J Korean Soc Radiol 2011 ; 64 : 213-216

Recurrent Clinically Mild Encephalitis/Encephalopathy with a Reversible Splenial Lesion (MERS) on Diffusion Weighted Imaging: A Case Report[1]

Jung Yeun Hong, M.D., Ji Kang Park, M.D.[2], Seung Hyoung Kim, M.D.[2], Gukmyung Choi, M.D.[2]

We report serial MR imaging of an 11-year-old boy who had a recurrent episode of clinically mild encephalitis/encephalopathy with a reversible splenial lesion. During the first episode, brain lesions were limited to the corpus callosum. However, for the second episode, the lesions were distributed in the corpus callosum and bilateral deep white matter. No abnormality remained in the follow-up MR images obtained after full recovery.

Index words : Encephalitis
Recurrence
Corpus Callosum
Diffusion Magnetic Resonance Imaging

Recently, transient splenial lesion with restricted water diffusion has been reported in various conditions including clinically mild encephalitis/encephalopathy with a reversible splenial lesion (MERS), withdrawal of antiepileptic drugs, as well as metabolic or toxic insult such as immunoglobulin therapy (1-3). Despite the different clinical conditions, previously reported cases showed very similar clinical and MR imaging patterns. In almost all cases, the neurological symptoms were transient, and the brain lesions were usually limited to the corpus callosum (CC) and were reversible. We recently experienced a similar case, but the episode was recurrent. In this case, we describe the clinico-radiological course and discuss the possible pathogenesis.

[1]Department of Pediatrics, Jeju National University College of Medicine, Jeju, Korea
[2]Department of Radiology, Jeju National University College of Medicine, Jeju, Korea
Received September 3, 2010 ; Accepted November 10, 2010
Address reprint requests to : Ji Kang Park, M.D., Department of Radiology, Jeju National University Hospital, Jeju National University College of Medicine, 1753-3, Ahra-1-dong, Jeju-si, Jeju Special Self-Governing Province 690-716, Korea.
Tel. 82-64-717-1371 Fax. 82-64-757-8276
E-mail: jkcontrast@naver.com

Case Report

A previously healthy 11-year-old boy was admitted to our hospital presenting with abdominal pain over the course of the previous day.

On admission, he was alert without any neurological abnormalities. During the evening of his admission, drowsiness associated with high fever developed and progressed to delirium on the second hospital day (HD). Blood examinations revealed mild leukocytosis (11,200/mm^3). The blood culture was negative and anti-mycoplasma antibody titer was significantly elevated (1:1,280 positive) in the serum. The altered consciousness continued until diffusion-weighted MR imaging (DWI) was performed on the second HD (spin-echo EPI, TR/TE =5,300/98, 4-mm section thickness, b factor = 2,000 sec/mm^2) and it revealed the lesion within the corpus callosum (CC) (Fig. 1). The apparent diffusion coefficient (ADC) value was within the range of 330-390 $\times$ $10^{-6}$$mm^2$/s. CSF examination and viral studies were not done. On the third HD, without any specific treatment except IV cefotaxime and oral erythromycin, his mental

status began to return towards normal. On the 11th HD, he recovered completely and was discharged.

About 3 months later, when an influenza alarm was issued, he was again admitted to our hospital due to a severe headache and high fever up to 40° C. Initially, he was alert and oriented. On the first HD, a CSF examination was performed under the impression of acute meningitis. His WBC count in the CSF was 465/ mm^3 (80% polymorphonuclear granulocyte). The concentrations of protein and glucose were 43 mg/dL and 82

