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**REPORT**

# Mild encephalitis/encephalopathy with a reversible splenial lesion associated with mumps infection: A case report

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**Abstract**: We describe for the first time an child who demonstrated Mild encephalitis/encephalopathy with a reversible splenial lesion (MERS) after mumps infection in China. In this report, a 12-year-old boy came to Children′s Hospital Affiliated to Zhengzhou University due to fever, swelling and pain under the earlobe for 4 days, and headache and vomiting for half of a day. Laboratory examinations showed a blood sodium level of 125mmol/L, both the Immunoglobulin M and Polymerase Chain Reaction results for the serum mumps virus were positive. Brain Magnetic Resonance Imaging (MRI) showed slight hypointense on T1 weighted images, hyperintense on T2-weighted images, fluid attenuated inversion recovery, diffusion-weighted images in the splenium of the corpus callosum indicative of MERS. On the 8th day, the patient no longer had swelling and pain around the parotid salivary glands, the sodium levels returned to normal. Onset of 14$^{th}$ d, follow-up brain MRI did not reveal any abnormalities. The case given to us indicates that MERS should be considered when patients after mumps infection presents with neurological symptoms and MRI should be performed to evaluate the splenium of the corpus callosum.

**Keywords**: Mild encephalitis/encephalopathy with a reversible splenial lesion (MERS), mumps, magnetic resonance imaging (MRI), infection.

## INTRODUCTION

Mild encephalitis/encephalopathy with a reversible splenial lesion (MERS) was first reported by Tada et al.from Japan in 2004 (Tada *et al*., 2004). MERS is clinically characterized by acute mild encephalopathy symptoms including impaired consciousness, headache, vomiting and seizures during infection or autoimmune inflammatory diseases. Brain Magnetic Resonance Imaging (MRI) shows that the lesion of MERS mainly involves the splenium of the corpus callosum (SCC), which usually does not require special treatment and recovers spontaneously in a short period of time (Yıldız AE *et al*., 2018). To date, no case reports of MERS in children infected with the mumps virus have been published in China. Recently, a child with MERS caused by mumps virus infection was admitted and treated in our hospital.

### *Case Report*

A 12-year-old boy was admitted to the hospital due to fever, swelling and pain under the earlobe for 4 days and headache and vomiting for half of a day. The patient's peak body temperature was 39.0℃ and no shivering, coughing, abdominal pain, vomiting or convulsions were noted. The patient was diagnosed with mumps and prescribed an anti-inflammatory analgesic cream for external use and oral Ibuprofen in a local hospital. The patient's symptoms did not significantly improve after four days of treatment. The patient was admitted to our hospital due to headache and vomiting that started twelve hours prior to admission. The patient was healthy in the past, immunized with two doses of Measles, Mumps and Rubella Combined Attenuated Live Vaccine and had been in touch with a patient with mumps in recent two weeks. The patient had no other medical history and no specific family history. Physical examinations showed a body temperature of 38.2°C, a pulse of 108 beats per minute, a respiratory rate of 24 breaths per minute, a blood pressure of 108/78mmHg (1mmHg=0.133 kPa) and a body weight of 44.5kg. The bilateral parotid salivary glands showed swelling centred at the earlobes, with obvious pain upon touch, no clear boundaries, no redness on the surface and a normal skin temperature. Pharyngeal congestion was noted. The orifices of the parotid ducts on both sides were swollen. Examination of the nervous system did not reveal any distinct abnormalities. Laboratory

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examinations showed normal routine blood parameters, normal urine and stool test results, normal liver and kidney function, a normal serum lipase level, a blood sodium level of 125 mmol/L(normal range: 135 mmol/L-145mmol/L) and normal blood potassium and chloride levels. The serum amylase level was 413.0 U/L, and the urine amylase level was 779.2U/L.

Both the Immunoglobulin M(IgM) and Polymerase Chain Reaction(PCR) results for the mumps virus were positive in the serum examination. Cerebrospinal fluid (CSF) examination showed a white blood cell count of $39x10^6$/L. Mononuclear cells accounted for 91% and multinuclear cells accounted for 9% of these cells. The protein level was 249.9mg/L, the glucose level was 3.0mmol/L and the chloride level was 120.0mmol/L. Both the IgM and PCR results for the mumps virus were negative in the CSF examination. Viral serologic and CSF testing all showed negative IgM results for Epstein-Barr virus, adenovirus, Echovirus, Mycoplasma pneumoniae, respiratory syncytial virus, Chlamydophila pneumoniae, parainfluenza virus, coxsackie virus, influenza A virus, influenza B virus and Mycobacterium tuberculosis. CSF and blood culture were both negative. Electrocardiography, electroencephalography (EEG) and chest X-ray examinations were all normal. Brain MRI showed slight hypointense on T1-weighted images (T1WI) (fig. 1a), hyperintense on T2-weighted images (T2WI) (fig. 1b), Fluid-Attenuated Inversion Recovery (FLAIR) (fig. 1c), diffusion-weighted images (DWI) (fig. 1d) in the SCC. Therefore, the patient was diagnosed with mumps, viral meningitis and MERS and was treated with ribavirin, mannitol and methylprednisolone sodium for symptomatic treatment. On the 4$^{th}$ day after hospitalization, the patient's condition improved significantly, with no signs of fever or headache. On the 5$^{th}$ day of hospitalization, the patient no longer had swelling and pain around the parotid salivary glands, the sodium levels returned to normal. On the 10$^{th}$ day after admitted, CSF examination results were normal, brain MRI did not reveal any abnormalities and the abnormal signals in the SCC were no longer present (fig. 2). The follow-up which carried out every month after hospital discharge revealed no abnormalities.

