

## CASE REPORT

### ACUTE DISSEMINATED ENCEPHALOMYELITIS (ADEM) PRESENTING WITH BILATERAL OPTIC NEURITIS

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A 43-year old lady presented with progressive loss of vision in both eyes followed by rapid deterioration of consciousness within the next few days. This was preceded by a viral infection one week before her presentation. At presentation she had evidence of meningism and signs of bilateral upper motor neuron lesions and was managed initially as acute meningoencephalitis with antibiotics. The brain CT was within normal limits but subsequent MRI of the brain revealed multiple foci of hyperintense lesions on T2-weighted and FLAIR images. The cerebrospinal fluid examination revealed lymphocytosis, and normal protein and glucose levels. Cultures of the CSF were negative. She was managed as acute disseminated encephalomyelitis (ADEM) with high-dose of intravenous methylprednisolone one gram/day for three consecutive days followed by oral prednisolone 60 mg/day. Despite the management she lapsed into coma and succumbed to her illness nine days after admission.

*Key words : Acute disseminated encephalomyelitis (ADEM), blindness.*

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#### Introduction

An acute inflammatory disease of the central nervous system may be associated with an infectious illness or post-vaccinations, and when this is an isolated event it is termed acute disseminated encephalomyelitis (ADEM). ADEM is a rare multifocal, inflammatory demyelinating disorder of the CNS. It occurs after vaccination against various viruses, follows on many viral infections, and can also occur spontaneously. It occurs few days to several weeks after infections or vaccinations. There is no specific age, sex, or race predilection. It is most commonly a non-progressive acute monophasic illness (1). The clinical manifestations are widespread CNS disturbances, including coma, drowsiness, seizures, and multifocal neurological signs due to involvement of the brain, spinal cord, and optic nerves. Paraparesis, or tetraparesis, ascending sensory dysfunction, segmental sensory level, neurogenic bladder, and altered cerebral function are the dominant clinical features. Clinically, ADEM may be indistinguishable from any primary viral encephalitis. The diagnosis is made when there is an antecedent infection followed by

focal neurological disturbances, an abnormal CSF analysis (increased protein with cells), and MRI evidence of multifocal white matter involvement. The diagnosis is most frequently established on the characteristic findings on MRI of the brain (2). The treatment of choice is high dose intravenous corticosteroids. The mortality rate is up to 20% with a high neurologic sequelae in those who survive (3).

#### Case report

A 43-year-old woman presented with rapidly progressive loss of vision in both eyes. One week previously she had had a viral infection suggested by rhinorrhoea and corryza. Two days before presentation she experienced photophobia followed by reduced vision in both eyes the next day. For these she consulted a private practitioner who prescribed an anti-hypertensive drug when she was found to have an elevated blood pressure. In the evening, she developed slurring of speech associated with generalized weakness, followed by complete blindness of both eyes that same night. This prompted the family to bring her to the hospital the next morning. There was no history of headache, or

Figure 1: MRI of the brain (FLAIR image- coronal section) demonstrated multiple foci of hyperintense lesions within the white matter.



trauma but she vomited once on the way to the hospital. She had no history of any neurological symptoms previously and no family history of neurological disease. There was no history of traveling or rearing birds. She was diagnosed with hypertension four years previously; however, she was not compliant with treatment.

On the day of admission, she was conscious but drowsy, responded to verbal commands, moved all extremities and opened her eyes spontaneously. She was afebrile, and her blood pressure was 134/66-mmHg and pulse rate 66 bpm, regular. Her pupils were 5 mm in diameter, regular, and reacted sluggishly to light. Fundoscopic examination showed bilaterally obliterated disc margins, suggestive of papillitis. Deep tendon reflexes were exaggerated throughout, and plantar reflexes were extensor bilaterally. Muscle tone was increased generally and meningeal signs were present. The rest of the examination was essentially normal.

Initial investigations revealed normal full blood count, urea, electrolytes and glucose level. The chest radiograph was normal. Enhanced computerized tomography (CT) of the brain on the day of admission was also normal. Magnetic resonance imaging (MRI) of the brain demonstrated multiple foci of hyperintense signals (Figure 1) within both posterior limbs of the internal capsules, centrum semiovale, and optic radiations bilaterally.

