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Early detection and quantification of cerebral venous thrombosis by Magnetic Resonance Black Blood Thrombus Imaging (MRBTI)

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Background
Early diagnosis of cerebral venous and sinus thrombosis (CVT) is currently a major clinical challenge. We proposed a selective MR black-blood thrombus imaging technique(MRBTI).

Methods
MRBTI was performed on 23 patients with proven CVT and 24 patients with negative CVT by conventional imaging techniques. Signal-to-noise ratio (SNR) was calculated for the detected thrombus and contrast-to-noise ratio (CNR) was measured between thrombus and lumen, and also between thrombus and brain tissue. The feasibility of using MRBTI for thrombus volume measurement was also explored.

Results
With effectively suppressed blood signal**,** MRBTI correctly identified 113 out of 116 segments with proven CVT with a sensitivity of 97.4%. In 527 out 531 segments, CVT was ruled out correctly with a specificity of 99.3%. Quantification of thrombus volume was successfully conducted in all patients with CVT, and mean volume of thrombus was 10.5 ± 6.9 cc.

Conclusions
The current findings support that MRBTI allows direct selective visualization of thrombus as opposed to indirect detection of venous flow perturbation and can be used as a promising first line diagnostic imaging tool.

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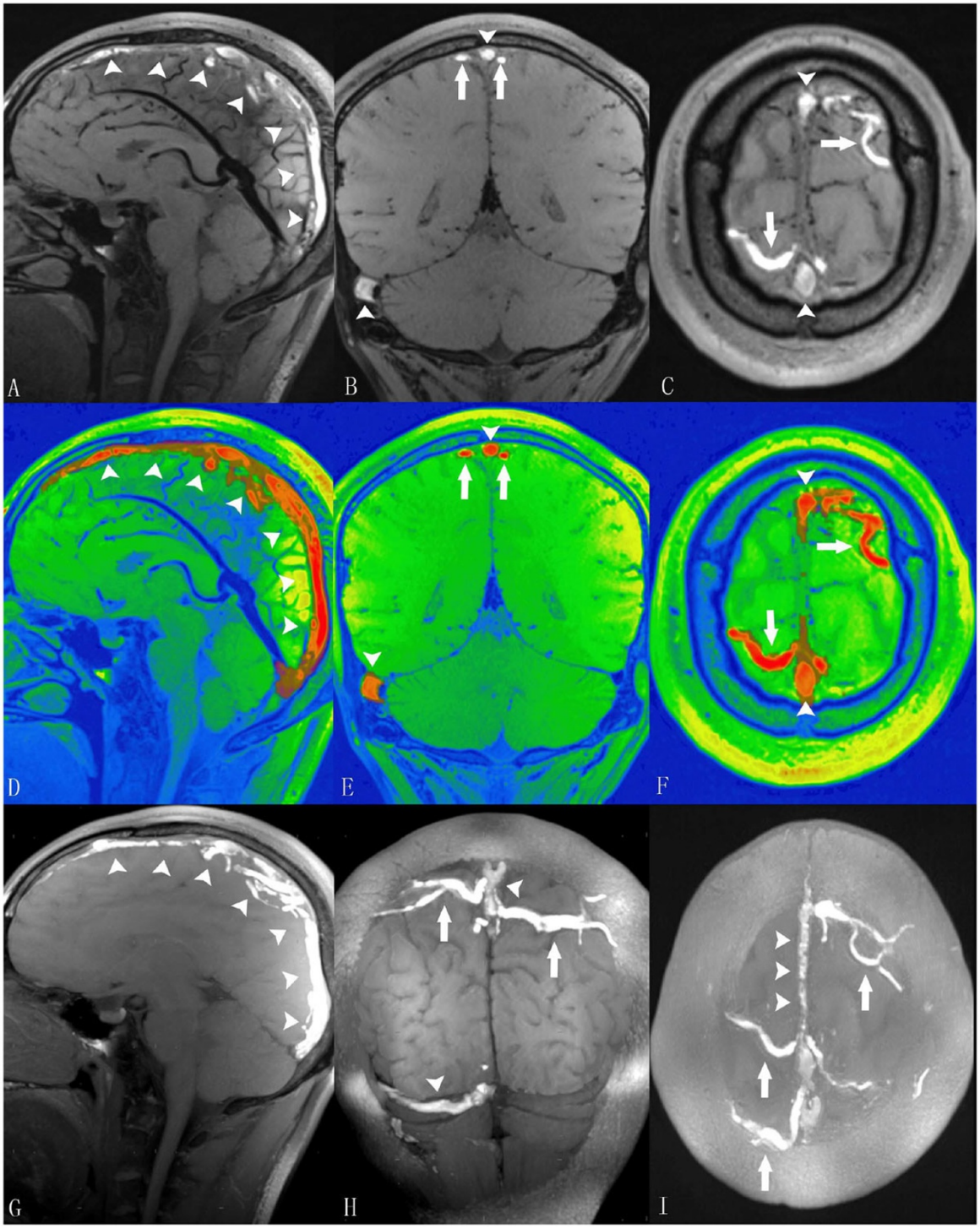

Figure 1 MRBTI of a 27-year-old male patient with sub-acute CVT. A-C: MRBTI demonstrated hyper-intense signal intensity in the superior sagittal sinus (arrowheads), the right transverse and sigmoid sinuses (arrowheads), and the cortical veins (arrows) suggesting intraluminal thrombus formation. D-F: All thrombi semi-automatically outlined by software based on their high signal contrast were rendered with red color and volume was 21.5 cc. G-I: sagittal, coronal and axial sections of maximum intensity projection (MIP) reformations of MRDTI better depicted the thrombosed segments with hyper-intense signals.