Differentiating Epidermoid and Arachnoid Cysts with Diffusion-Weighted Imaging: Pitfalls in Diagnosis

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Purpose
To illustrate the inability to differentiate epidermoid cysts from arachnoid cysts with diffusion-weighted imaging when FLAIR preparation pulses are used.

Materials & Methods
Two patients with cystic pineal region masses were studied with diffusion-weighted images. The first patient, a 28-year-old female, presented with headaches and was found to have a large pineal epidermoid cyst. The second patient, a 2-year-old male with developmental delay, had an incidental arachnoid cyst. Echo planar–diffusion weighted images were obtained on a 1.5 T MR system with a b = 1000 sec/mm² applied on three orthogonal axes. Diffusion-weighted images were acquired with and without FLAIR preparation pulses. Isotropic diffusion-weighted images were obtained and apparent diffusion coefficient (ADC) maps were created.

Results
When diffusion-weighted imaging was performed with FLAIR preparation pulses, the signal within both the epidermoid and the arachnoid cyst was suppressed and both cysts appeared dark on the isotropic diffusion-weighted image. The calculated two point ADC values of the CSF and epidermoid were erroneously low and not significantly different (0.52 and 0.78 µm²/msec, respectively). However, when diffusion-weighted imaging was performed without FLAIR preparation, the epidermoid demonstrated high signal on the isotropic diffusion-weighted image and was distinguished easily from the arachnoid cyst, which continued to demonstrate low signal. The calculated two point ADC values of the CSF and epidermoid were now 3.13 and 0.93 µm²/msec respectively.

Conclusion
Diffusion-weighted imaging easily differentiated the epidermoid and arachnoid cysts when performed without FLAIR preparation. However, when FLAIR preparation was used, it was difficult to distinguish between these lesions. With FLAIR, the signal within lesions with T2 relaxation times similar to CSF is nulled. This results in low signal on the isotropic diffusion-weighted image and erroneously low two point ADC calculations. Caution should be exercised in implementation of diffusion-weighted imaging with FLAIR preparation pulses, which are now widely available in clinical practices.

References