***Ethics approval***

The present study was approved by the local ethics committee, and signed informed consent was provided by the patient's parents.

## DISCUSSION

Viruses are common pathogens responsible for MERS (Nishino T *et al*., 2018). Additionally, some cases of MERS are associated with bacterial infection, and increasing reports of M. pneumoniae infections have recently emerged. A few MERS cases have also been reported to occur during the course of non-infectious diseases (Jing *et al*., 2018).

Mumps is an acute respiratory infectious disease. The most effective means of preventing and controlling mumps is immunization with mumps-containing vaccines. However, in the recent 10 years, the global mumps incidence has remained high, with outbreaks every few years (Marx *et al*., 2018).

The clinical manifestations of MERS are non-specific. Most patients with MERS have a history of infection. Nervous system symptoms often manifest 1~4 days after infection. The symptoms are self-limiting and generally recover completely. The patient in our report first developed a fever followed by headache and vomiting lasting for approximately 4 days. The patient remained conscious during the disease course and all clinical symptoms completely disappeared on the 8$^{th}$ day of disease onset.

A reversible splenial lesion is the characteristic feature of MERS (Feraco P *et al*., 2018). Brain MRI shows high-signal-intensity on T2WI, FLAIR, DWI, or hypo-isointense signals on T1WI sequences .Some cases may involve white matter and/or the entire corpus callosum. The lesion in the MERS patient caused by mumps virus infection in our report involved the SCC. At 9 days after first MRI,second MRI showed that the patient had recovered completely.

CSF examination in most MERS cases is normal, with a few cases showing mild elevation of cell numbers or protein levels. Electroencephalography (EEG) examination in MERS cases usually does not show any specific changes. Abnormalities on EEG in MERS cases often manifest as diffuse slowing waves. Some MERS patients exhibit hyponatraemia. While the patient in our report had a normal EEG results, the serum sodium level was 125mmol/L, which is slightly lower than the normal range. In addition, this patient also showed mild elevation of cell counts in the CSF. Serum sodium and CSF returned to normal as the patient's condition improved.

Currently, the pathogenesis of MERS remains unclear. Various possible causes include intra- or inter-myelinic oedema, axonal injury, hyponatraemia, oxidative stress and genetic factors. MERS may be caused by a combination of multiple factors (Kurahashi *et al*., 2018).

No specific treatments are available for MERS. Current treatments mainly include aetiological and symptomatic treatments. Most MERS cases have a good prognosis. However, neurological sequelae may be associated with MERS has been reported previously (Bellani *et al*., 2020).

