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Letter to the Editor

Adrenoleukodystrophy: Diffusion MRI findings

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An 8-year-old boy with laboratory evidence of adrenal insufficiency, and an established diagnosis of X-linked adrenoleukodystrophy was referred to our institution for a follow-up magnetic resonance imaging (MRI) examination. Besides T1 and T2-weighted sequences, a diffusion MRI protocol was added. The "trace" sequence, a single-shot, spin-echo, echo-planar imaging sequence was used, which averages the data from the three (x, y, and z) gradients and which provides automatically generated apparent diffusion coefficient (ADC) maps. The acquisition time was 22 sec with TR = 5700 msec, and TE = 139 msec, and slice thickness was 5 mm.

On diffusion MRI b = 1000 sec/mm^2 images revealed high-signal changes similar to that seen in cases of restricted diffusion pattern (Fig. 1a). However, the ADC maps revealed that an elevated diffusion pattern was present in the necrotic regions (2.06 and 1.60 $\times$ 10^{-3} mm^2/sec). The ADC value of the central necrotic zone was higher (2.06 $\times$ 10^{-3} mm^2/sec) compared to that of the peripheral necrotic zone (1.60 $\times$ 10^{-3} mm^2/sec), and that of the intermediate zone of active demyelination was lower (1.14 $\times$ 10^{-3} mm^2/sec) (Fig. 1b). These values were higher than the ADC values of the normal regions of the brain parenchyma.

Three previous reports have dealt with diffusion MRI changes in Adrenoleukodystrophy [1–3]. Segawa et al. [2] reported two patients associated with elevated diffusion coefficients. Ito et al. [1] reported 11 patients with similar elevated diffusion patterns in the lesions compared to the normal appearing brain regions. Sener [3] reported a patient with predominantly frontal involvement. It was cited in that report that the lesions were difficult to observe on b = 1000 sec/mm^2 images, while ADC maps had detailed information. The ADC value of central zone was higher than that of the peripheral zone. This was a reflection of zonal differences regarding the evolution of the disease. The intermediate zone of active demyelination had an ADC value similar to normal white matter [3]. In the present patient high-signal changes on b = 1000 sec/mm^2 images was equivalent to a restricted diffusion pattern. However, presence of high ADC values (2.06 and 1.60 $\times$ 10^{-3} mm^2/sec) definitely indicated presence of an elevated diffusion pattern at the lesion sites. Thus, diffusion MRI revealed that there is an elevated diffusion pattern in the lesions of adrenoleukodystrophy, and that differing water diffusibility can be present between the two necrotic zones, likely related to the evolution of the disease process.

References

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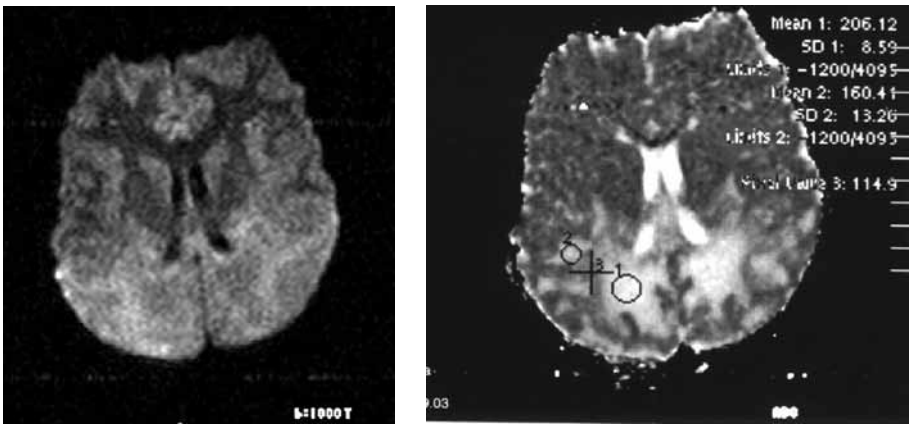

(a) (b)

Fig. 1. (a): b = 1000 sec/mm^2 image reveals high-signal in the occipital regions implying restricted diffusion. (b): ADC map reveals elevated diffusion in the necrotic regions. The ADC value of the central necrotic zone is higher (2.06×10^{-3} mm^2/sec) than that of the peripheral necrotic zone (1.60×10^{-3} mm^2/sec). The ADC value of the intermediate band of active demyelination is lower (1.14×10^{-3} mm^2/sec).

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