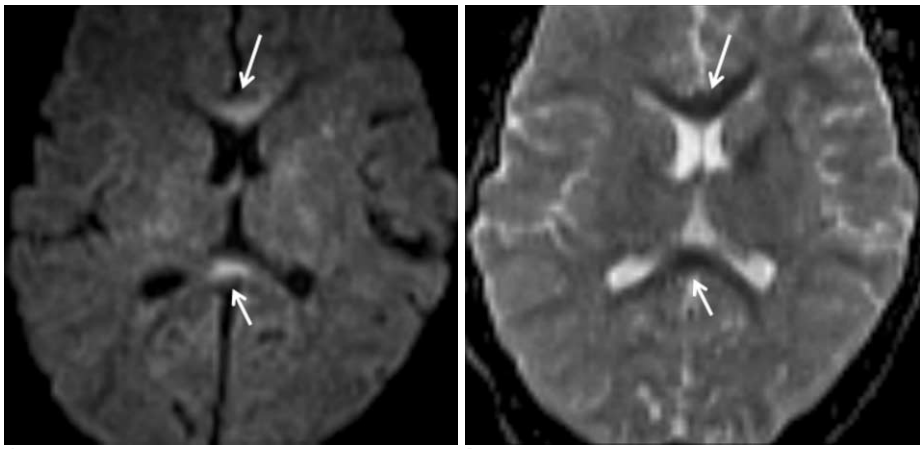
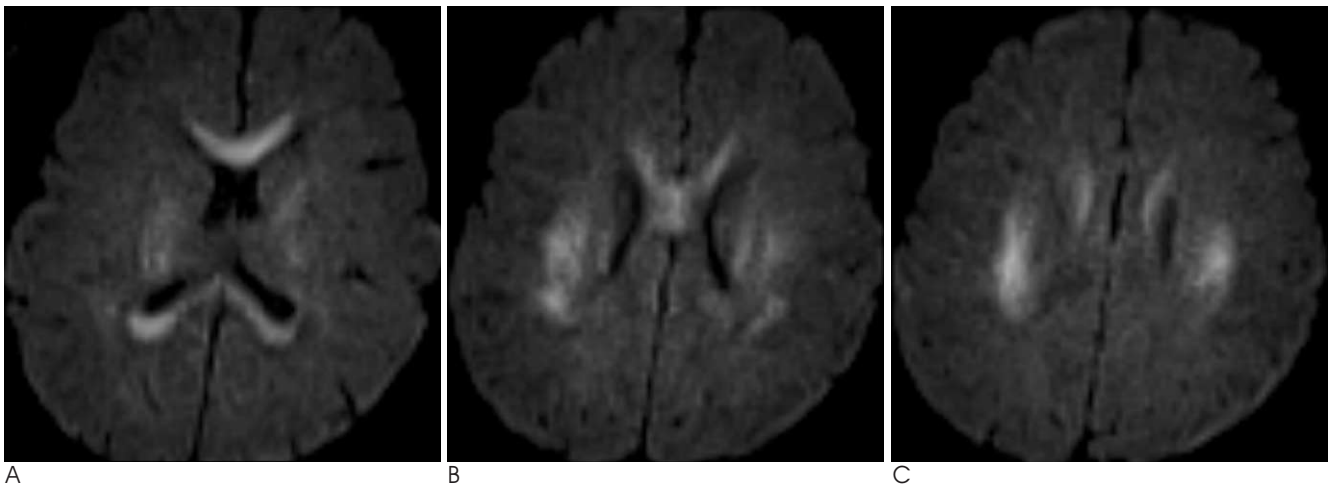


Fig. 1. MR imaging of the first episode.
Diffusion-weighted imaging (DWI) and ADC map (A, B) indicated that the lesions in the genu and splenium of the CC (arrows) show a pattern of water diffusion restriction (high signal intensity on the DWI, low signal intensity on the ADC map).