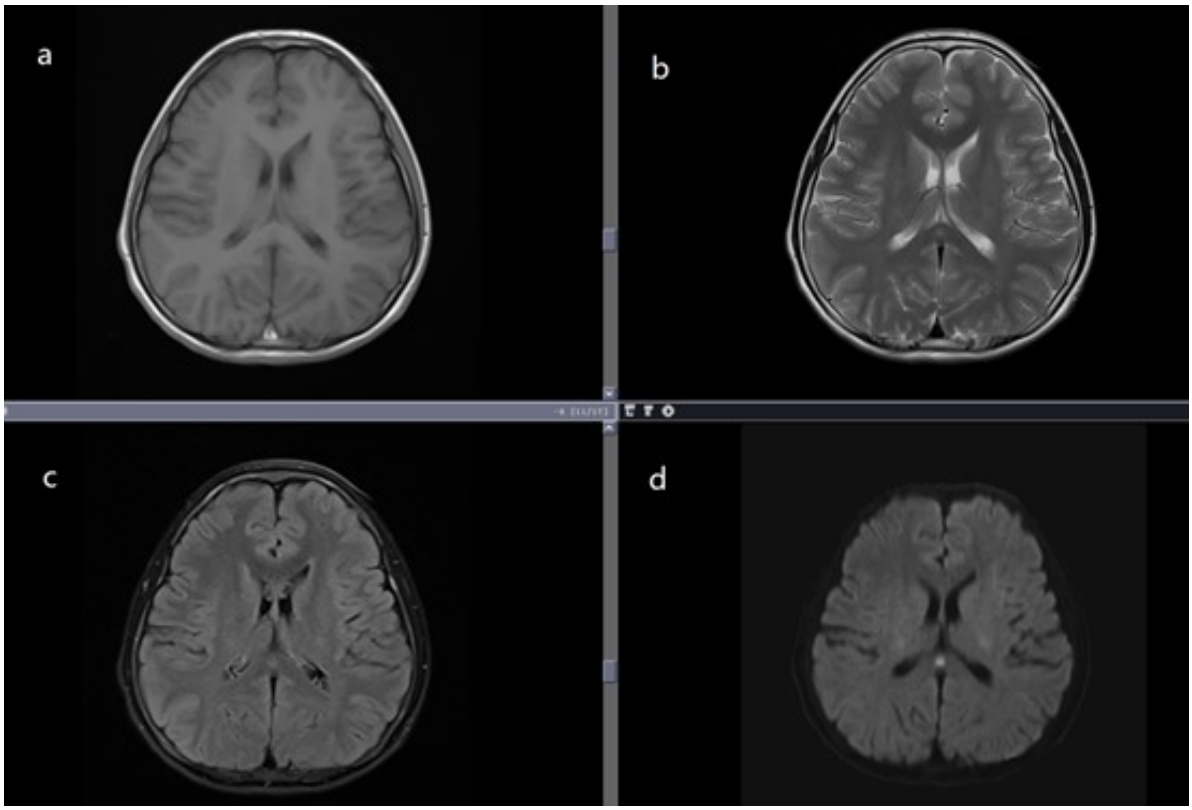


**Fig. 1**: The brain MRI showed slight hypointense on T1WI (Fig. 1a). T2WI (Fig. 1b), FLAIR(Fig. 1c) and DWI(Fig. 1d) show high signal lesions in the splenium of the corpus callosum .

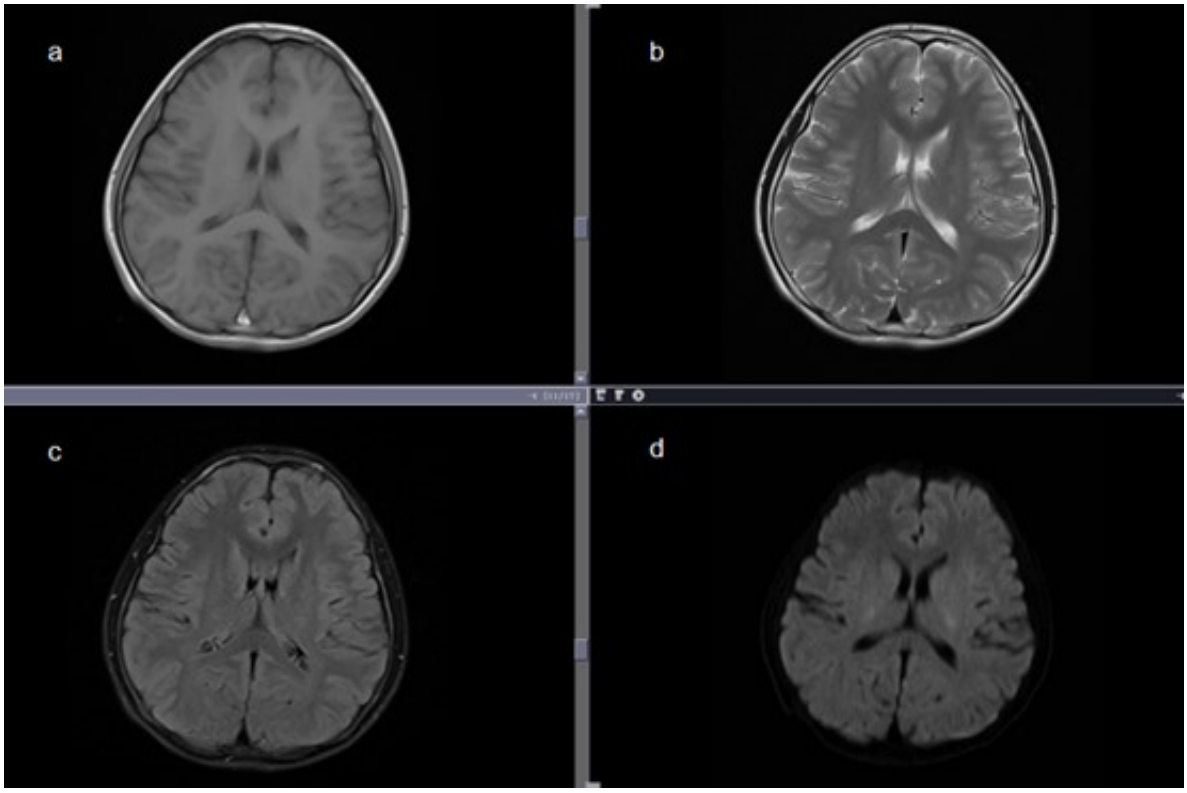


**Fig. 2**: At 9 days after first MRI, second MRI showed abnormal signals of the splenium of corpus callosum completely disappearing onT1WI (a), T2WI (b), FLAIR (c) and DWI (d).

Therefore, more case reports with long-term follow-ups are required to determine the long-term prognosis of MERS.

## CONCLUSION

MERS should be considered when patients after mumps infection presents with neurological symptoms and MRI should be performed to evaluate the SCC.

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