USPIO-SWI showed vascular factors involved in the evolution of "black holes" in multiple sclerosis

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ABSTRACT

Background: Black hole (BH) lesions show hypointensity on T1 images and hyperintensity on T2 images in patients with multiple sclerosis (MS). The etiology of BH progress is unknown.

Objective: Investigate whether vascular factors are involved in BH progress using USPIO-enhanced SWI images (USPIO-SWI) in a prospective cross-observational study.

Methods: 3D-SWI, 3D-T1 and 3D fluid-attenuation inversion recovery (FLAIR) were performed on 10 patients with MS. BH lesions were classified into 3 subtypes base on T1 intensity, which demonstrated BH gradual progress. Counts were conducted for USPIO-enhanced central vessel signs (USPIO-CVSs) or vessels in the paraventricular regions (USPIO-vessels) on USPIO-SWI images.

Results: The total number of isolated BH lesions was 117, comprising 17, 38, and 62 instances of the type 1-3 BHs. The USPIO-CVS detection rates for the three types of BH from 1 to 3 were 17.65%, 73.68% and 91.94%, respectively. The median number of USPIO-vessels in the middle slices of paraventricular regions was 29 (range = 26-29) and the median BH volume was 0.03 mm^3 (range = 0.03-0.13). There was a negative correlation (r = -0.61, p = 0.11).

Conclusion: USPIO-CVS was increase with BH progress, suggesting that perivascular inflammation may contribute to the evolution of BH.