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Acute Combined Demyelination of CNS and PNS: A Case Report

Acute disseminated encephalomyelitis (ADEM) and Guillain-Barre syndrome (GBS) are both para infectious demyelinating disorders. While ADEM almost always affects the CNS, GBS affects the PNS. The combined demyelinating process – demyelination of both upper motor neuron (UMN) and lower motor neuron (LMN) – occurs very rarely. Here we report a case of severe combined peripheral and central demyelination, in which the former disorder was preceded by the latter.

Keywords: Encephalomyelitis, Acute Disseminated, Guillain-Barre Syndrome, Child

Introduction

Acute disseminated encephalomyelitis (ADEM) and Guillain-Barre syndrome (GBS) are two inflammatory demyelinating diseases.The former affects the central nervous system (CNS) and the latter affects the peripheral nervous system (PNS). The combined demyelinating process in the CNS and PNS is a rare occurrence.

The overall incidence of the disease is 0.4/100000 per year,[1] and the prevalence of this disorder is 4.5/10000 in hospitals.[2]

ADEM is considered a monophasic acute demyelinating disorder of the central nervous system, characterized by diffuse neurologic signs and symptoms coupled with evidence of multifocal lesions of demyelination on neuroimaging.[3]

We here report a case of severe combined central and peripheral demyelination in a 6-year old girl, in whom each of the two conditions contributed equally to the clinical syndrome.

Case Presentation

A 6- year-old girl was admitted to Mofid children's hospital with a 4-day history of pain in the legs, mild leg weakness and dribbling. She had a one-week history of low-grade fever, nausea and vomiting, abdominal pain, and non-bloody diarrhea. Neurological examination revealed a 4/5 muscle strength in the lower extremities and a decreased deep tendon reflex. The patient's blood pressure was 140/90. Having a previous history of urinary tract infection (UTI), she had been admitted to the nephrology ward, and ceftriaxone and adalat were prescribed for this condition. The further nephrology evaluation only showed UTI with no urinary tract anomaly or any evidence of vasculitis. Sonography of the kidneys revealed bilateral stasis in both kidneys, proximal distention of the right ureter, and some free fluid in the posterior side of the bladder and in the pelvis. Urine analysis, done twice, yielded normal results. Urine culture was negative and blood cell count showed leukocytosis (14600/mm3) with 82% polymorphonuclear cells (PMN). The electrolytes were normal.

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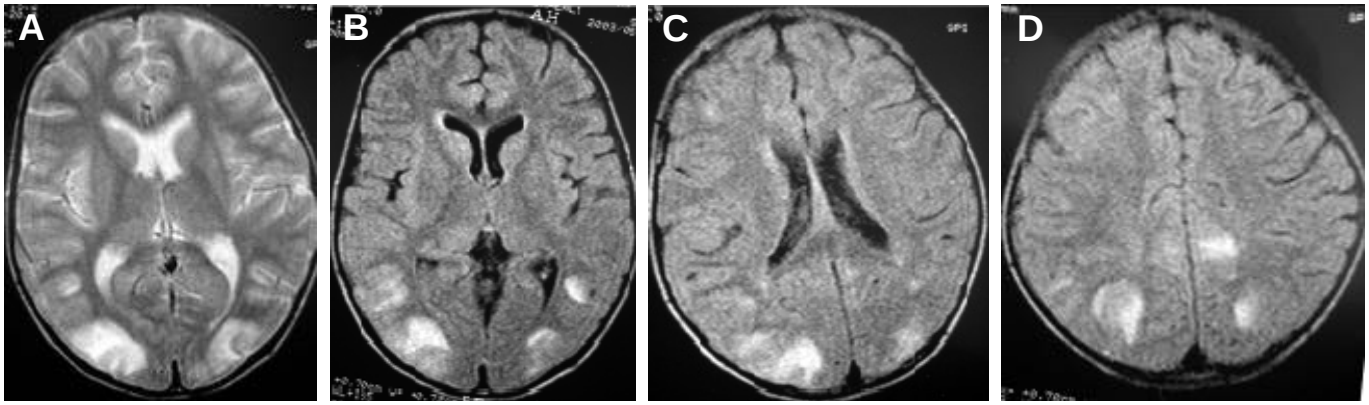

Fig. 1. A 6-year-old female with acute severe combined demyelination on admission.

