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Prerequisite for Evaluating Pial Collateral Flow on Conventional Enhancement CT

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We thank Dr. Kloska for his comments on our article in the recent issue of *Cerebrovascular Diseases* dealing with the potential usage of conventional contrast CT for pial collateral flow [1]. Kloska commented that CT angiography (CTA) acquisition at the plateau phase of contrast injection with steady vascular and tissue contrast is an essential point of the cerebral blood volume (CBV) equation [2].

Previous studies have reported that the CTA source image (CTA-SI) is closely related to a qualitative perfusion CBV map that reflects the infarct core [3, 4]. Therefore, the American Heart Association Guidelines mentioned in the 2009 issue of *Stroke* that 'CTA-SI reflect blood volume' [5]. CBV is the volume of the blood vessels within brain tissue and is represented by the fraction of each imaged voxel comprising the intravascular space. Only a small fraction of the CBV is arterial, the major part being in the capillaries and veins.

Meanwhile, in the setting of more rapid modern multidetector CT (MDCT) CTA protocols, recent reports suggest that CTA-SI are flow weighted rather than volume weighted [6]. In a state-of-the-art MDCT scanner, the flow weighting performance was facilitated by higher contrast injection rates, relatively short preparation delay times of 15–20 s, and a shorter scanning time, eliminating the near-steady state during acquisition of CTA-SI [6]. Nevertheless, we would like to point out that the prerequisite for the evaluation of pial collateral flow on conventional enhancement CT is an appropriate time gap after contrast infusion regardless of CT modality and other technical details.

We agree with Kloska's comment that attention to the technical principle is crucial for the interpretation of CTA-SI. Further comparative studies are needed to evaluate CTA-SI with appropriate injection protocols on modern and rapid MDCT scanners for the measurement of pial collateral flow without four-vessel angiography.

References

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