

Preoperative central benzodiazepine receptor binding potential/cerebral blood flow images on SPECT predict development of new cerebral ischemic events and cerebral hyperperfusion after carotid endarterectomy: comparison with cerebrovascular reactivity to acetazolamide

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Abstract

Purpose: Risk factors for cerebrovascular complications developing during or after carotid endarterectomy (CEA) include preoperative impairments in cerebral hemodynamics, as detected by demonstration of decreased cerebrovascular reactivity (CVR) to acetazolamide on brain perfusion single-photon emission computed tomography (SPECT). Central benzodiazepine receptor binding potential (CBRBP)/cerebral blood flow (CBF) images on SPECT provide high sensitivity and high specificity for detecting misery perfusion in patients with chronic unilateral major cerebral artery occlusive disease. The aim of the present study was to determine whether preoperative CBRBP/CBF images on SPECT could identify patients at risk for new cerebral ischemic events, including neurological deficits and cerebral ischemic lesions on diffusion-weighted magnetic resonance imaging (DWI), or cerebral hyperperfusion after CEA and to compare the predictive accuracy of CBRBP/CBF with that of CVR to acetazolamide on SPECT.

Methods: CBF, CVR and CBRBP were assessed using *N*-isopropyl-*p*-[¹²³I]-iodoamphetamine (¹²³I-IMP) and ¹²³I-iomazenil SPECT, respectively, before CEA in 112 patients with unilateral internal carotid artery stenosis (≥70%). CBF measurement using ¹²³I-IMP SPECT was also performed immediately and 3 days after CEA. A region of interest (ROI) was automatically placed in the middle cerebral artery

territory in both cerebral hemispheres using a three-dimensional stereotaxic ROI template. DWI was performed within 3 days before and 24 hours after surgery.

Results: There was no difference in the ability to predict post-CEA hyperperfusion when comparing the area under the receiver operating characteristics curve of the affected side-to-contralateral side asymmetry on CBRBP/CBF and that of the CVR in the affected hemisphere. However, the former value (0.924; 95% CIs, 0.854 to 0.972) was significantly greater than the latter value (0.782; 95% CIs, 0.697 to 0.852) for the prediction of new postoperative cerebral ischemic events ($p < 0.05$).

Conclusion: Preoperative CBRBP/CBF images on SPECT can more accurately identify patients at risk for cerebrovascular complications occurring during or after CEA when compared with preoperative CVR to acetazolamide.