A. T2W MRI reveals hypersignal intensity in the bilateral parieto-occipital region. These lesions are asymmetric and involve the subcortical white matter.

B. FLAIR MRI at the same level of Fig. 1A, reveals more hypersignal intensity lesions in the bilateral parieto-occipital region involving gray-white matter junction. No mass effect or edema is seen. No obvious involvement of corpus callosum is seen.

C. FLAIR MRI at the upper level of Fig. 1B, reveals more hypersignal intensity lesions in the bilateral posterior parietal and white matters of frontal and parietal regions. There is no mass effect or edema in these lesions.

D. FLAIR MRI at the upper level of Fig.1C, reveals more hypersignal intensity lesions in the bilateral posterior parietal and para sagittal regions involving gray-white matter junction. There is no mass effect or edema in these lesions.

Because of the increased leg weakness and decreased deep tendon reflexes, electromyography (EMG) & nerve conduction velocity (NCV) were achieved on the second day of admission which showed decreased motor and sensory NCV of lower extremities and absence of F-waves. Lumbar puncture (LP) findings (cell=0, Glucose=68mg/dl, and protein=45mg/dl) confirmed acute demyelinating peripheral neuropathy, and following the diagnosis of GBS, intravenous immunoglobulin (total dose of 2g/kg in 4 days) was ordered. On the third day after admission, the patient had two episodes of generalized tonic-clinic seizures and showed mild changes in the mental status. Since this finding (seizure) was not consistent with the GBS diagnosis, further work-up was required. Phenobarbital and phenytoin were administered and the seizure was controlled. The brain CT-scan was normal, but a brain MRI showed hyperintense changes in the supratentorial and periventricular areas in T2-weighted and FLAIR images, and hypointense changes in T1 (Figs.1 A-D). EEG showed generalized slowing.

Visual field assessment through perimetery was normal; visual evoked potential (VEP), auditory brain stem response (ABR), and somatosensory evoked potential (SSEP) were normal.

T2W and FLAIR MRI (Figs. 1 A-D) on admission revealed multiple hyperintensity lesions in the parietooccipital, posterior parietal, and parasagittal regions which involved gray-white matter junctions in subcortical areas. There were also some patchy foci of hypersignal intensities in the frontal and parietal white matters. All of the mentioned lesions had no mass effects and were asymmetric. On the other hand, corpus callosum was intact. After two weeks treatment, no evidence of the mentioned lesions was seen (Figs. 2 A-C). These lesions could be seen in a variety of diseases, however, a combination of prodromal illness or preceding vaccination, MRI signs of demyelination[4] (asymmetric involvement, location of lesions in white matter, and gray-white matter junctions in the subcortical area, no mass effect and spare of corpus callosal), and an acute presentation of neurologic symptoms are the triad most commonly looked for in making the diagnosis of ADEM. Proper response to treatment should be suggestive of ADEM. One of the characteristic MRI findings in ADEM is inflammation and demyelination in the subcortical or periventricular regions, which were detected in this case.[4-6]

Following the diagnosis of ADEM, the patient received methylprednisolone (pulse therapy-20mg/kg for 5 days). After two weeks, she was discharged from the hospital in good condition, and could walk with some assistance. Prednisolone was continued for four weeks and antiepileptic drugs were discontinued after one year. Follow up results which were obtained at 6, 12, 24, and 30 months later, showed she was quite