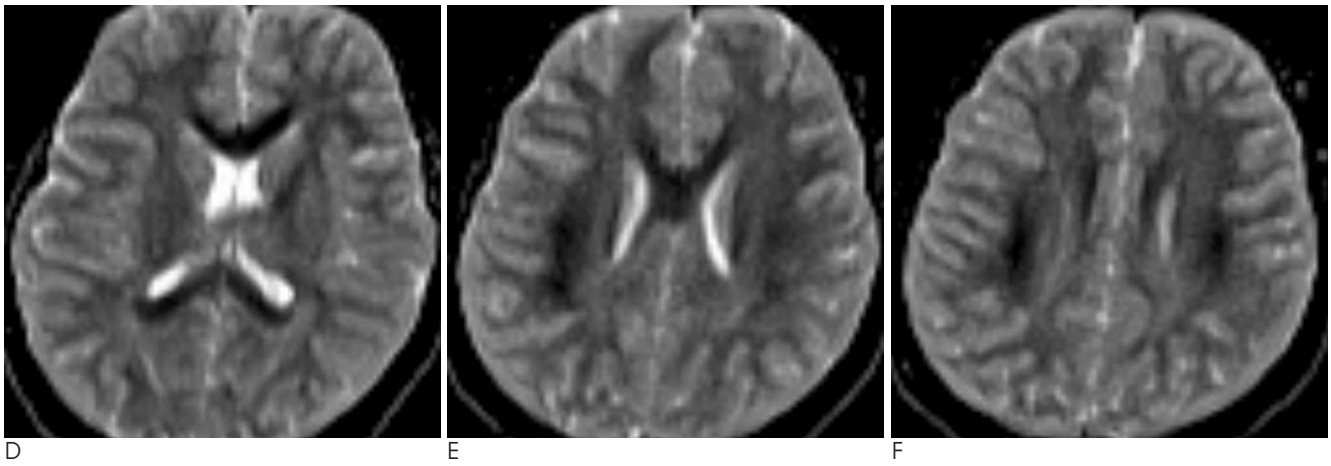
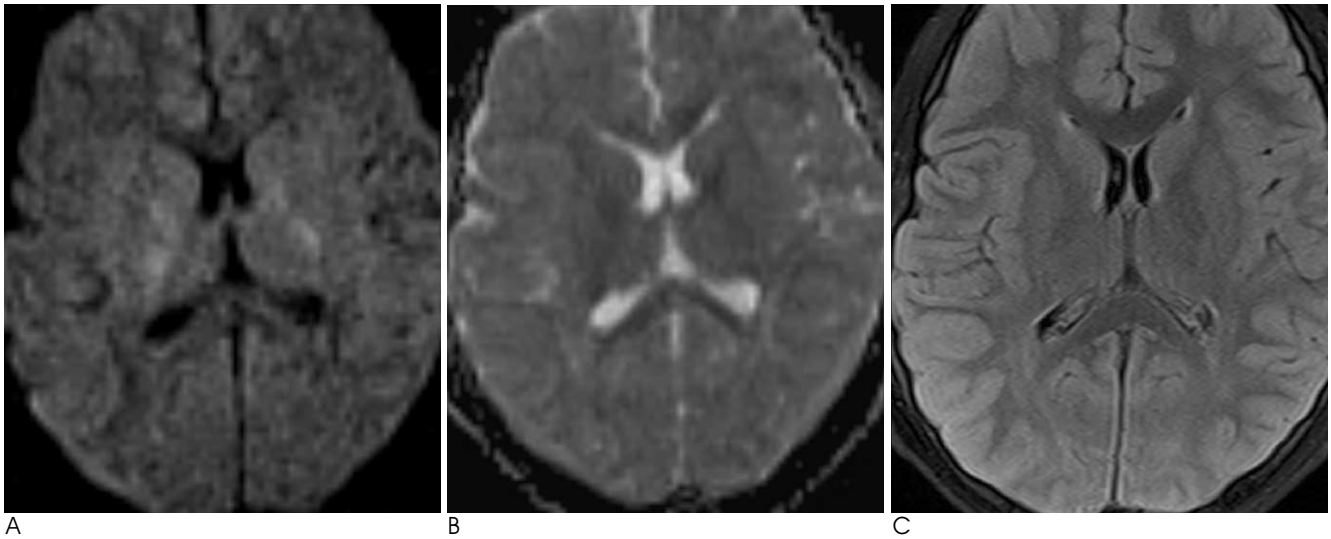


Fig. 2. MR imaging of the second episode.
DWI (A-C) and ADC map (D-F) demonstrate the lesion in the entire CC and deep periventricular white matter, which show a pattern of restricted water diffusion.



A B C

Fig. 3. Follow-up MR imaging after 4 months.
There is no remarkable residual lesion in the corpus callosum on axial DWI, ADC map (A, B), and FLAIR image (C).

mg/dL, respectively. Blood examinations revealed leukocytosis (21,400/mm^3) and his anti-mycoplasma antibody was positive at 1:1,280 dilution. Microbiologic tests including PCR of the blood and CSF were negative for bacteria and herpes simplex virus, enterovirus, and mycoplasma pneumoniae. On the first HD, he was diagnosed with aseptic meningitis and supportive treatment including 20% mannitol injection was started. Through the first night in hospital, he started to show delirious mental status. As he was considered to have encephalitis or encephalitis-associated condition, brain MRI and EEG were performed. EEG on the second HD showed diffuse irregular continuous slow waves and frequent bursts of high amplitude rhythmic delta waves with both frontal areas. DWI on the second HD revealed distinct lesions with high signal intensity in the deep periventricular white matter and the entire CC (Fig. 2). The ADC value in the CC was within the range of 240-346 $\times$ $10^{-6}$$mm^2$/s. Following brain MRI, the influenza virus was considered as the possible cause and Tamiflu was administered on the second HD. On the third HD, he began to show dramatically improved mental status. On the seventh day, he was discharged without any neurological abnormalities. Follow-up brain MR imaging after 20 days revealed no abnormalities. The ADC value of the CC was within the range of 430-450 $\times$ 10^{-6} mm^2/s. Although he showed complete normal condition and no abnormal lesion remained in the MRI, there were still several intermittent rhythmic or arrhythmic slow waves in both frontal areas on follow-up EEG. The final follow-up, which included brain MRI and EEG, was performed 4 months after the second attack, and there were no abnormalities observed in the brain MRI (Fig. 3) or the EEG.

