Case Report

Acute Necrotising Encephalopathy of Childhood — A Case Report with Classical Imaging Finding

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Abstract :

Acute Necrotising Encephalopathy of Childhood (ANEC) is a rapidly progressing fulminant encephalopathy with high mortality and morbidity. It follows viral febrile illness. Clinical symptoms are non-specific with fever, seizure, altered sensorium resulting in rapid neurological deterioration. Magnetic Resonance Imaging (MRI) features are characteristic and help to confirm the diagnosis.

Key words :

Acute Necrotising Encephalopathy, Trilaminar sign, Acute Disseminated Encephalomyelitis, Acute Necrotising Encephalopathy Severity Score

Introduction :

First described by Mizuguchi from Japan (1995), ANEC is rare, rapidly progressive encephalopathy affecting previously healthy children.[1] It is distinguished by an acute clinical course and characteristic radiological pattern. The pathophysiology of ANEC remains partially understood. Viral infection is essential to initiate the disease pathogenesis. Influenza A, Rubella, Coxsackie 9, Measles, Herpes Simplex Virus (HSV), Human Herpes Virus 6, Enterovirus, Novel Reovirus, Rotavirus, Mycoplasma - all have been reported as etiological factors, the commonest being HHV-6.[2]

Some authors describe the role of proinflammatory cytokines like IL-6, IL-1 and Tumour Necrosis Receptor-1 in ANEC pathogenesis.[3] In this hypothesis, cytokine storm is held responsible which is caused by excessive immune response to viral infection.

Although rapid progression is consistent, neurological manifestations of ANEC are nonspecific and include seizure, altered sensorium and focal neurological deficit. Hence, laboratory tests and imaging (MRI) play an important role.

Case report :

A 2 year old male child was referred to our hospital with a 3 day history of fever, burning micturition and decreased urine output. He had five or six episodes of convulsion from the second day of fever along with tonic involuntary movement of upper and lower limbs, deviation of mouth to left and upward rolling of the eyes. The child became drowsy from the third day along with diarrhoea and abdominal distension.

The general examination findings were unremarkable. The GCS score was E2M4V2.

Neurological examination showed bilateral extensor planter and brisk knee jerks. The rest of the systemic examination was unremarkable. Laboratory tests showed markedly raised liver transaminases (AST, ALTA) and LDH. Bilirubin and alkaline phosphatase were normal. C-reactive protein (CRP) was positive, and the platelet count was 41000 ml^{-1}. Electrolytes were on the higher side of normal, and antigens for dengue and

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malaria were negative. EEG changes were consistent with diffuse encephalopathy.

The CT scan of the brain, prior to admission, showed bilateral thalamic hypodensity. An MRI scan of the brain done in our institution showed bilaterally symmetric altered signal (T1 hypointensity and T2 hyperintensity) in thalami, brainstem, cerebellar and cerebral white matters. The left putamen and both internal capsules were also involved [fig 1 & 2]. Diffusion restriction was noticed on DWI sequence [fig. 3] Thalamic lesions showed the characteristic trilaminar sign on ADC map [fig 4]. Haemorrhage was present in thalami. A thin rim of enhancement was noticed in most of the lesions after contrast administration [fig 5, fig 6].

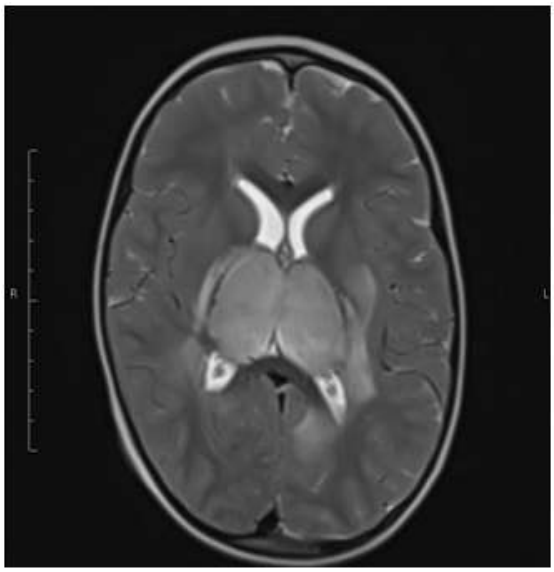


Fig 1. T2W Axial image showing symmetrical bulky T2 hyperintense thalami, internal capsule and left putamen.

