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WHITE MATTER INJURY IN A NEONATE WITH ROTAVIRUS INFECTION

Radiodiagnosis

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ABSTRACT

Rotavirus infection is common in neonates. Although rare in this age group, a wide range of neurologic manifestations have been recognized in neonates with rotavirus infection. The clinical features of rotavirus-infected neonates with white matter injury include the onset of seizures at days 4-6 of life in apparently healthy term neonates. Recent studies using diffusion-weighted imaging (DWI) have suggested a connection between neonatal seizures and rotavirus infection and that rotavirus infection can induce diffuse white matter injury without direct invasion of the central nervous system. Neonates with seizures associated with rotavirus infection show extensive and symmetric areas of restricted diffusion in the periventricular white matter, deep white matter, corpus callosum, internal capsule, optic radiation, or posterior thalami. Similar imaging appearance is also seen in encephalitis associated with parechovirus or enterovirus. DWI is required to detect this white matter injury.

KEYWORDS

Rotavirus, neonate, encephalitis, seizures.

INTRODUCTION:

Rotavirus infection is common in neonates, known to cause gastrointestinal symptoms. Seizures due to various causes are also common in neonates. A wide range of neurologic manifestations have been recognized in neonates with rotavirus infection, although they are rare in this age group (1, 2). Recent studies using diffusion-weighted imaging (DWI) have suggested a connection between neonatal seizures and rotavirus infection and that rotavirus infection can induce diffuse white matter injury without direct invasion of the central nervous system (3). The clinical features of rotavirus-infected neonates with white matter injury include the onset of seizures at days 4-6 of life in apparently healthy term neonates. Here we a present case rotavirus encephalitis in a neonate.

CASE HISTORY

A five day old neonate was brought with complaints of abnormal movements and poor feeding from day 4 of life. The antenatal history was uneventful. The patient was assessed and found to have had subtle seizures. Patient had no history of fever, rashes or gastrointestinal symptoms. Complete blood counts, liver and renal function tests were within normal limits. Blood culture was negative. Cerebrospinal fluid (CSF) analysis was performed, but polymerase chain reaction analysis was negative for rotavirus, enterovirus and parechovirus. Protein and glucose levels in CSF were within the normal limits. Stool sample was positive for rotavirus. Magnetic Resonance Imaging (MRI) was performed on day 2 after the onset of seizure. MRI sequences included sagittal spin-echo T1 and axial spin-echo T1 and T2, fluid-attenuated inversion recovery, and DWI including apparent diffusion coefficient (ADC) map. No abnormal signal changes were seen on T1 and T2 weighted sequences (Figure 1). However DWI revealed symmetrical diffusion restriction in the periventricular white matter with the involvement of corpus callosum (Figure 2). Reduced ADC values were found in these areas of increased DWI signal intensity. In view of positive stool samples for rotavirus and MRI findings a diagnosis of rotavirus encephalitis was made. Seizures stopped after phenobarbitone loading. On day 3-4 of hospitalization patient was encephalopathic followed by a spontaneous recovery with supportive measures on day 6 of hospitalization. On follow up after 4 months, no further seizures had been reported and normal milestones were achieved. Follow up MRI after 4 months showed no significant abnormality.

DISCUSSION:

Rotavirus infections present differently in neonates than in older infants. Most rotavirus infections in neonates are asymptomatic (3). Gastrointestinal symptoms are uncommon in neonates with early onset rotavirus infection less than 7 days of life (2). The clinical entity of seizures in neonates, 'fifth day fits' has been described (4). Neonates with seizures associated with rotavirus infection show extensive and symmetric areas of restricted diffusion in the periventricular white matter, deep white matter, corpus callosum, internal capsule, optic radiation, or posterior thalami (3). In the neonatal brain, conventional MRI sequences are not very sensitive to acute edema due to lack of myelination (5). Acute edema is detected earlier in DWI with corresponding ADC maps than conventional MRI sequences (5). In our patient, the white matter injury would have been missed if DWI was not performed. Cranial ultrasound in these neonates may show increased echogenicity in the periventricular region (6). The pattern of white matter injury is the same as those reported for encephalitis associated with parechovirus and enterovirus. However the timing and presenting complaints vary between these entities. Neonates with rotavirus associated encephalitis present with seizures typically occurring between 4-7 days since birth and they are usually otherwise asymptomatic. Neonates with parechovirus / enterovirus encephalitis present with seizures later (6-14 days) and usually with symptoms like fever and rash (7,8). Diagnosis of rotavirus infection is made only with stool samples which are positive for rotavirus. CSF analysis for rotavirus does not always test positive even in known cases of rotavirus infection (9,10). However in neonates infected with enterovirus and parenterovirus, virus is usually detected in the CSF (7,8). The extent of white matter involvement on MRI influences the neuro-developmental outcome in neonatal rotavirus infection. Extensive involvement can result in cerebral palsy with epilepsy and intellectual disability can be seen with extensive involvement of white matter (3). Late-onset cystic-periventricular leukomalacia in preterm neonates following rotavirus infection, which is strongly associated with adverse neurological sequelae has been reported (11). Considering the prevalence and rate of spread of spread rotavirus infection in a neonatal care units, preventive measures need to be enforced. Infection preventive measures have been shown to decrease the incidence of the disease (12). Rotavirus should be considered among the list of viruses causing white matter injury in neonates. DWI is required to detect this white matter injury.

CONCLUSION

Rotavirus infection should be considered in neonates with seizures, particularly around 5 days of life. These neonates may not present with gastrointestinal symptoms. Neonates with seizures associated with

rotavirus infection show a pattern of bilateral symmetrical areas of restricted diffusion in the periventricular white matter, corpus callosum, deep white matter, optic radiation, internal capsule, and posterior thalami. Similar imaging appearance is also seen in encephalitis associated with parechovirus or enterovirus although clinical presentation varies. Importance of DWI for detecting this pattern cannot be understated.

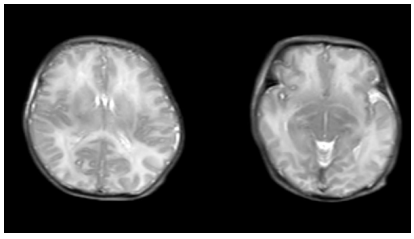

Figure 1. T2 weighted images showing no abnormal signal intensities.

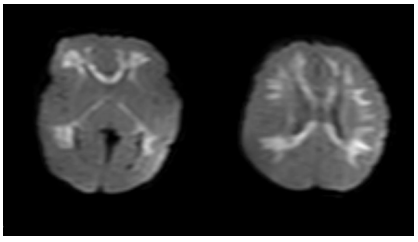

Figure 2. Bilateral symmetrical diffuse restricted diffusion in periventricular white matter with involvement of corpus callosum on DWI.

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