Low b-value DWI in assessment of large vessel vasculitis

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***Introduction*:** Contrast-enhanced MRA is a well established technique for imaging patients with large vessel vasculitis, and can effectively demonstrate luminal abnormalities associated with vasculitis. Vessel wall imaging is also an important component of these examinations, since mural thickening is common, and mural edema and enhancement have been correlated with disease activity. Mural edema is typically assessed with T2-weighted images, often ecg-gated double or triple inversion recovery pulse sequences. We evaluated the feasibility of breath-held non-gated low b-value diffusion-weighted imaging (DWI) as an alternative approach for visualization of mural edema in 29 patients with known or suspected vasculitis.

***Methods*:** All examinations were performed on a 1.5T Twin Speed Excite system (GE Healthcare, Waukesha, WI). Clinically indicated MRI/MRA was performed in 29 patients (20 female, 9 male, average age 55 yrs) with known or suspected large vessel vasculitis. Examinations consisted of axial black blood images through the thoracic and/or abdominal aorta (ecg-gated double and/or triple inversion recovery fast spin echo or respiratory-triggered fast spin echo). Breath-held low b-value DWI images were acquired with the following parameters: TR/TE 2000/45-65, b-value 50-100, slice thickness 8 mm, matrix 128x128, parallel imaging (ASSET) acceleration factor 2, NSA 3, with acquisition time 24 seconds. 3D contrast-enhanced MRA was typically performed in a coronal oblique plane following injection of 0.1 mM/kg gadolinium contrast agent at a rate of 2-3 ml/s. Axial fat-suppressed 3D SPGR (LAVA) images were acquired 1-2 minutes after the MRA. DW images were assessed for the presence of mural edema in the aorta based on wall thickening and increased signal intensity. This was qualitatively rated as absent, mild, moderate, or severe. T2-weighted FSE images when available were rated using the same scale. 3D SPGR post-gadolinium images were evaluated for the presence of mural enhancement, which was qualitatively rated as absent, mild, moderate, or severe.

***Results*:** Table 1 shows comparison of qualitative assessment of mural edema and mural enhancement in 29 patients who had both DWI and 3D SPGR images acquired, as well as comparison of qualitative assessment of mural edema in 11 patients who had both DW and T2-weighted FSE images acquired. Figure 1 is a representative example of DW images in patients with vasculitis and mural enhancement/edema.

	DWI	3D SPGR		DWI	FSE
Negative	8	5		2	3
Mild	14	19		4	5
Moderate	6	4		4	2
Severe	1	1		1	1

Table 1. Qualitative assessment of mural edema on DWI images in comparison to mural enhancement on 3D SGPR images (left) and mural edema on FSE images (right).

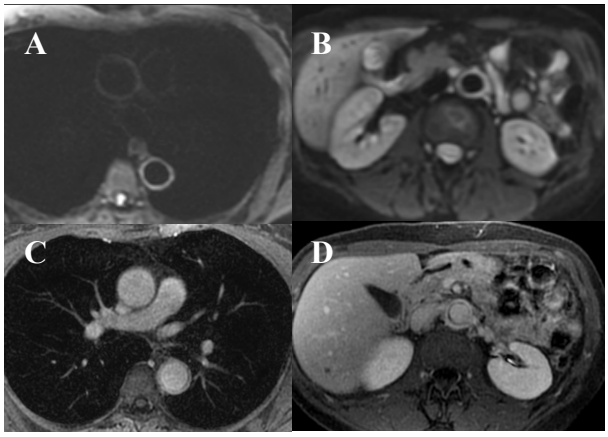

Fig 1. Low b-value diffusion weighted images (A and B) in a patient with giant cell arteritis demonstrate moderate mural thickening and edema in the lower thoracic and abdominal aorta. Corresponding post contrast 3D SPGR images also demonstrate mural thickening and enhancement.

***Discussion*:** Preliminary results indicate that low b-value DWI is a promising technique for assessing mural edema in patients with large vessel vasculitis. Diffusion weighting provides a black blood effect which optimizes visualization of the vessel wall, and the increased signal intensity on low b-value DWI noted in the presence of mural edema likely reflects a combination of T2 and diffusion weighting. Diffusion-weighted images can be acquired more quickly than conventional FSE images, often with higher image quality due to a more robust black blood effect. Limitations include lower spatial resolution in comparison to standard FSE images, and limited experience regarding the expected signal intensity in normal and atherosclerotic aortas. The optimal b-value(s) for this application are also uncertain.