

Original Research Article

# Role of MRI in acute disseminated encephalomyelitis

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## Abstract

**Background:** Acute disseminated encephalomyelitis is an acute demyelinating disorder of the central nervous system and is characterised by multifocal white matter involvement. Diffuse neurological signs with multifocal lesions in brain and spinal cord characterise the disease. It do not invade central nervous system.

**Aim:** To evaluate role of MRI in acute disseminated encephalomyelitis.

**Materials and methods:** A prospective study of 10 cases which was conducted in the pediatric department in Dhiraj hospital. MRI brain was done on 1.5 Tesla MRI machine.

**Results:** ADEM can be distinguished from acute viral encephalitis because the disease is not the result of primary tissue invasion by an infectious organism. It was thought to be immune-mediated and is characterized neuropathologically by perivenular inflammation and demyelination.

**Conclusion:** ADEM is more common in female and more associated with previous infection as compared to previous vaccination. Neurological deficit is mostly associated with it. CSF showed raised protein in almost cases. It showed hyperintense lesion on T2W and FLAIR sequences. Periventricular area of brain is commonly associated.

## Key words

Acute disseminated encephalomyelitis, ADEM, MRI, CNS disorder.

## Introduction

Acute disseminated encephalomyelitis (ADEM) is an immune-mediated demyelinating CNS

disorder, characterized clinically by new-onset polyfocal neurologic symptoms including encephalopathy, coupled with neuroimaging evidence of multifocal demyelination [1, 2, 3].

ADEM is classically considered a monophasic illness, with highest incidence in early childhood. ADEM carries high mortality rate (up to 30%) and neurologic sequelae are frequent.

### Signs and symptoms [4, 5]

- Prodromal illness → asymptomatic period → acute neurological presentation
- Neurological onset is abrupt, Mental changes are common
- Convulsive seizure, Irritability and lethargy, Fever, headache and meningism
- Neurological abnormality: visual disturbances and language, mental status, and psychiatric abnormalities
- Weakness is more commonly discerned than sensory defects

### Triad of ADEM

- Prodromal illness or preceding vaccination,
- MRI signs of demyelination
- Acute presentation of neurologic symptoms

### Materials and methods

This was a prospective study of 10 cases which was conducted in the pediatric department in Dhiraj hospital. These cases were admitted with a chief complaint of fever, seizures and behavioral problems after the initial episode of infection or after vaccination. MRI brain was done on 1.5 Tesla MRI machine.

### Demographic and epidemiologic data

- 10 clinical cases were taken. Out of them 6 were female and 4 were male.
- 8 Cases had the history of previous infections and 2 had history of previous vaccination.

### Results

Clinical features were as per **Table – 1**. Physical examination was as per **Table – 2**.

### Laboratory investigations

CSF analysis was done

- Raised protein level was found in 9 patients
- One patient had normal CSF protein.
- CSF lymphocytes were raised in all cases.

**Table – 1:** Clinical features.

Sign and Symptoms (10 Patients)	
Fever	9
Nausea and vomiting	5
Headache	7
Neck stiffness	1

**Table – 2:** Physical examination.

Neurological deficits	4
Ataxia	2
Hemiparesis	2
Paraparesis	1
Convulsions	3
Visual disturbances	2
Oculomotor nerve palsy	1
Facial nerve palsy	1
Impairment of consciousness	3

### Cases

- A two years-old previously healthy girl who presented with fever and altered sensorium in OPD, having history of infection.
- She had hemiparesis on right side.
- She developed postinfectious focal encephalitis.
  - MRI was done and showed fluid attenuated inversion recovery (FLAIR) sequences show extensive area of increased signal in left hemisphere and right basal ganglia (**Photo -1**).
  - T2 weighted MRI showing extensive area of increased signal in left hemisphere and right basal ganglia (**Photo – 2**).
  - Diffusion-weighted MRI (DWI) show a restriction of diffusion (**Photo – 3**).

A 14 year old male admitted for acute illness with lowered consciousness, right-sided hemiparesis and fever.

Few days later, we note a progressively aggravate clinical symptoms evolving to coma.

MRI was done - Axial Flair brain images: Bilateral and asymmetric involvement of the periventricular and subcortical white matter (**Photo – 4**).

13year old patient presented with visual disturbances, hemiplegia, single episode of seizures.

FLAIR sequence shows hyperintense signal involving periventricular, subcortical white matter and grey matter on left side (**Photo – 5**).

ADEM can be distinguished from acute viral encephalitis because the disease is not the result of primary tissue invasion by an infectious organism. It is thought to be immune-mediated and is characterized neuropathologically by perivenular inflammation and demyelination.