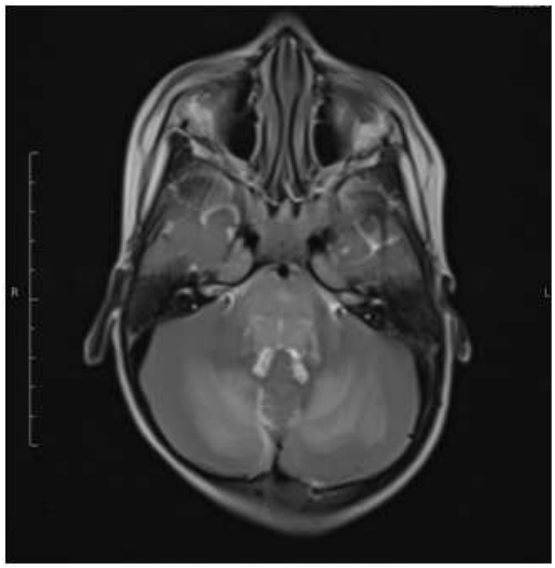


Fig 2. T2W Axial image showing t2 hyperintensity involving brainstem and cerebellar white matter in bilateral symmetrical manner.

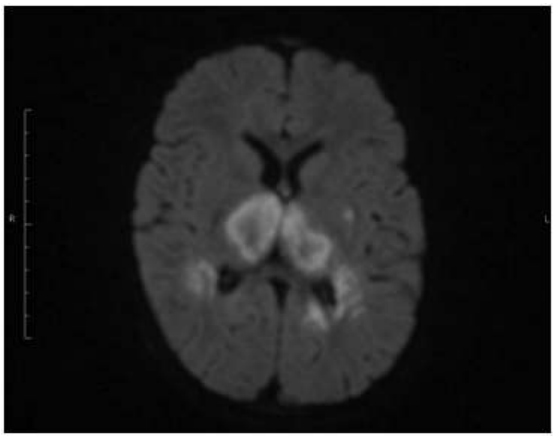


Fig 3. Restricted diffusion seen in bilateral thalami on DWI.

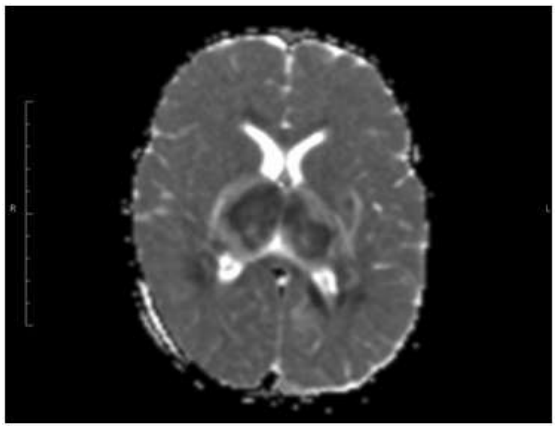
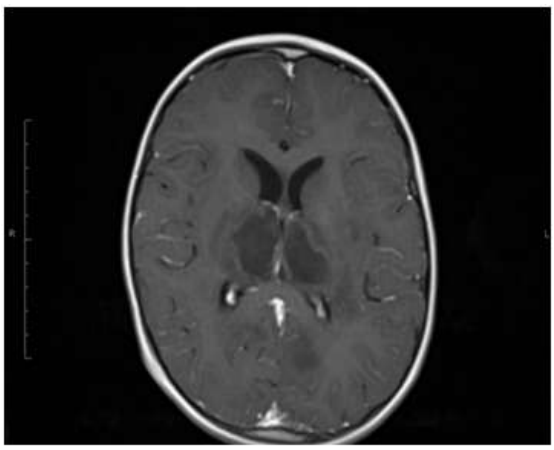


Fig 4. Tricolor or Trilaminar sign on ADC map.



