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Letter to the Editor

Cortical DWI Hyperintensity does not Necessarily Indicate Successful Recanalization Following Thrombolysis or Thrombectomy

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Letter to the Editor

We read with interest the article by Miyamoto *et al*. regarding the frequency of cortical hyperintensities on diffusion-weighted imaging (CDWIH), referred to as the "ribbon sign", and described as a novel finding in 140 patients with acute ischemic stroke in the anterior circulation territory who underwent intravenous thrombolysis, thrombectomy, or both [1]. Recanalization was achieved in 58% of the patients; CDWIH occurred more frequently in patients with successful recanalization than in those without. The authors concluded that CDWIH represents a specific sign of successful recanalization [1]. The study is interesting, but several points warrant further discussion.

The first point concerns the retrospective study design [1]. Retrospective designs have several disadvantages [2]. These include poor data quality, missing data, the inability to establish causality (only associations can be demonstrated), susceptibility to recall and selection bias, difficulties in controlling for confounding variables, and a generally lower level of evidence compared to prospective studies [2].

The second point relates to the statement in the abstract that CDWIH are a specific sign of recanalization [1]. Since CDWIH also occurred in 9% of patients in whom recanalization was not achieved, this conclusion is questionable. Therefore, the abstract should be revised.

The third point is that no corresponding apparent diffusion coefficient (ADC) maps were presented or described [1]. To assess the pathophysiological background of the cortical DWI hyperintensity, it is crucial to know how this area appeared on ADC. FLAIR, SWI, and perfusion-weighted imaging (PWI). Was it actually cytotoxic edema, or was vasogenic edema responsible for the DWI hyperintensity? Was the cortex part of the stroke core or the penumbra?

A fourth point is the failure to account for differences in vascular supply and the architecture of the vascular tree between the cerebral cortex and the white matter [1]. The cerebral cortex features a significantly denser vascular network, corresponding to the high density of neurons with high energy demands. In contrast, white matter exhibits a markedly lower vascular density, as myelinated axons require less energy to maintain their functions than gray matter [3]. The cerebral cortex is supplied by a dense, highly branched microvascular network that enables local adjustments in blood flow (neurovascular coupling), whereas white matter is supplied by long, penetrating medullary arteries that show comparatively little branching [3]. Vessels in the deep white matter often follow tortuous, looped, or spiral paths within wide adventitial spaces [3].

A fifth point is that the varying degrees of collateralization were not considered when explaining the presence or absence of CDWIH [1]. Good collateralization in cases with CDWIH could explain why this phenomenon was observed more frequently in instances of successful recanalization than in cases with absent or poor collateralization [4].

A sixth point is that no correlation was calculated between the time interval from clinical stroke onset to the MRI examination and the occurrence of CDWIH. Since the cerebral cortex is most susceptible to rapid damage following the occlusion of a major cerebral artery, it is crucial to determine whether CDWIH occurred particularly in patients with a short time interval.

A seventh point is that the observation period spanned the years 2011 to 2020, suggesting that MRI technology may have evolved during this time. Was the same MRI scanner used throughout the entire observation period? Was a single scanner used for the examinations, or were software or hardware upgrades performed during this period?

Finally, it would be important to know whether CDWIH occurred more frequently in the territory of the anterior cerebral artery or the middle cerebral artery, and whether patients with CDWIH exhibited classic atherosclerosis risk factors, such as smoking,

diabetes, hypertension, and hyperlipidemia, more frequently than patients without CDWIH.

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