

1 . 1,2 . 1,2 . 1,2 . 1 . 1 . 1,2 . 2,3

: - (HIE) (DWI) .
 : MR 4 32 11.8
 T1 T2 , FLAIR, DWI
 , T2 FLAIR DWI
 : T2, FLAIR DWI
 . 4 가 , 2
 6 4 T2 FLAIR DWI
 , 2 6
 5 T2, FLAIR DWI , 3
 T2 FLAIR DWI . 3
 가 , 6 4
 T2, FLAIR DWI , 1 T2
 FLAIR DWI .
 : HIE DWI 가
 , T2 FLAIR .

CT MR
 가 (2-5).
 HIE) - (hypoxic-ischemic encephalopathy, 가 MR (echo
 (1). planar imaging, EPI) (diffusion-
 weighted image, DWI)
 가 가
 가 HIE 가 . DWI
 HIE

12:49 - 54(2008)

1
2
3

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(2, 3, 5-7). HIE DWI , DWI

MR HIE DWI , DWI

2003 5 2005 8

(Table 1). 가 4 , 가 2 6 1 57 26.2 MR

4 32 11.8 6

1.3 , 6

MR 1.5 Tesla (Magnetom Sonata, Siemens, Germany) 5 mm , 1 - 1.5 mm

T1 (TR/TE 500 msce/13 msec), T2 (TR/TE 4,390 ms/111 ms) FLAIR (TR/TE/TI 8,010 ms/119 ms/2,500 ms) DWI single-shot EPI (TR/TE 3,500 ms/95 ms) b value 0 1,000 sec/mm² , T2

FLAIR DWI 가

가

Table 1 T2, DWI

(Fig. 1). 가 4

가

4

6 4 T2 FLAIR DWI

(Table 2). , 2

DWI 6 5 T2, FLAIR

3 T2 FLAIR DWI

3 가

(Fig. 2, Table 2).

6 4 T2, FLAIR DWI

1

Table 1. Clinical Data and MR Characteristics of Six Patients with Hypoxic-Ischemic Encephalopathy

No	Age/Sex	Etiology	Days to MR	MR Characteristics (Signal Intensity)											
				Basal Ganglia (n = 6)			Thalamus (n = 2)			Cortex and Subcortical WM (n = 5)			Deep WM (n = 4)		
				Globus Pallidus (n = 4)	Putamen and Caudate Nucleus (n = 6)	Thalamus (n = 2)	Subcortical WM (n = 5)	Deep WM (n = 4)	T2/FL/DWI	ADC	T2/FL/DWI	ADC	T2/FL/DWI	ADC	
1	12/M	Near Drowning	4	High	Iso	High	High	High	Low	Low	High	Low	High	Low	
2	11mo/F	Respiratory Arrest with Pneumonia	5	High	Iso	Iso	High	High	Low	Low	High	Low	High	Low	
3	57/M	Diabetic Nonketotic	7	High	Low	Low	High	High	Iso	Iso	High	Iso	High	Iso	
4	30/F	Hyperosmolar Coma	8	High	Low	High	High	High	Iso	Iso	High	Iso	High	Iso	
5	16/M	Chemical Poisoning	15	High	Low	High	High	High	Iso	Iso	High	Iso	High	Iso	
6	44/M	Sudden Cardiac Arrest	32	High	Low	High	High	High	Iso	Iso	High	Iso	High	Iso	

T2: T2-weighted image FL: fluid-attenuated inversion recovery image D: diffusion-weighted image
 ADC: apparent diffusion coefficient map image WM: white matter

Table 2. Lesion Conspicuity of Hypoxic-Ischemic Encephalopathy According to Each MR Sequence

Location	DWI > T2/FLAIR	DWI = T2/FLAIR
Basal Ganglia (n = 6)	4	2
Cortex & Subcortical		
WM (n = 5)	3	2
Deep WM (n = 4)	1	3
Thalamus (n = 2)	1	1

DWI: diffusion-weighted image

T2: T2-weighted image

FLAIR: fluid-attenuated inversion recovery image

WM: white matter

T2 FLAIR DWI
(Fig. 3). 1 가

2 T2,
FLAIR DWI

1 1
(Fig. 1). 1 T2 FLAIR
DWI 1
(Table 2).

