

Diffusion-weighted MR Imaging of Rim-enhancing Lesions in the Brain

Y.H. Kim, D. G. Na, J. W. Ryoo, H. S. Byun, Department of Radiology, Samsung Medical Center, Sungkyungwan University School of Medicine, Seoul, Korea

Purpose: This study was performed to assess diffusion-weighted MR features of various rim-enhancing lesions in the brain and to evaluate the use of DW-MR imaging in the differential diagnosis of rim enhancing lesions.

Materials and Methods: Thirty-seven patients with surgically or clinically proven rim-enhancing parenchymal lesions were included in this study. The rim-enhancing lesions were cystic or necrotic tumors 19 (glioblastoma multiforme 12, metastasis 7), inflammatory masses 14 (pyogenic abscess 5, cysticercosis 6, tuberculosis 2, sparganosis 1), and multiple sclerosis 4. Diffusion-weighted MR imaging was performed on 1.5T GE MR. Diffusion gradients (b value: 0, 100, 1000 s/mm²) were applied in the three orthogonal directions and isotropic image was obtained. The signal intensities of rim-enhancing lesions were visually assessed in the centers and peripheral rims of the lesions on DW images. The apparent diffusion coefficient (ADC) was measured with two different b values (100 and 1000 s/mm²) in the center of the lesions.

Results: Most of glioblastoma multiformes and metastases showed central hypointense signal intensity with hyper- or iso-signal intensity of the peripheral rim in 14(74 %) of 19 patients (Table 1). Central hyperintensity was found in one glioblastoma multiforme and one metastasis. Pyogenic abscess showed central bright signal intensity with hypo- or iso-signal rim in all 5 patients. Multiple sclerosis showed variable signal intensities of the lesions. Cysticercosis also showed variable signal intensities of the lesion centers according to the degenerative stages of the lesions. In the patients with multiple rim-enhancing lesions of multiple sclerosis and cysticercosis, variable signal intensities were simultaneously found in the same patient. The signal intensity of the lesions was iso-signal in tuberculosis and sparganosis. In the center of rim-enhancing lesion, ADC value was significantly

lower in pyogenic abscess than those of glioblastoma multiforme and metastasis (Table 2). The ADC values were variable in multiple sclerosis and cysticercosis.

Table 1. Diffusion-Weighted MR Findings of Rim-Enhancing Brain Lesions

Tumor	Center			Rim	
	high	iso	low	high	iso/low
GM (n= 12)	1	3	8	10	2
Metastasis (n=7)	1	0	6	4	3
Multiple sclerosis (n=4)	2	2	1	2	2
Pyogenic abscess (n=5)	5	0	0	0	5
Cysticercosis (n=6)	1	0	6	0	6
Tb, Sparganosis (n=3)	0	3	0	0	3

GM: glioblastoma multiforme

Table 2. ADC of Rim-enhancing Lesions

ADC of Center	
GM	2.82 ± 1.18 X 10 ⁻³ mm ² /sec
Metastasis	3.30 ± 1.20 X 10 ⁻³ mm ² /sec
Pyogenic abscess	1.14 ± 0.31 X 10 ⁻³ mm ² /sec

Conclusion: Central hyperintensities of rim-enhancing lesions were dominantly found in pyogenic abscess and multiple sclerosis on DW-MR images. However, central hyperintensity was also found in GM and metastasis. Hyperintense signal of the peripheral rim was found in GM, metastasis, and multiple sclerosis. Diffusion-weighted MR imaging may provide additional information in the differential diagnosis of the various rim-enhancing lesions in the brain.

Reference

- Ebisu et al. *Magn Reson Imaging* 14, 1113-1116, 1996
- Kim et al. *AJR* 71,1487-1490, 1998
- K. Noguchi et al. *Neuroradiology* 4,171-174, 1999