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Titel des Beitrags: Cerebral haemodynamics during hypo- and hypercapnia: determination with simultaneous 15O-butanol-PET and transcranial Doppler sonography.

Abstract: AIM: Transcranial Doppler sonography (TCD) is increasingly used in cerebrovascular disease for monitoring brain perfusion. It allows estimation of cerebral blood flow (CBF) by the measurement of cerebral blood flow velocity (CBFV). The CBFV as well as CBF are intimately associated with the intravascular CO2-concentration. Thus, hyper- or hypocapnia can be used to induce a defined range of blood flows. The aim of our study was the comparison of vasomotor reactivity assessed with simultaneous TCD and quantitative regional CBF-measurements (rCBF) by PET (serving as the reference method for in-vivo quantification of rCBF). PATIENTS, METHODS: Six healthy young volunteers participated in this study. CBF was measured using 15O-butanol PET. A flow and dispersion-model was fitted to the measured time activity curves using arterial input curves. Each subject underwent five scans at five different end-tidal CO2 levels (EtCO2): 25, 32, 40, 48, and 55 mmHg. CBFV was assessed by continuous bilateral TCD of the middle cerebral artery (MCA). Volumes of interest for rCBF determination were placed in grey matter of the prefrontal cortex (PFC) as determined from individual MRIs. Comparisons between the rCBF, EtCO2 and CBFV were carried out with regression and correlation analysis and paired t-tests. RESULTS: Strong positive linear correlations of
rCBF and CBFV with the CO2-concentration and linear relationships between rCBF and CBFV were found in each individual. Normalised CO2-reactivities measured by TCD and PET were closely correlated. CONCLUSIONS: TCD-measurements of vascular reactivity in healthy volunteers show a high correlation to those acquired with PET that serves as the reference method of quantitative rCBF-measurement. The results of the MCA insonation are a close approximation of the rCBF changes induced by variations of EtCO2.