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MR Clinical Case Study

MR Brain: Uncovering the Truth

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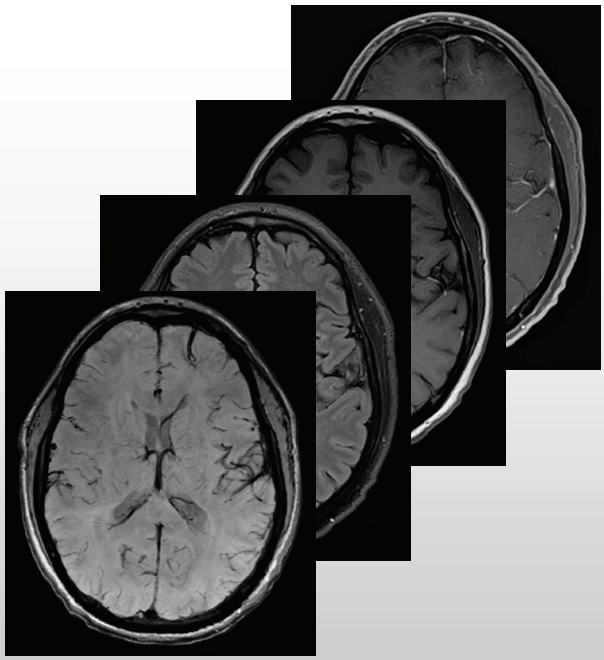
> "I need imaging equipment that gets it right the first time."



HISTORY

A 57-year-old male patient presented for imaging follow-up of a presumed low grade infiltrative astrocytoma in the right peri-ventricular parietotemporal white matter. His medical history included controlled hypertension, kidney stones, slight hearing loss, and occasional headaches. His neurological and physical exams were normal, including his reflexes and muscle strength.

Two years before the current MRI, the patient had a 3.0T MRI of the brain performed for headaches in an outside facility. The exam demonstrated an ill-defined, non-enhancing T1 and T2 hyperintense lesion in the right trigone area that measured approximately 2.5 x 1.7cm. The decision was made to follow the lesion with imaging rather than pursue a biopsy.

One year later, a second brain MRI exam was performed on a 1.5T system with the following sequences: axial and sagittal T1 pre and post contrast, susceptibility weighted imaging, axial FLAIR, coronal T1 post contrast and diffusion imaging. Once more, the MR exam demonstrated a T1 and T2 hyperintense lesion in the right trigone region that did not enhance. The size of the lesion was also unchanged. The diffusion imaging was negative for acute water restriction and the susceptibility sequence demonstrated no evidence of microhemorrhage or abnormal iron accumulation. The final impression was of a probable infiltrative astrocytoma of at least grade II. After receiving the results, the patient declined to have either surgery or biopsy of the area, and agreed to continue with yearly follow-up MRIs.

The latest annual follow up MRI was done on a Toshiba Titan 3T system. An MR brain tumor protocol was used and included the following sequences (Axial T1 pre and post contrast, Axial FLAIR, Axial T2, Axial Flow-Sensitive Black Blood (FSBB), Sagittal 3D T1 IR post contrast and diffusion imaging).

LATEST IMAGING FINDINGS

This latest MR showed no significant change in the size of the right periventricular white matter signal abnormality. However, the FSBB image (Figure 4) showed prominent internally draining medullary veins in the lesion area, without obvious microhemorrhage. There was minimal parenchymal volume loss and mild prominence of the sulci in the same area.

DIAGNOSIS

The imaging findings are consistent with a capillary type angiodysplasia with an associated developmental venous anomaly. The signal abnormality in the white matter is likely the result of chronic ischemia from a steal phenomenon related to vascular shunting. The findings are not that of a tumor.

DISCUSSION

Toshiba's Flow-Sensitive Black Blood (FSBB) technique utilizes motion-probing gradients (MPGs) in a 3D FE sequence to generate image contrast from both T2* susceptibility effects as well as intra-voxel incoherent motion dephasing effects. In other words, FSBB sequence builds upon the susceptibility contrast in T2*-weighted FE sequences by adding motion-probing gradients to generate additional signal dephasing in slow flowing vessels, significantly improving visualization of the vessels that were otherwise unobservable in other images.

