Delineation of draining veins in arteriovenous malformations on susceptibility weighted imaging: Impact of magnitude images

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Purpose: The purpose of the current study is to evaluate the conspicuity and signal intensity of draining veins in cerebral arteriovenous malformations on susceptibility weighted image (SWI) including magnitude image, which is one of the source images of SWI.

Materials and Methods: Our subjects are 10 cases with angiographically proven arteriovenous malformations (8 male, 2 female, 39 years old – 67 years old; 3 pial type, 7 dural type). MR imaging was underwent in each of two 1.5T scanners (MAGNETOM Symphony Sonata, MAGNETOM Avant; Siemens, Erlangen, Germany). The SWI was acquired with the following parameters: TR/TE, 46/40 ms; flip angle, 15 degree; rectangular FOV; matrix, 167 x 256; section thickness, 1.5mm on Symphony Sonata and TR/TE, 49/40 ms; flip angle, 15 degree; rectangular FOV; matrix, 320 x 320; section thickness, 1.6mm on Avant. Referring to angiogram as the golden standard, the draining veins of AVM were assessed on coupleted SWI and the magnitude image. Visualization of the draining vein on SWI was classified into grade A-C; A: draining vein which is clearly depicted on SWI, C: draining vein which is not depicted on SWI, B: draining vein in which degree of visualization is between A and C. On magnitude image, the signal intensity of the draining vein was classified into grade I –III; The grade I veins are defined as having high intensity, the grade II as presenting high intensity and partially low intensity, the grade III as not having high intensity.

Results: 1) On SWI, the draining veins were assessed as grade A in 2 patients (20%), grade B in 5 patients (50%), grade C in 3 patients (30%). 2) Using both SWI and the magnitude image, the draining veins were assessed as grade A in 8 patients (80%), grade B in 2 patients (20%), grade C in 0 patients (0%). On the magnitude image, the draining veins were classified as grade I in 7 patients (70%), grade II in 2 patients (20%), grade III in 1 patient (10%).

Conclusion: While draining veins of AVM are depicted as low signal structure on SWI, magnitude image depicts draining veins as high signal. We speculate that this phenomenon is partially due to higher concentration of oxy-Hb and higher flow speed within draining vein of AVM. For treatment planning or follow-up in AVM cases, magnitude images as well as SWI seems to have great clinical usefulness.

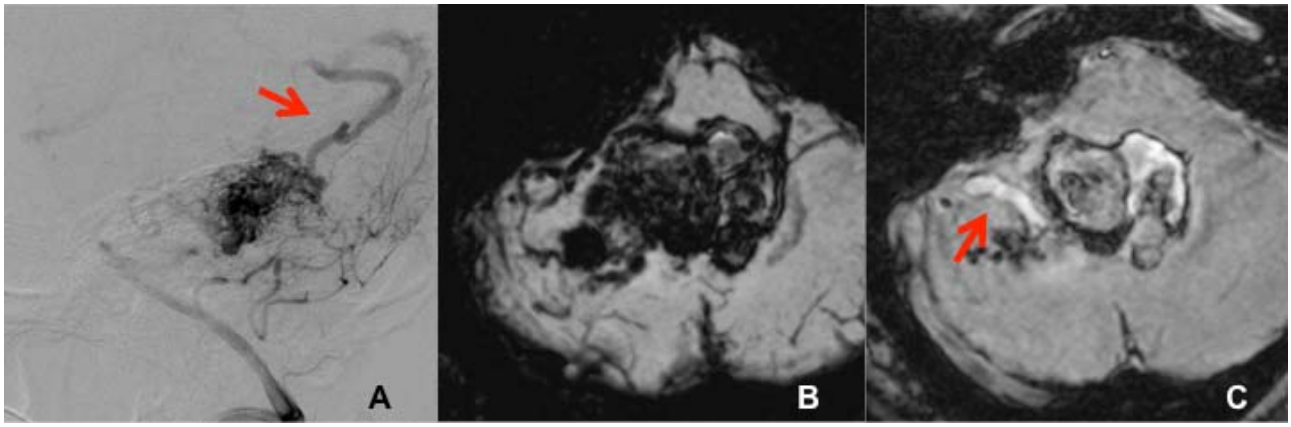

Fig 1. A 41-year-old female patient with hemorrhagic AVM in cerebellum. A: Late arterial phase of right vertebral angiogram, lateral view, shows a large AVM with feeder from the right anterior inferior cerebellar artery and posterior anterior inferior cerebellar artery. Thick and serpentine draining vein was depicted (arrow). B: Axial SWI demonstrates low signal intensity in nidus and hemorrhage. The draining vein is not demonstrated. C: Axial magnitude image presents high signal intensity in draining vein (arrow).