**Table – 3:** Hyper intense lesions on T2W and flair sequences.

Bilateral and asymetrical in white matter	8
Diffuse involvement in white matter	2
Unilateral	1
Profound involvement of grey matter	1

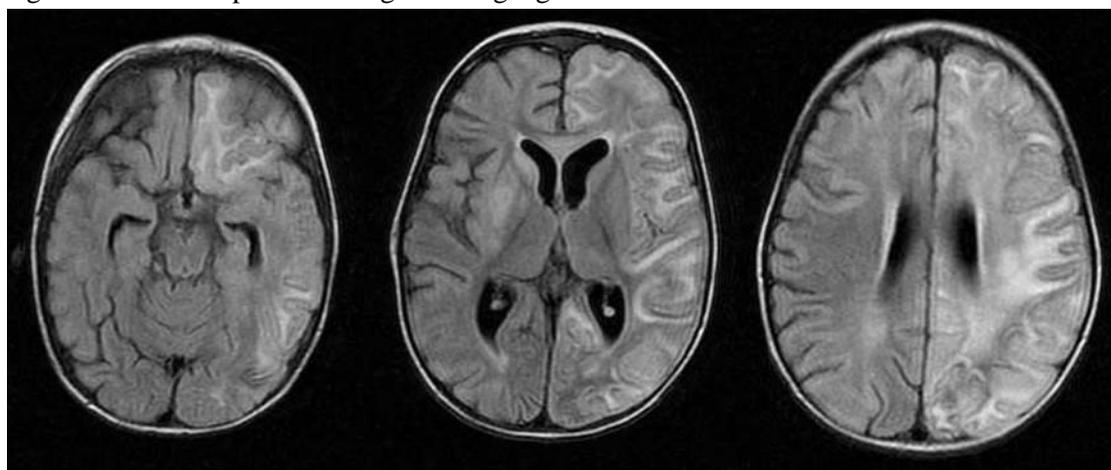
**Table – 4:** Areas of brain affected.

Periventricular area	7
Subcortical white matter	3
Basal ganglia	5
Thalamus	4
Cortical grey matter	1
Brainstem	2
Spinal cord	1
Cerebellum	0

**Discussion**

Demyelinating lesions of ADEM are better visualised by MRI. These demyelinating lesions of ADEM usually exhibit no mass effect and can be seen scattered throughout the white matter.

**Photo – 1:** Fluid attenuated inversion recovery (FLAIR) sequences show extensive area of increased signal in left hemisphere and right basal ganglia.



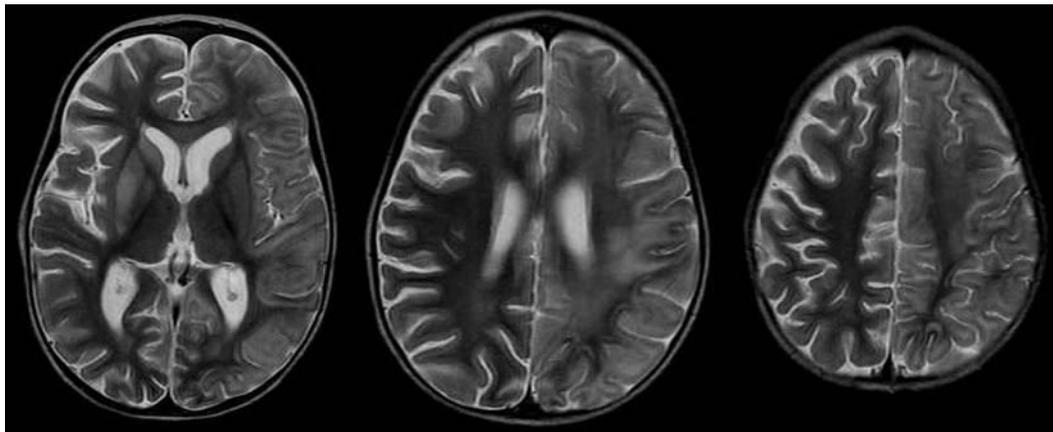
Characteristic lesions seen on MRI appear as patchy areas of increased signal intensity on conventional T2-weighted images and on fluid attenuated inversion recovery sequence (FLAIR).

Few MRI lesions may enhance after gadolinium administration. Extensive perifocal oedema may be seen.

