ORIGINAL ARTICLE

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Cerebral blood flow and vascular response to hypercapnia in hypertensive patients with leukoaraiosis

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Both arteriosclerosis and leukoaraiosis have a close relationship with hypertension, but the relationship between cerebral hemodynamics and leukoaraiosis in hypertensive patients has not been fully examined. To clarify this issue, we measured the regional cerebral blood flow (rCBF) and cerebrovascular response to hypercapnia in hypertensive patients with various degrees of leukoaraiosis. The subjects consisted of 7 normotensive normal controls and 17 hypertensive patients. The hypertensive patients were divided into three groups according to the severity of white matter lesions (leukoaraiosis) on MRI and the presence of dementia, namely, (1) negative or mild leukoaraiosis without dementia, (2) moderate to severe leukoaraiosis without dementia and (3) severe leukoaraiosis with dementia. Both the rCBF and the cerebrovascular response to hypercapnia were measured by the O-15 H_2O bolus-injection method and positron emission tomography. The rCBF in hypertensive patients without dementia did not decrease when compared with the normotensive controls, but the rCBF in hypertensive patients with dementia markedly decreased in the cerebral cortices and white matter. On the other hand, the cerebrovascular response to hypercapnia declined with the severity of leukoaraiosis, and it decreased most severely in patients with severe leukoaraiosis and dementia. Our results indicate that the reduction in the cerebral hemodynamic reserve capacity has a close relationship with the severity of leukoaraiosis in hypertensive patients, although the rCBF is maintained in hypertensive patients without dementia, and suggest that arteriosclerotic change reduces cerebrovascular CO_2 response and causes a leukoaraiosis in hypertensive patients.

Key words: cerebrovascular response, hypercapnia, cerebral blood flow, hypertension, leukoaraiosis, positron emission tomography