Discussion

Transient CC lesions with restricted water diffusion in DWI is a well-known phenomenon associated with various conditions including meningoencephalitis, withdrawl of antiepileptic drug, metabolic disorder (hypoglycemia, electrolyte imbalance) and high altitude cerebral edema (4). The known pathogen associated with MERS include the influenza virus (A and B, 19%), mumps virus (7%), adeno virus (6%), Streptococcus (6%), and Escherichia coli (6%). However, the pathogen associated MERS is unknown in 41% of cases. One limitation in our report was that we did not evaluate all possible pathogens of MERS, and we could not determine the exact pathogen. The common imaging features were mildly increased signal intensity on T2WI, high signal on DWI, and decreased ADC values (1, 5, 6). It is still not clear why CC is always involved and why ADC is decreased with the lesion site. Intramyelin edema due to separation of the myelin layer, transient inflammatory infiltration like in multiple sclerosis, hyponatremia resulting in water influx to brain and cerebral edema, and excitotoxic injury have been suggested as the reason of the reduced water diffusion (1, 3, 7).

There were no previous reports concerning the recurrence of the MERS associated with meningoencephalitis or other conditions. In our case, the lesion loads were

different between the two episodes. The different lesion loads may be due to different time course between the CC lesion and other white matter lesion (8), or the difference in severity between the two episodes. We could not clearly explain the reason for the recurrence and we consider the possibility of various cytokine (such as interleukin-6) mediated immune responses to be the causative agents (1, 9, 10). In our case, anti-mycoplasma antibody titer was elevated in both episodes, and this infectious agent might be the possible pathogen in our case.

In conclusion, transient CC lesion with restricted water diffusion may recur under the circumstances of repeated exposure to the causative agents. In our case, the clinical course and imaging finding was more severe in the recurrent episodes.

References

1. Tada H, Takanashi J, Barkovich AJ, Oba H, Maeda M, Tsukahara H, et al. Clinically mild encephalitis/encephalopathy with a reversible splenial lesion. *Neurology* 2004;63:1854-1858
2. Gurtler S, Ebner A, Tuxhorn I, Ollech I, Pohlmann-Eden B, Woermann FG. Transient lesion in the splenium of the corpus callosum and antiepileptic drug withdrawal. *Neurology* 2005;65:1032-1036
3. Wada A, Yoshida R, Oda K, Fukuba E, Uchida N, Kitagaki H. Acute encephalopathy associated with intravenous immunoglobulin therapy. *AJNR Am J Neuroradiol* 2005;26:2311-2315
4. Garcia-Monco JC, Cortina IE, Ferreira E, Martinez A, Ruiz L, Cabrera A, et al. Reversible Splenial Lesion Syndrome (RESLES): What's in a Name? *J Neuroimaging* 2008
5. Takanashi J, Barkovich AJ, Shiihara T, Tada H, Kawatani M, Tsukahara H, et al. Widening spectrum of a reversible splenial lesion with transiently reduced diffusion. *AJNR Am J Neuroradiol* 2006;27:836-838
6. Bulakbasi N, Kocaoglu M, Tayfun C, Ucoz T. Transient splenial lesion of the corpus callosum in clinically mild influenza-associated encephalitis/encephalopathy. *AJNR Am J Neuroradiol* 2006;27:1983-1986
7. Takanashi J. Two newly proposed infectious encephalitis/encephalopathy syndromes. *Brain Dev* 2009;31:521-528
8. Takanashi J, Imamura A, Hayakawa F, Terada H. Differences in the time course of splenial and white matter lesions in clinically mild encephalitis/encephalopathy with a reversible splenial lesion (MERS). *J Neurol Sci* 2010;292:24-27
9. Narita M, Tanaka H, Togashi T, Abe S. Cytokines involved in CNS manifestations caused by Mycoplasma pneumoniae. *Pediatr Neurol* 2005;33:105-109
10. Aiba H, Mochizuki M, Kimura M, Hojo H. Predictive value of serum interleukin-6 level in influenza virus-associated encephalopathy. *Neurology* 2001;57:295-299

대한영상의학회지 2011 ; 64 : 213-216

뇌수막염과 관련된 일과성 뇌량 병변의 재발 증례의 확산강조영상 소견[1]

[1]제주대학교병원 소아청소년과
[2]제주대학교병원 영상의학과

홍정연 · 박지강[2] · 김승형[2] · 최국명[2]

저자들은 11세 남아에서 발생한 재발성 가역성 뇌량 병변을 보이는 예후가 양호한 뇌염/뇌병증 (clinically mild encephalitis/encephalopathy with a reversible splenial lesion)을 보고하고자 한다. 첫 번째 발작에서는 뇌량에만 병변이 국한되었고 두 번째 발작에서는 교량과 양측 심부백질에 병변이 위치하였다. 회복후의 추적 자기공명영상에서 병변은 모두 사라졌다.