Assessment of the Specificity of the Central Vein Sign (CVS) on 3.0T MRI in Relapsing-Remitting Multiple Sclerosis: Application of the McDonald 2024 Classification Criteria

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Abstract

Background: The central vein sign (CVS) is defined as perivenular inflammatory lesions that appear as hyperintense white matter abnormalities on SWAN. CVS is increasingly recognized as a potential diagnostic marker for multiple sclerosis (MS).

Objective: To evaluate the specificity of CVS using 3T MRI in patients with relapsing-remitting multiple sclerosis (RRMS).

Methods: Twenty patients with a confirmed diagnosis of RRMS were included (age range 21–55 years; mean 35.4 years; 3 males [15%], 17 females [85%]). Between May and August 2025, all patients underwent brain MRI with contrast on a 3T scanner (GE Signa Architect). The imaging protocol included T1, T2-FLAIR, SWAN, and T1+Gad. Lesion localization, number, size, and the presence of CVS were assessed.

Results: The mean proportion of CVS-positive lesions was 95% (19 out of 20 patients). No active enhancing lesions were detected on T1+Gad. High-field MRI provided detailed visualization of demyelinating lesions and confirmed CVS as a key marker of perivenular inflammation.

Conclusion: CVS on SWAN was detected in >95% of RRMS cases, indicating high specificity. These findings confirm its value as an additional diagnostic criterion. Incorporating CVS into the 2024 McDonald criteria may improve diagnostic accuracy and enable earlier detection of MS.

Keywords

Central Vein Sign (CVS), Multiple Sclerosis (MS), Relapsing-Remitting Multiple Sclerosis (RRMS), 3 Tesla MRI, SWAN (Susceptibility Weighted Angiography), Demyelinating Lesions, Diagnostic Specificity, McDonald Criteria 2024, Neuroinflammation, Multiparametric MRI, White Matter Lesions.