There was no enhancement with gadolinium and no mass effect. A study of cerebrospinal fluid (CSF) on the third day of admission showed lymphocytosis (10 lymphocytes cell/mm<sup>3</sup>), a normal protein level (325 mg/L) and glucose content (5.2 mmol/L, compared to a random blood glucose level 7.5mmol/L). The opening pressure was normal (17 cm CSF). Cultures of the blood and CSF were negative for any bacteria, fungi or viruses.

She was managed initially as an acute meningoencephalitis with antibiotics but was changed to intravenous methylprednisolone one gm/day for three consecutive days followed by high dose of oral prednisolone (60 mg/day). Her consciousness level deteriorated rapidly and she lapsed into coma despite the steroid treatment. She died nine days after admission.

## Discussion

ADEM is a monophasic, immune-mediated disorder that produces multifocal demyelinating lesions within the central nervous system. It is characterized clinically by the acute onset of neurological abnormalities, including varying degrees of mental state changes ranging from drowsiness to coma. Acute disseminated encephalomyelitis and multiple sclerosis are both demyelinating conditions of the central nervous

system. During the acute presentation they can be mistaken as acute meningoencephalitis, as was the case in our patient. Clinical findings that may exclude acute meningoencephalitis are bilateral optic neuritis, which is rarely present in meningoencephalitis. Enhanced CT of the brain may be normal in the early stages of acute meningoencephalitis and it does not normally reveal any abnormal findings in both ADEM and MS. MRI is helpful in diagnosing ADEM and MS. Murthy et al [3], in a study of 64 patients with ADEM, reported that white matter lesions observed on MRI were similar to the lesions observed in MS. However the lesions were predominantly subcortical and/or located in the centrum semiovale in ADEM whereas they were predominantly periventricular in MS.

Typical presentations of ADEM are with widespread neurological abnormalities, including multifocal signs in the brain, spinal cord, and optic nerves, and may include drowsiness or seizures. The classic pathological appearance is a perivenous lymphocytic inflammation with demyelinating lesions. The condition is usually precipitated by a viral infection or immunization (4). In the acute phase, MRI of the brain and spinal cord will show hyperintense lesions on T2-weighted and FLAIR images, although the underlying pathology may be oedema with minimal demyelination. Cerebrospinal fluid examination shows an increased protein level and leucocytosis, predominantly lymphocytes.

Our patient has strikingly classical MRI findings of ADEM in the brain. Together with clinical features of bilateral optic neuritis and the cerebrospinal fluid analysis results make the diagnosis of ADEM highly likely. One might argue that viral encephalitis should be considered as a possible alternative diagnosis given the CSF results. However the MRI findings are atypical. Multiple sclerosis and other demyelinating diseases were also less likely based on the patient's clinical, neuroimaging and CSF findings.

Although controlled studies are lacking, corticosteroids are the mainstay of treatment in ADEM. Plasmapheresis or immunoglobulins are an alternative if no satisfactory response is obtained (5). In a recent case report, early use of high dose corticosteroids was recommended for early recovery (6). Nishikawa et al (7) also reported successful treatment with IVIG, where three children ranging in age from 2 to 5 years with ADEM were successfully treated with high-dose IVIG. All patients were given IVIG at a dose of 400 mg/kg/day for 5 consecutive days. The patients rapidly

regained consciousness in 14 hours, 2 days, and 4 days and demonstrated complete clinical improvement within 18 days, 10 days, and 7 days of the initiation of the treatment, respectively. Pradhan et al. [8] described 4 patients with ADEM who were treated with IVIG after getting no immediate response from a 3-5 day course of high dose intravenous methylprednisolone. All had clinical features to suggest poor prognosis and MRI findings to indicate extensive white matter changes in the brain. Two patients, who had spinal cord involvement as well, required ventilatory support during acute phase of the illness. All the 4 patients recovered dramatically.

## Conclusion

ADEM is a rare inflammatory disease of the CNS affecting predominantly children and young adults, typically antedated by an infectious illness. Clinical presentations vary from focal neurological deficit to reduced consciousness level or even coma and death. No treatment has been established by controlled trials in ADEM. A few studies have shown that high dose corticosteroids are beneficial, and in severe cases IVIG and plasmapheresis have shown good results.

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