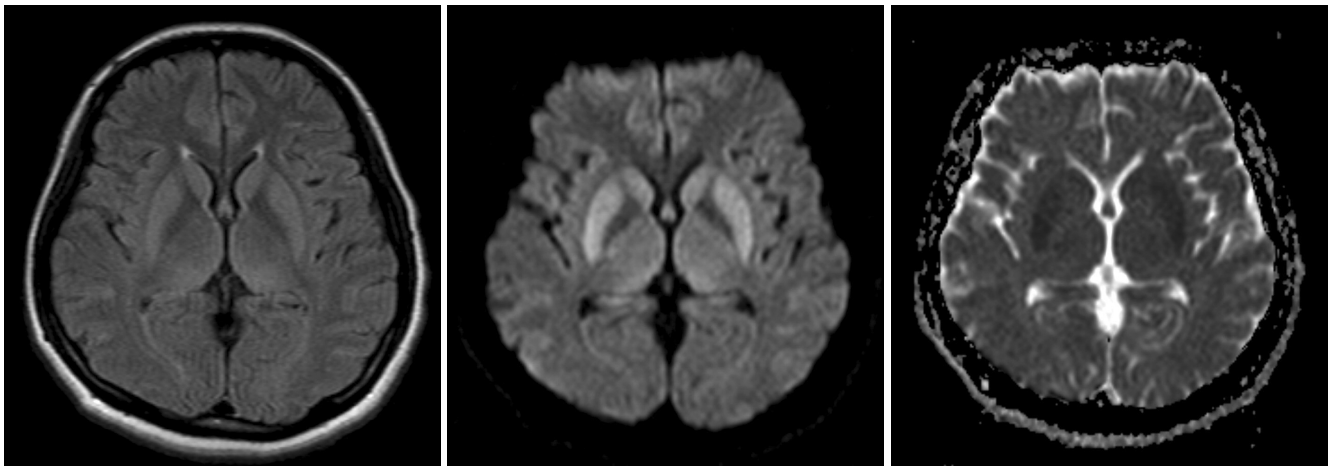


Fig. 1. Patient 4. A 30-year-old female underwent MR imaging 8 days after respiratory arrest and hypoxic insult. **a.** Axial FLAIR image shows subtle hyperintense lesions in the bilateral putamina, caudate nuclei and posterior medial thalami. **b.** On DWI, the lesions are more conspicuously demonstrated than on FLAIR image. **c.** ADC map image reveals restricted water diffusion of the basal ganglia lesions. However, the thalamic lesions are isointense.

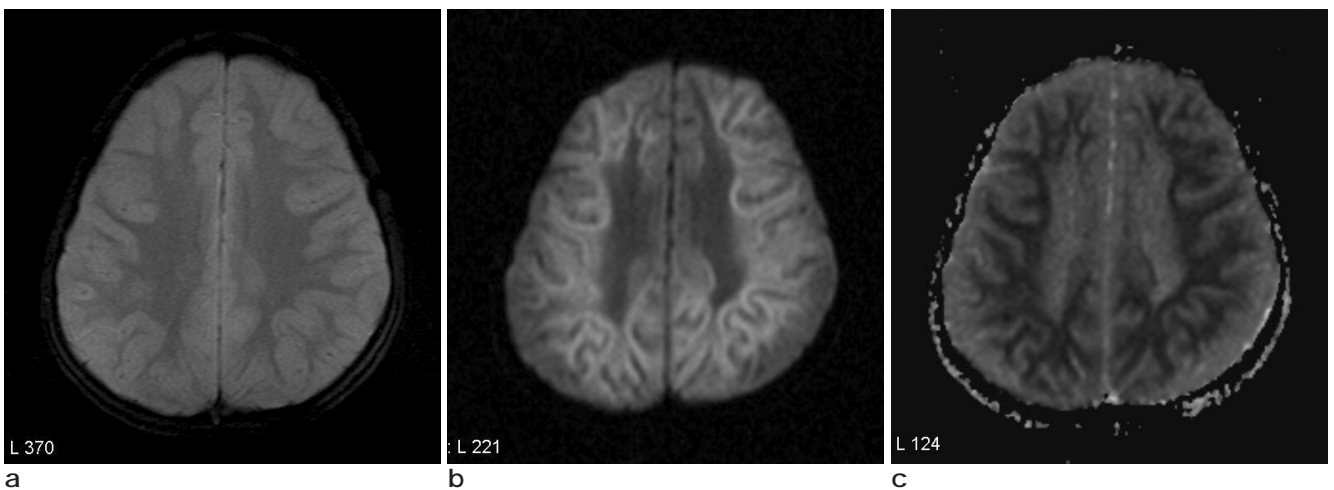


Fig. 2. Patient 1. A 12-year-old male underwent MR imaging 4 days after near drowning. **a.** Axial T2-weighted image shows subtle hyperintense lesions in the cortices and subcortical white matter of both cerebral hemispheres. **b.** On DWI, the lesions are more conspicuously demonstrated than on T2-weighted image. **c.** ADC map image reveals restricted water diffusion of the lesions.

(2-5, 9, 10).
15 32
2

가
가 가

HIE DWI
DWI T2 FLAIR

DWI 가 가
DWI
DWI
'T2 shine through effect'
(3, 6,

8).
bias) 가
가

HIE 가 가
DWI
(6).

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Diffusion-weighted MR Imaging of Hypoxic-Ischemic Encephalopathy

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Purpose : The purpose of this study was to determine the characteristics of hypoxic-ischemic encephalopathy (HIE) on diffusion-weighted imaging (DWI) and the role of DWI for the diagnosis of HIE.

Materials and Methods : Six patients with HIE underwent MRI including DWI. MR examinations were performed within 4 - 32 days (mean, 11.8 days) after hypoxic brain insult. We assessed the distribution of the lesions and compared the DWI and T2, FLAIR images for the subjective conspicuity of the lesions.

Results : In all patients, symmetrical hyperintense lesions were demonstrated in the bilateral basal ganglia on T2, FLAIR, and DWI. On ADC map image, the lesions were hypointense in four of six patients and isointense in other two patients. Lesion conspicuity on DWI was higher than on T2 and FLAIR images in four of six patients and similar in other two patients. For the involvement of the cortex and subcortical white matter, in five of six patients, bilateral symmetric hyperintense lesions were seen on T2, FLAIR, and DWI. Lesion conspicuity on DWI was higher than on T2 and FLAIR images in three of them and similar in other two patients. On ADC map image, the lesions showed hypointensity in three of five patients and isointensity in other two patients. For the involvement of the deep cerebral white matter, T2, FLAIR, and DWI showed bilateral symmetric hyperintense lesions in four of six patients. Among them, Lesion conspicuity on DWI was higher than on T2 and FLAIR images in only one patient.

Conclusion : HIE is characterized by symmetrical hyperintense lesions in the bilateral basal ganglia, cerebral cortex, and white matter on DWI and the lesions are more conspicuously demonstrated on DWI than on T2 and FLAIR images.

Index words : Brain
Hypoxia
Magnetic resonance (MR)
Diffusion MR

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