

## Clinical significance of cerebrovascular reserve in acetazolamide challenge —Comparison with acetazolamide challenge H<sub>2</sub>O-PET and Gas-PET—

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**Objective:** The response of cerebral blood flow (CBF) to acetazolamide (ACZ) challenge is frequently determined in clinical settings to evaluate cerebrovascular reserve (CVR). A reduced CVR can indicate patients with occlusive cerebrovascular disease and compromised hemodynamics who may be at increased risk of cerebral ischemia. However, how precisely ACZ reflects cerebral hemodynamic impairment remains obscure. The present study aims to clarify the pathological significance of CVR in patients with occluded carotid arteries. **Methods:** We recruited seventeen patients with occlusive lesions in the internal carotid artery (ICA) or middle cerebral artery (MCA). We assessed these patients in terms of resting cerebral blood flow (CBF) and the CVR response to ACZ challenge using H<sub>2</sub>O positron emission tomography (PET). In addition, we evaluated hemodynamic parameters including oxygen extraction fraction (OEF) using Gas-PET. **Results:** We identified a significant negative correlation between the CVR and OEF or the cerebral blood volume (CBV)/CBF ratio, as a potential index of cerebral perfusion pressure. Although the CVR values were reduced in all regions with elevated OEF (Stage II), these values were highly variable regardless of the CBV/CBF ratios. The cut-off value of CVR alone could not detect Stage II, but when combined with resting CBF, misery perfusion accompanied by increased OEF was detected with high sensitivity (6/7) and specificity (61/62). **Conclusion:** CVR could be applied as an index reflecting both autoregulatory capacity and OEF. The present study also supported the notion that SPECT with ACZ challenge can be clinically applied to detect misery perfusion.

**Key words:** acetazolamide, hemodynamics, positron emission tomography