

Preoperative prediction of cerebral hyperperfusion
after carotid endarterectomy using middle cerebral artery signal intensity
in 1.5-tesla magnetic resonance angiography followed by
cerebrovascular reactivity to acetazolamide using brain perfusion
single-photon emission computed tomography

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Abstract

Objective: The purpose of the present study was to determine whether signal intensity of the middle cerebral artery (MCA) on preoperative 1.5-T magnetic resonance angiography (MRA) could identify patients at risk for hyperperfusion following carotid endarterectomy (CEA) as a clinical screening test and whether an additional measurement of preoperative cerebrovascular reactivity (CVR) to acetazolamide on brain perfusion single-photon emission computed tomography (SPECT) could increase the predictive accuracy for the development of hyperperfusion.

Methods: In 301 patients, the signal intensity of the MCA ipsilateral to CEA on MRA was preoperatively graded according to the ability to visualize the MCA. For patients with reduced MCA signal intensity on the MRA study, CVR to acetazolamide was subsequently assessed using brain perfusion SPECT. Cerebral hyperperfusion was also determined using brain perfusion SPECT.

Results: Preoperative reduced MCA signal intensity was significantly associated with the development of cerebral hyperperfusion (95% CI, 1.188–3.965; $P = 0.0352$). While the sensitivity and negative predictive value were 100% both for the preoperative MCA signal intensity alone and in combination with subsequent preoperative CVR to acetazolamide, the specificity and positive predictive value were significantly greater for the latter than for the former ($P < 0.05$).

Conclusions: Signal intensity of the MCA on preoperative 1.5-T MRA identifies patients at risk for hyperperfusion following CEA as a clinical screening test. An additional measurement of preoperative CVR to acetazolamide increases the predictive accuracy for the development of hyperperfusion.