

Cerebral hemodynamics and metabolism in adult moyamoya disease: Comparison of angiographic collateral circulation

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Purpose: The extent of the hemodynamic and metabolic impairments in adult patients with moyamoya disease is still controversial. The aim of the present study was to evaluate the hemodynamic and metabolic status in relation to the development of basal moyamoya vessels (BMVs). **Methods:** The cerebral blood flow (CBF), cerebral metabolic rate of oxygen (CMRO₂), oxygen extraction fraction (OEF), and cerebral blood volume (CBV) were measured using PET in ten patients with ischemic adult moyamoya disease (mean age, 36.6 years) and six age-matched normal controls (mean age, 33.3 years). The cerebrovascular reserve (CVR) after acetazolamide (ACZ) loading was also estimated using iodine-123 *N*-isopropyl-*p*-iodo amphetamine single photon emission computed tomography (¹²³I-IMP SPECT). **Results:** Based on the angiographic findings, eleven cerebral hemispheres with well-developed BMV (extensive BMV hemispheres) and nine cerebral hemispheres with diminished BMV (diminished BMV hemispheres) were identified. The main routes of collateral circulation in extensive BMV hemispheres were BMVs and leptomeningeal anastomoses. On the other hand, in diminished BMV hemispheres, transdural anastomosis was predominant, and leptomeningeal anastomoses were less developed. In cortices distal to the occluded internal carotid artery, the extensive BMV hemispheres exhibited a significantly lower CBF, CMRO₂, CBF/CBV, and CVR ($p < 0.05$) and a significantly higher CBV and OEF than in diminished BMV hemispheres and controls ($p < 0.05$). Except for the CBF in the white matter, the mean hemodynamic and metabolic parameters of the diminished BMV hemispheres were not significantly different from those of the controls. **Conclusion:** The extensive development of basal moyamoya vessels is a sign of severe hemodynamic impairment in adult patients with ischemic moyamoya disease. The results may not apply to adults with hemorrhagic onset.

Key words: adult moyamoya disease, collateral circulation, PET, cerebral blood flow, cerebral metabolism