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Application of 3D T1 Black-Blood Imaging in the Diagnosis of Leptomeningeal Carcinomatosis: Potential Pitfall of Slow-Flowing Blood

S.A. Nabavizadeh

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I read the publication "Application of 3D Fast Spin-Echo T1 Black-Blood Imaging in the Diagnosis and Prognostic Prediction of Patients with Leptomeningeal Carcinomatosis" by Oh et al[1] with a great interest. The authors concluded that black-blood imaging showed a significantly higher sensitivity than contrast-enhanced gradient recalled-echo and contrast-enhanced spin-echo imaging for detecting leptomeningeal carcinomatosis.

A variety of techniques can be used to achieve blood suppression on T1-weighted imaging. The most commonly used technique, which was also used by Oh et al,[1] is a variable flip angle refocusing pulse sequence in which the protons in the vessel lumen experience the slice-selective radiofrequency pulse but flow out of the imaging section before the refocusing pulse, resulting in blood-signal suppression. This technique is widely used in high-resolution intracranial vessel wall MR imaging; however, an important pitfall with this technique is that slow-flowing blood in leptomeningeal veins, dilated arteries, or leptomeningeal collaterals can cause incomplete or lack of suppression.[2,3] Kato et al[4] compared 3D fast spin-echo (sampling perfection with application-optimized contrasts by using different flip angle evolutions [SPACE; Siemens, Erlangen, Germany]) and 3D gradient-echo T1-weighted MPRAGE images in patients with small parenchymal brain metastasis. Lesion detectability was significantly higher on SPACE than on MPRAGE; however, vessels were falsely reported as metastasis using both techniques. I can only imagine that this pitfall will be aggravated when assessing leptomeningeal metastasis. One way to avoid these artifacts would be to use a double inversion recovery technique, which exploits both the flow and T1 properties of blood to suppress its signal.[2] This technique requires a longer acquisition time, which is a limitation in high-resolution intracranial vessel wall MR imaging, given the need for very high spatial resolution; however, this should be less of a problem in the context of metastatic disease.

In conclusion, I agree with the authors that postcontrast T1 black-blood imaging is a promising technique for the detection of leptomeningeal carcinomatosis; however, it will require further investigation to determine the best technique for blood suppression to avoid the above-mentioned pitfall.

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ⓘ **S.A. Nabavizadeh**
Department of Neuroradiology
Hospital of the University of Pennsylvania
Philadelphia, Pennsylvania