

## Flow-Sensitive Black Blood Imaging : Clinical Intracranial Applications

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**PURPOSE:** Susceptibility-weighted imaging (SWI) is sensitive to venous vasculature and is a powerful tool for evaluating vascular malformations such as venous angiomas [1]. To enhance the visibility of small vascular structures, especially at 1.5T systems, a flow-sensitive black-blood (FS-BB) has been recently developed [2]; The purpose of this study is to evaluate the utility of the FS-BB sequence in various intracranial lesions apart from vascular malformations.

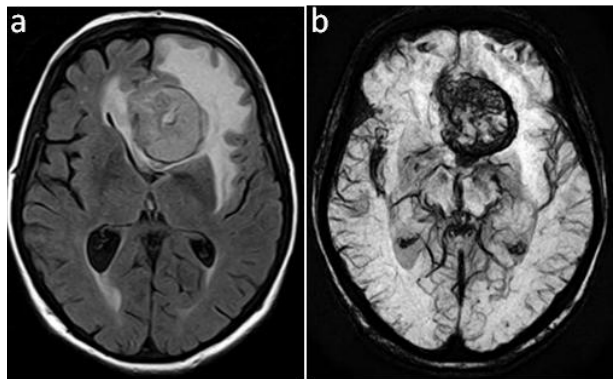


Fig1. Glioma with haemorrhage.(a) FLAIR. (b) FS-BB

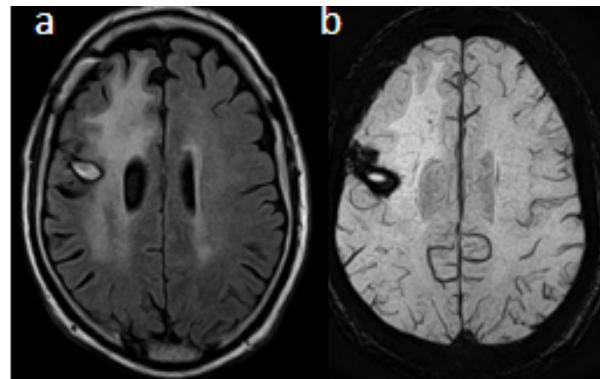


Fig2. Metastasis (a) FLAIR, (b) FS-BB.

**MATERIALS AND METHODS:** We have incorporated FSBB sequence in our routine MRI brain protocol for all suspected lesions. We scanned, so far, 25 patients on a 1.5 T MR system (Toshiba, Tokyo). FS-BB is a 3D FE sequence with weak motion probing gradient (MPG) like in diffusion, unlike SWI which uses gradient moment nulling to be flow insensitive [1]. We used the following parameters; TE: 40 ms, TR: 50ms, FA: 20, slice thickness – 1,5 mm, b: 4m/s, Matrix 320x320, FOV: 22x22 cm AQ = 1, Speeder factor: 2 and reconstruction resolution 0,4x0,4x0,75 mm<sup>3</sup>. Time 8-9 minutes for a whole head coverage.

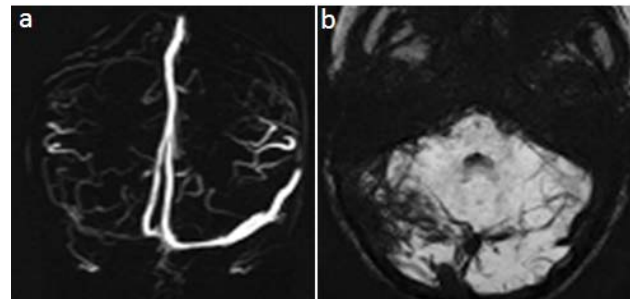


Fig3. Right transverse sinus thrombosis (a) MR Venogram, (b) FS-BB. Note the collateral venous circulation and venous congestion

**RESULTS:** Vascularisation of tumour and haemorrhage is better appreciated on FS-BB. The abnormal vessels within and around the tumour can be visualized without any contrast agent injection (fig1). More numbers of haemorrhagic lesions are seen on FSBB sequence in metastases (fig2). In venous sinus thrombosis, the collateral venous circulation and venous congestion is very well appreciated on FSBB (fig3).

**CONCLUSION:** FS-BB is a useful tool in imaging haemorrhages from trauma, visualizing blood products, venous sinus thrombosis and vascularisation of tumours. The small perforator arteries and veins are better seen on FS-BB than Time of Flight angiogram. Because it is flow-sensitive, FS-BB makes it possible to look at small vessels at 1.5T even when the susceptibility effect is much smaller than at 3T. Its role in degenerative diseases (such as MS, Alzheimer's and Parkinson's diseases should be investigated.

**REFERENCES:** 1. Haacke EM, et al. MRM 52:612-618,2004 2. Kimura T, et al. ISMRM 2007,Berlin.