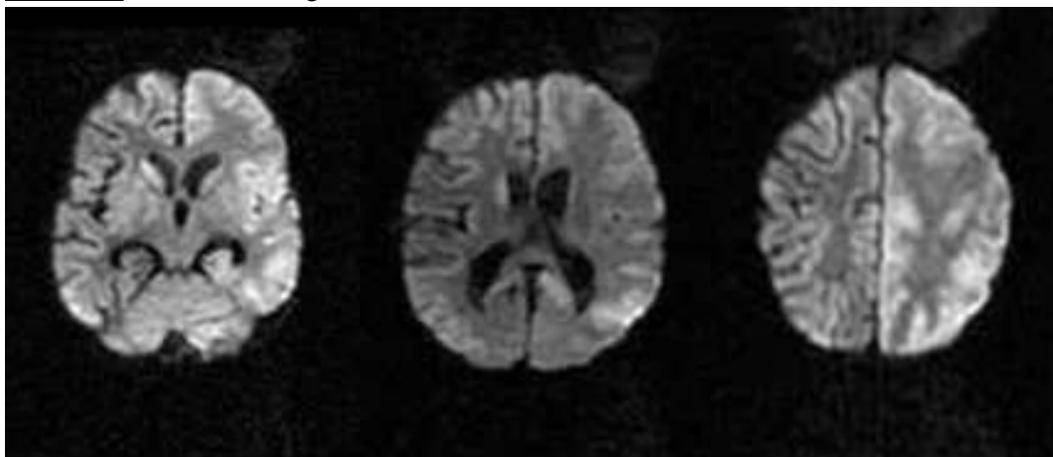
Though white matter involvement predominates grey matter can also be affected, particularly basal ganglion, thalami, and brainstem

Thalamic involvement may be seen in 40% patients of ADEM, making this finding a potentially useful discriminator.

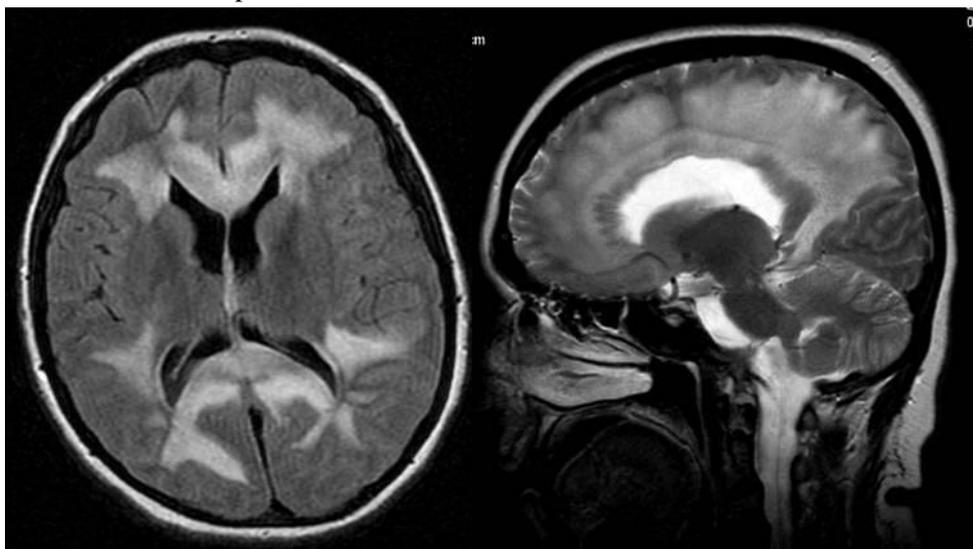
**Photo – 2:** T2 weighted MRI showing extensive area of increased signal in left hemisphere and right basal ganglia.



**Photo – 3:** Diffusion-weighted MRI (DWI) show a restriction of diffusion.

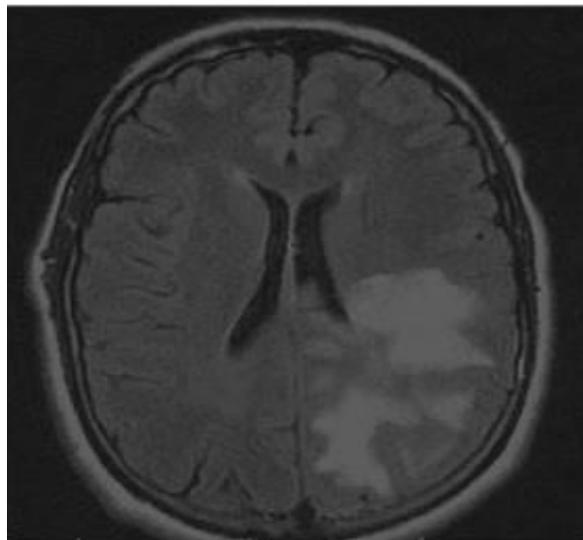


**Photo – 4:** MRI was done - Axial Flair brain images: Bilateral and asymmetric involvement of the periventricular and subcortical white matter.



Although ADEM is typically a disseminated process in the central nervous system, often with impaired sensorium, a few cases are dominated by spinal pathology.

**Photo – 5:** FLAIR sequence shows hyperintense signal involving periventricular, subcortical white matter and grey matter on left side.



### **Conclusion**

ADEM is a potentially severe demyelinating disorder likely to be increasingly diagnosed by magnetic resonance imaging studies, performed on patients with acute encephalopathy. The investigation of choice for establishing the diagnosis of ADEM is MRI of the brain. Other investigations are seldom helpful in reaching the diagnosis. Early diagnosis and prompt treatment of ADEM will probably reduce morbidity.

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