Supplementary Material

Collateral-core ratio as a novel predictor of clinical outcomes in acute ischemic stroke

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Supplementary Methods

Imaging post-processing and analysis

Firstly, each T1 image was linearly aligned to the MNI (Montreal Neurological Institute) standard space (1). Secondly, the diffusion-weighted imaging (DWI) and cerebral blood flow (CBF) images of arterial spin labeling (ASL) were aligned to the T1 images in the MNI space. The FLIRT and demons' algorithm was used for alignment (2). Thirdly, images were skull-stripped to remove non-brain regions. All the pre-processing steps were performed by using the free software SPM (Statistical Parametric Mapping) 12 (http://www.fil.ion.ucl.ac.uk/spm/).

Supplementary Figures

Supplemental Figure S1. **Post-processing workflow in the present study**
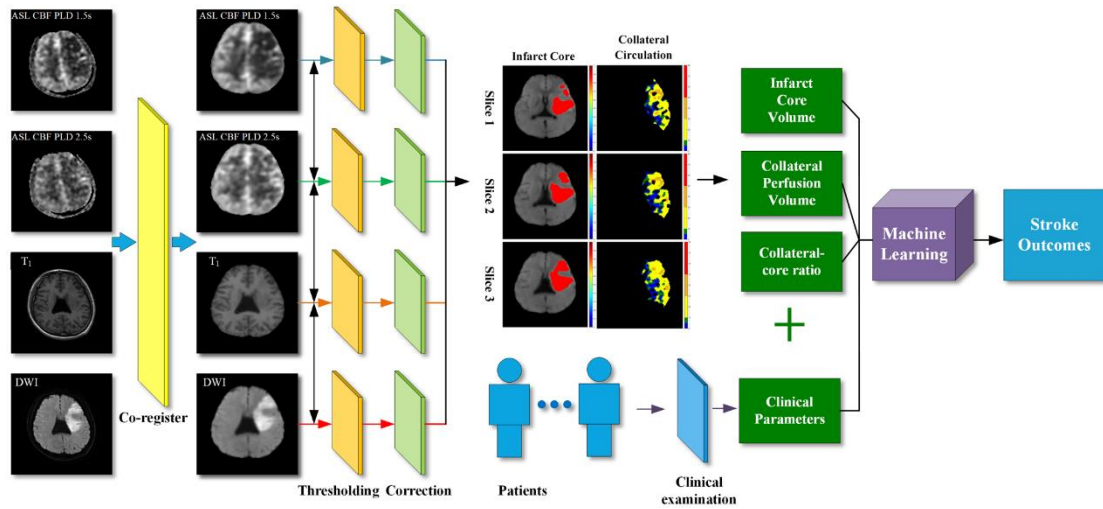
The post-processing workflow was used to measure the ischemic core volume, hypoperfusion volume on ASL, and collateral perfusion volume on multimodal magnetic resonance imaging. Volume segmentations were performed based on adaptive thresholds and regional growth methods. All imaging and clinical parameters were simultaneously analyzed using machine learning. ASL, arterial spin labeling; CBF, cerebral blood flow; PLD, post-labeling delay; DWI, diffusion-weighted imaging.

Supplementary Figure S2. Receiver operating characteristic (ROC) analysis
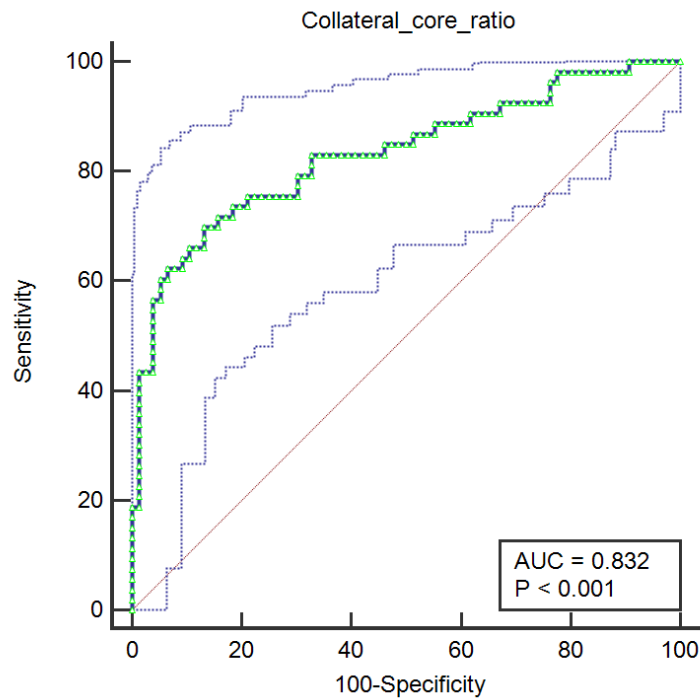
A receiver operating characteristic (ROC) analysis of the collateral-core ratio for identifying patients with an unfavorable outcome. By maximizing Yuden's J, the cutoff value was determined to discriminate between patients with and without unfavorable outcomes, and its sensitivity and specificity were calculated.