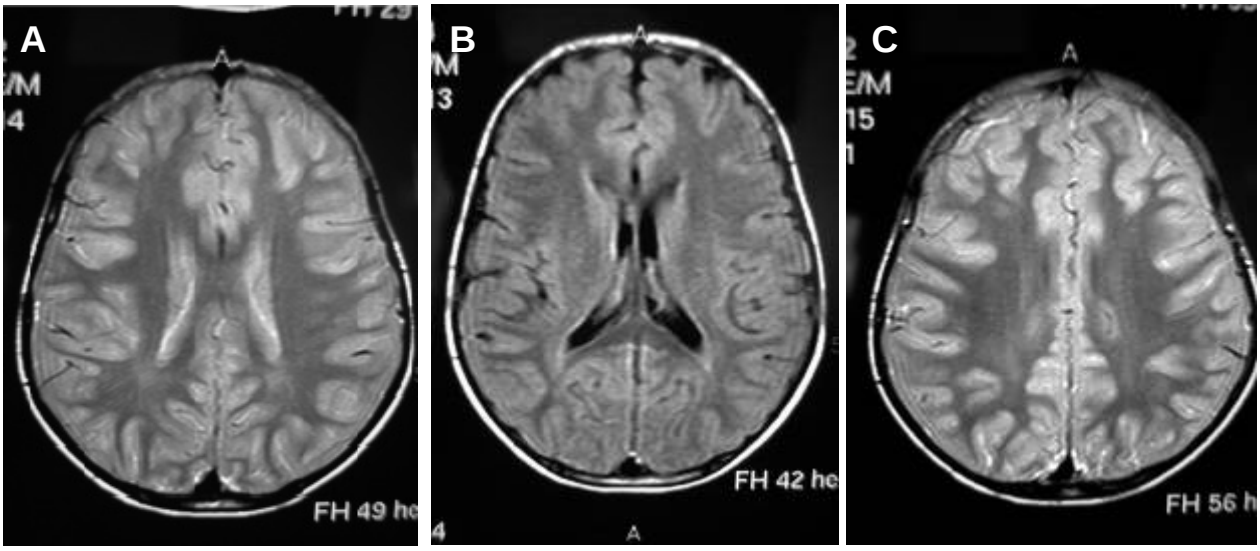

Fig. 2. A 6-year-old female with acute severe combined demyelination after two weeks treatment.

A. T2W MRI at the level of Fig.1C, reveals no abnormality except mild hypersignal intensity regions in the periventricular regions.

B. FLAIR MRI at the level of Fig. 2A reveals no abnormality.

C. T2W MRI at the level of Fig. 1D shows no abnormality.

well and had no disability. Control neuroimaging (brain MRI), carried out after 30 months, showed no evidence of abnormality, confirming the diagnosis of ADEM (Figs. 2A and B).

Discussion

Our patient was presented with an acute demyelinating disorder, affecting the central and peripheral nervous system simultaneously. Documented overlap of acquired acute central and peripheral system demyelination is very rare.[7,8] Gamstorp and Blennow used the descriptive diagnosis of encephalomyeloradiculoneuropathy to delineate pediatric cases of Guillain-Barre syndrome with presumed CNS involvement.[7,8] This term describes cases in which major involvement of one system, most commonly the peripheral, were associated with mild involvement of the others.[9] Again in children, Amit et al coined the entity of acute combined demyelination for cases in which the pathology of both the central and peripheral nervous systems contributed equally to the overall clinical picture[10]. Later Itokozu et al.,[11] Katchanov et al.,[7] and Aimoto et al.,[12] described other similar cases of a 9-year-old female, a 32-year-old female and a 41–year-old male respectively. In two of the above studies, the involvement of CNS and PNS was severe and they occurred simultaneously. Only in the case reported by Aimoto et al. in 1996,[12] the PNS involvement occurred after one month of CNS problems. Our report is the only case of a child in whom the CNS involvement was preceded by PNS neuropathy; the CNS presentation involved seizures, mental changes, and MRI and EEG abnormalities. On the other hand, there have been several reports of combined central and peripheral demyelination in 1994 [13] and 1996 [14] which were confirmed by necropsy. In CNS and PNS disorders, if there is evidence of involvement of one of these systems, the physician should consider evaluation of the other system. As a conclusion, we suggest that neuroimaging (MRI) and neurophysiologic studies (EMG-NCV) are complementary for the diagnosis of severe combined demyelinating disorders.

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