The inherent capability of the FSBB sequence to improve vessel contrast without suffering from excessive T2* decay was paramount for making the diagnosis in this case, since none of the other sequences performed during previous exams provided essential detail of the slow-flow vessels of the area to differentiate it as a capillary angiodysplasia.

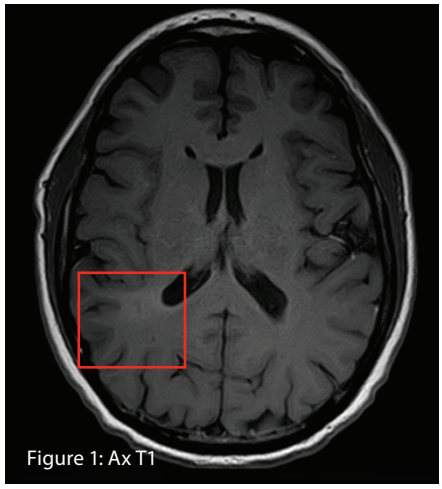


Figure 1: Ax T1

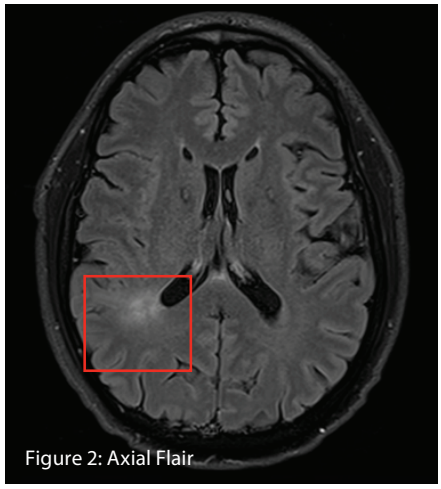


Figure 2: Axial Flair

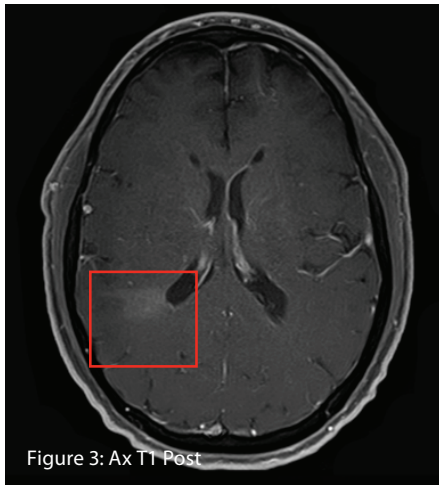


Figure 3: Ax T1 Post

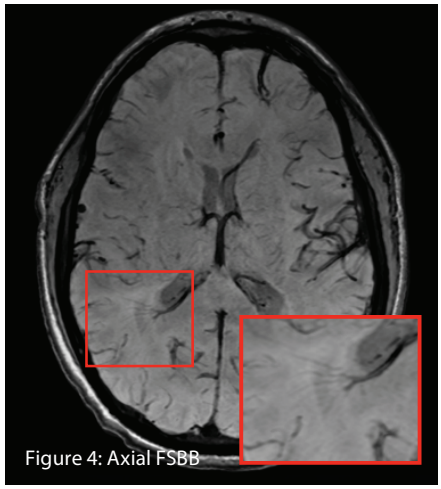


Figure 4: Axial FSBB

Toshiba's Flow-Sensitive Black Blood (FSBB) (Figure 4) demonstrating internally draining medullary veins in the lesion area (red rectangle). The clinical results described in this paper are the experience of the author. Results may vary due to clinical setting, patient presentation and other factors.

CONCLUSION

In retrospect, we can affirm that the change in diagnosis was made possible due to the combination of the Toshiba's Flow-Sensitive Black Blood (FSBB technique) with the other image sequences. Without that combination, the data provided would still indicate that a non-enhancing lesion most likely representing an infiltrative astrocytoma affected the area. With the new definitive diagnosis, the patient no longer needs imaging follow-up, and no longer has the emotional stress often associated with having a brain tumor.

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