Evaluation of the “Three Lesions with a Central Vein Sign” Criteria for the Differentiation between Multiple Sclerosis and its Imaging Mimics

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Objective: To evaluate the sensitivity and specificity of CVS lesion criteria that are based on the absolute numbers of lesions with CVS in differentiating MS from non-MS conditions on clinical 3T brain MRI in a multicenter study.

Background: For differentiation between multiple sclerosis (MS) and non-MS, the central vein sign (CVS) was proposed as a specific and sensitive imaging biomarker, and recent studies have proposed criteria based on the proportion of lesions with CVS. Nevertheless, criteria that are based on the absolute numbers of lesions with CVS may be more applicable in clinical practice to improve differentiation between MS and its imaging mimics.

Design/Methods: 606 subjects with clinically isolated syndrome (CIS, n=117), relapsing-remitting MS (RRMS, n=236 of which 108 had a disease duration shorter than 5 years), aquaporine-4 antibody positive NMOSD (n=32), systemic lupus erythematosus (n=25), migraine (n=29), cluster headache (n=5), diabetes mellitus (n=20), or other types of small vessel disease (n=142) were analysed. Occurrence of CVS was determined on 3T T2* weighted (T2*w) or susceptibility weighted imaging (SWI) by raters blinded to clinical data and lesion distribution. Sensitivity and specificity were assessed for different CVS lesion criteria that were defined based on the absolute numbers of lesions with CVS.

Results: In total, 4447 lesions were analyzed. The “two-CVS-lesions criterion” (two or more CVS lesions) had a sensitivity and specificity of 76.2%, and 79.3%, and the “three-CVS-lesions criterion” (three or more CVS lesions) had a sensitivity and specificity of 61.9%, and 89.0% in differentiating between RRMS/CIS and non-MS. The observed sensitivity and specificity values were consistent across all studied disease subgroups including CIS and early RRMS.

Conclusions: The application of a “three-CVS-lesions criterion” seems feasible in clinical routine, and yields a high specificity and moderate sensitivity in differentiating MS from non-MS.