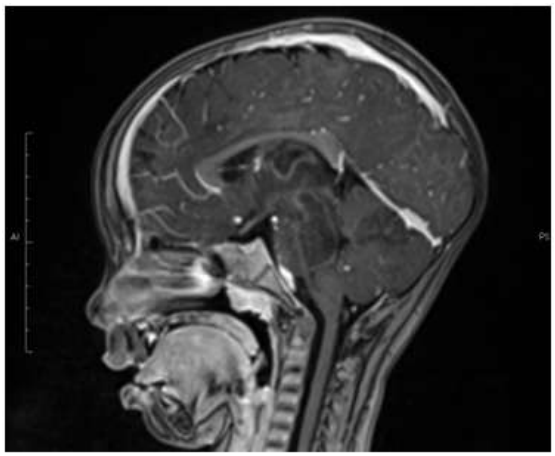


Fig 5. and Fig 6. Post contrast T1W images show thin rim enhancement of involved areas.

Discussion :

ANEC is a fatal neurological condition and its diagnosis is based on clinical features and typical MRI findings. The diagnostic criteria proposed by Mizuguchi et al. for acute necrotising encephalopathy are as follows:[4]

1. Acute encephalopathy following a viral febrile illness and rapid deterioration in the consciousness level, convulsion.
2. Increased cerebrospinal fluid (CSF) protein without CSF pleocytosis.
3. CT or MRI findings of symmetric multifocal brain lesions involving bilateral thalami, cerebral periventricular white matter, internal capsule, putamen, upper brain stem tegmentum, and cerebellar medulla without involvement of other CNS regions.
4. Elevation of serum aminotransferase of variable degree without hyperammonaemia.
5. Exclusion of other resembling diseases like overwhelming bacterial and viral infections, fulminant hepatitis, Reye syndrome, leigh encephalopathy, Acute Disseminated Encephalomyelitis (ADEM), vasculitis, cerebral infarction and so on.

In presence of the characteristic MRI findings, differential diagnosis is limited. Clinically, ANEC may be differentiated from ADEM by early onset of encephalitic features just after the febrile illness whereas in ADEM, this usually occurs after 1 or 2 weeks. The other differential encephalitides can be excluded with help of laboratory findings. For example, ANEC is not associated with hyperammonaemia or lactic acidosis which are present in Reye syndrome and Leigh encephalopathy.

In ANEC, CSF shows raised protein without or minimal pleocytosis. In our case, a CSF study was not performed as the typical clinical setting and characteristic MRI findings established the diagnosis.

The distinctive neuroradiological manifestations of ANEC are multifocal, symmetric brain lesions with characteristic distribution in bilateral thalami, basal ganglia, brain stem, cerebral and cerebellar white matters.[5] The neuroradiological manifestations are characterised by dynamic

changes corresponding to the pathophysiological changes from oedema to petechial haemorrhage and then to necrosis.[1]

The MRI scan also helps in predicting the neurological outcome and mortality risk by contributing to the Acute Necrotising Encephalopathy Severity Score (ANE-SS) which is a 0 – 9 scale used for prognosis of patients affected by ANEC.

The score includes : Shock (3 points)

Brainstem lesions (2 points)

Age over 48 months (2 points)

Platelet count below 100000 (1 point)

CSF protein above 60 mg (1 point)

ANE-SS categorizes patients into low risk (0 – 1 point), medium risk (2 – 4 points) and high risk (5 – 9 points) groups and helps clinicians to identify high risk patients early and initiate timely and appropriate treatment like immuno-suppressive therapy and supportive care. Overall, ANEC is a clinico-radiological syndrome.[6]

Conclusion :

ANEC is a rare and rapidly progressive disease with poor outcome. Multiparametric MRI plays a crucial role in confirming clinical suspicion with its characteristic findings and helps in early initiation of treatment. Early detection and appropriate treatment may lead to better neurological outcome. MRI scoring has a positive correlation with clinical outcome.

References :

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