Cerebral Blood Flow Thresholds in Acute Stroke Triage

To the Editor:

We read with interest the recent article by Bandera and colleagues reporting their systematic review of cerebral blood flow (CBF) thresholds for ischemic penumbra and infarct core in acute ischemic stroke. Although we agree with the conclusion that further work is indeed required, before the use of CBF thresholds can become clinically routine, there are a number of important points not covered in this article that deserve further discussion.

First and most important, this review is already dated in that there is no mention of CT perfusion thresholds. With CT perfusion, unlike MR perfusion, the linear relationship between contrast concentration and pixel intensity more readily lends itself to quantification of blood flow values. Two recent publications, in particular, shed additional light on the use of CT-CBF thresholds in predicting tissue outcome. These articles, as well as another on MR perfusion not analyzed by Bandera et al., underscore the potential influence of both (1) time-to-scan and (2) time-to-reperfusion/recanalization on blood flow thresholds for core and penumbra. Perhaps of greatest relevance, however, in explaining the variability of the thresholds reviewed by Bandera et al., is (3) the blood flow difference between normal gray and white matter. Because the baseline CBF of gray matter (measured in ml/100 g/min) is roughly twice that of white matter, absolute perfusion thresholds for ischemia will vary widely depending on the gray-to-white matter ratio within a given region of interest.

Finally, it is MR diffusion-weighted imaging and CT cerebral blood volume mapping—and not CBF thresholds—that have been increasingly advocated for defining infarct core. The mismatch between core, and even a relatively imprecise operational measure of penumbra, such as visual interpretation of transit time images, has already proven a powerful tool for measurement by perfusion computed tomography, at the time of admission, in acute stroke patients. As the results of other similar randomized trials become available, including Echoplanar Imaging Thrombolysis Evaluation Trial (EPITHET), Diffusion-weighted imaging Evolution For Understanding Stroke Etiology (DEFUSE), and MR and Recanalization of Stroke Clots Using Embolectomy (MR RESCUE), the indications for perfusion-imaging of acute stroke, whether with MRI or CT, will likely continue to increase.

Disclosures

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