

Research Article

Mild encephalitis/encephalopathy in children with a reversible splenial lesion

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Abstract

Objective: To investigate the imaging features of a reversible lesion in the splenium of corpus callosum related to encephalitis/encephalopathy in children.

Methods: A retrospective analysis was performed on the MRI findings of 84 children suffering from mild encephalitis/encephalopathy with a reversible splenial lesion (MERS) during different infection processes, and the imaging characteristics of the lesion on diffusion weighted image (DWI) were analyzed.

Results: In the 84 children with MERS, 42 children had upper respiratory tract infection, 33 children had enteritis, 9 children had upper respiratory infection accompanied by enteritis. Among them, 76 cases were of type I, with round or oval lesions in the splenium of corpus callosum, the other 8 cases were of type II, with lesions not only in the splenium of the corpus callosum, but also in the genu of the corpus callosum and in the periventricular white matter. The splenial lesions exhibited high-intensity on the diffusion-weight imaging with low ADC value on the ADC map. The abnormal signal disappeared and normalized in 3–15 days.

Conclusion: There are three types of common infection could cause mild encephalitis/encephalopathy with a reversible splenial lesion in children. Reduced diffusion in the splenium of the corpus callosum on DWI proved to be a specific finding that could be used to guide clinical treatment.

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Keywords: Children; A reversible lesion in the splenium of the corpus callosum; DWI

Mild encephalitis/encephalopathy with a reversible splenial lesion, also called reversible splenial lesion syndrome, is a clinical imaging syndrome proposed in recent years [1]. It is frequently seen in children, and mostly associated with infection [2]. In this study, the clinical images of MERS in children with upper respiratory tract infection, enteritis or both were analyzed and the MRI imaging features were explored.

1. Data and methods

1.1. Clinical data

Totally 84 cases of MERS diagnosed in our hospital from November 2013 to March 2018 were analyzed. The age of onset ranges from 3 months to 12 years and 9 months. The median age was 3 years and 6 months. There were 46 males and 38 females. Clinical manifestation: the symptoms in upper respiratory tract infection group were cough and fever, in enteritis group were nausea, vomiting and diarrhea, and all the above-mentioned symptoms could be found in upper respiratory tract infection accompanied with enteritis group. The three groups of children all had nervous system symptom of convulsion. There were 6 cases with unclear vision and 7 cases

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with disturbance of consciousness. In etiological examination, rotavirus antibody was positive in 8 cases, herpes virus antibody was positive in 2 cases, respiratory syncytial virus antibody was positive in 1 case, respiratory adenovirus antibody was positive in 1 case, Mycoplasma pneumoniae antibody was positive in 1 case, and Streptococcus pneumoniae was positive in 2 cases. All cerebrospinal fluid routine and biochemical examination were normal.

1.2. MRI examination

MRI examinations were performed in all 84 children. Eighty children had MRI examinations twice and two three times. Two children with recurrence of infection had MRI four times. Children under three years old were scanned after chloral hydrate (0.5 ml/kg) administration. 1.5 T Avanto Siemens system was used. The conventional scanning sequence was T1WI, T2WI, FLAIR and sagittal plane T1WI with a thickness of 6.5 mm, an interval of 1.95 mm, a visual field of 23 cm × 23 cm and a matrix of 256 × 256. T1WI was performed with SE sequence, TR 209ms, TE 4.76, NEX 2. T2WI was performed with TSE sequence, TR 4500ms, TE 87, NEX 2. The FLAIR Obtained with TE 120, TI 2500ms, NEX 1. As for DWI, SE-EPI sequence was used, TR3400ms, TE102ms and b values were 0 and 1000 s/mm² respectively. MRI images were evaluated by two associate senior radiologists to identify and to characterize the lesions.

2. Results

In all the children, abnormal signals were found in the splenium of the corpus callosum in the shape of slices, oval or circular. No space occupying effect was found. Conventional T1WI showed equal or slightly low signal to grey matter, T2WI and FLAIR showed high signal. DWI revealed obvious high signal, and ADC map revealed low signal. Splenium lesions were found in 76 children (Fig. 1). Both splenium and genu lesion were noted in 4 children (Fig. 2). The splenium of

the corpus callosum, the hippocampus and the white matter of the left parietal lobe were involved in one case (Fig. 3). The corpus callosum, corona radiata and central white matter were involved in three cases (Fig. 4). All the children were examined with MRI within 1–2 days after the onset of the clinical neurological symptoms. After the disappearance of clinical symptoms, the children were re-examined, the interval time was 3–15 days between two MRI examinations. Abnormal signals disappeared and no abnormal morphological changes were found. The average ADC value of the lesions in three groups of infected children were 0.427×10^{-3} mm²/s, 0.447×10^{-3} mm²/s, 0.390×10^{-3} mm²/s respectively. There was no significant difference among the ADC values of the three groups.

3. Discussion

Clinically mild encephalitis/encephalopathy with a reversible splenial lesion is a new concept put forward by Japanese scholar Tada in 2004 [1]. This is a new clinical and imaging syndrome, gradually recognized by radiologists and clinicians. MRI examination of the splenium of the corpus callosum demonstrate the lesions with reversible signal intensity. Routine scanning of T1WI showed equal or slightly low signal. T2WI and FLAIR showed high signal. DWI showed restricted diffusion with high signal. ADC map showed low signal. There were no obvious abnormal signals in some cases under conventional scanning. In this study, 5 cases with no obvious abnormal signals under conventional scanning exhibited abnormal signals by DWI, indicating that DWI was specific. Researchers found that the lesions in MERS could also involve other white matter regions in addition to the splenium of the corpus callosum. Takahashi [3] put forward the concept of MERS genealogy and divided MERS into type I and type II according to MRI characteristics. The MRI lesions of type IMERS were confined to the splenium of the corpus callous. The MRI lesions of type IIMERS included changes in the splenium of the corpus callosum and other white matter. It

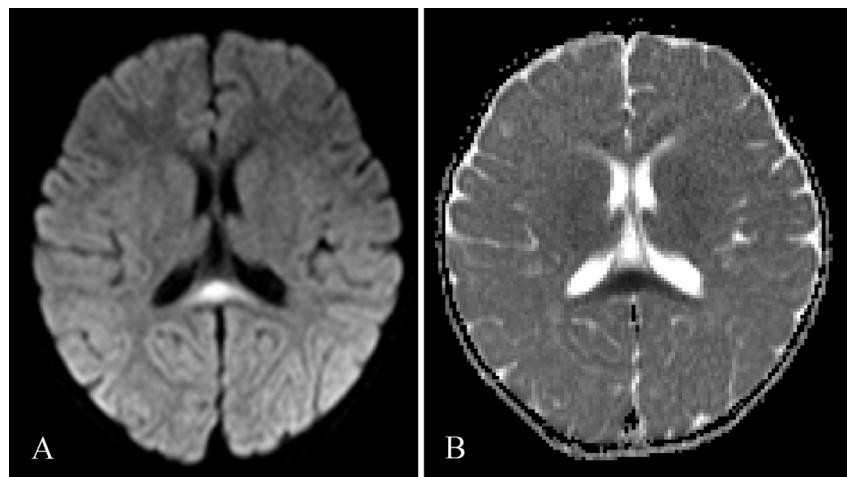


Fig. 1. Girl, 1 year and 8 months, fever and vomiting for 3 days, diarrhea for 2 days, convulsions once, MERS type I, splenium of the corpus callous lesion, DWI (A)revealed high signal intensity and ADC(B) graph revealed low signal intensity.

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