Supplementary Figure S3. Representative case exhibiting a low collateral-core ratio and a poor clinical outcome
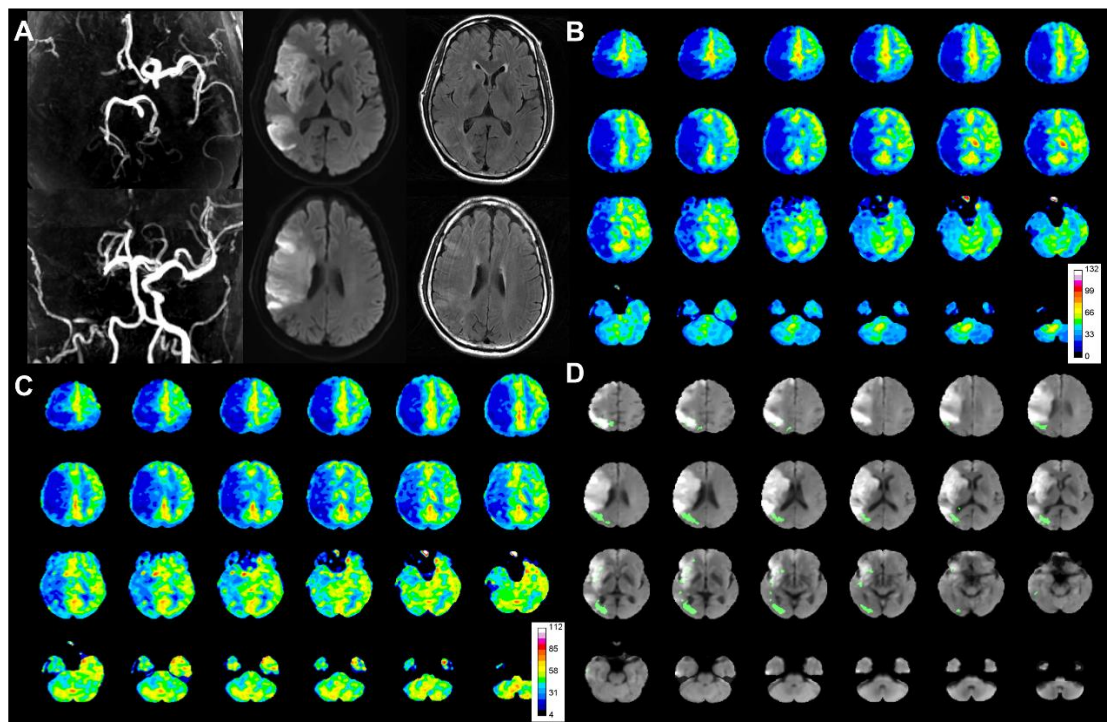

Figure shows a 66-year-old male patient with acute right internal carotid and middle cerebral artery occlusion. Diffusion-weighted imaging (DWI) demonstrates territorial infarction with a volume of 182.74 mL (A). Territorial hypoperfusion can be observed on cerebral blood flow maps on arterial spin labeling with a post-labeling delay (PLD) of 1500ms (B). Delayed inflow in the territory is visible on cerebral blood flow maps from PLD of 1500 ms to 2500 ms (C). The volume of collateral perfusion as overlaid green mask on DWI is 31.72 mL (D). The collateral-core ratio was measured as 0.17. The patient developed an unfavorable functional outcome (3-month mRS score is 4).

Supplemental references:

[1] Holmes, CJ, Hoge, R, Collins, L, et al. Enhancement of MR images using registration for signal averaging. J. Comput. Assist. Tomogr. 1998;22:324-333.

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