency range (.06-.12 Hz) where CA is most apparent. Correlation analysis was used to derive mean velocity index (Mx). Intraclass correlation and bivariate correlation coefficients were applied to assess asymmetry, cross-validity, and test-retest results: The bihemispheric average PS, gain, and Mx means were 45.99+/-14.24°, .62+/-.38 cm/second/mmHg, and .41+/-.13, respectively. Gain exhibited a difference by age (P = .03). PS, gain, and Mx values showed excellent interhemispheric correlation (r > .8; P < .001). PS and gain showed good reliability (R ICC = .632, L ICC = .576; P < .001). PS and Mx showed fair correlation (r = -.37; P < .001).

CONCLUSIONS:

CA parameters obtained by time- and frequency-domain methods correlate well, and show good interhemispheric and test-retest reliability. Group means from healthy controls may provide adequate norms for determining abnormal CA in cerebrovascular patients.