

## **ACUTE DISSEMINATED ENCEPHALOMYELITIS**

### **Akutni diseminirani encefalomieltis**

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*Case report*

*Summary*

Acute disseminated encephalomyelitis (ADEM) is a monophasic autoimmune postinfectious demyelinating disease that predominantly affects children. It appears to occur in a seasonal distribution (winter and early spring) and is characterized by the acute onset of diffuse neurological signs and symptoms. The diagnosis is often made by exclusion, and it is strongly suggested by preceding infection or immunization coupled by evidence of multifocal lesions of demyelization on neuroimaging. High dose corticosteroid therapy is the treatment of choice. Prognosis in pediatric patients is generally favorable.

**Key words:** Acute disseminated encephalomyelitis ▪ Childhood ▪ Case report

*Prikaz slučaja*

*Sažetak*

Akutni diseminirani encefalomieltis (ADEM) je monofazna, autoimuna, postinfekcijska demijelinizirajuća bolest, koja zahvaća prvenstveno djecu. Bolest se pojavljuje češće u zimu i rano proljeće. Karakterističan je akutni početak i difuzni neurološki znaci i simptomi. Dijagnoza ADEM-a je bazirana na kliničkim kriterijima: kliničkoj slici, anamnestičkim podacima o prethodnoj akutnoj infekciji ili vakcinaciji, te multifokalnim demijelinizirajućim lezijama na neuroradiološkim pretragama. Visoke doze kortikosteroida se najčešće koriste u terapiji. Prognoza u djece, prema objavljenim pedijatrijskim serijama, je povoljna.

**Ključne riječi:** Akutni diseminirani encefalomieltis ▪ Dječija dob ▪ Prikaz slučaja

### **INTRODUCTION**

Acute disseminated encephalomyelitis (ADEM) is a monophasic acute

postinfectious autoimmune multifocal demyelinating disease of the central nervous system (CNS) that primarily affects children. Atypical variants, such as

relapsing (multiphasic) and site-restricted variant, and association with peripheral nervous system involvement, have been recognized. Adult onset has also been reported (1). Validated diagnostic criteria have not been established, therefore, ADEM remains a clinical diagnosis (2). Typical features are seen in the following case report.

## CASE REPORT

A 3.5 year-old previously healthy Caucasian boy was hospitalized a few days before New Year's Eve for ataxia, slurred speech and increased sleepiness. Three days prior to admission he complained of a headache for less than 24 hours, had one episode of emesis, and was unsteady on his feet. Subsequently he became extremely difficult to arouse. Over the next few days, the patient's mental status and gait improved; however, his speech had been progressively worse, almost unrecognizable. The parents denied seizure activity, recent head trauma, unusual ingestions, or travel.

Review of systems revealed a history of an upper respiratory infection and fever that had lasted for about two days approximately 3 weeks prior to the onset of symptoms. His sibling had also been reportedly sick a week prior to the initiation of the patient's illness. Family history was unremarkable and negative for migraine and seizures.

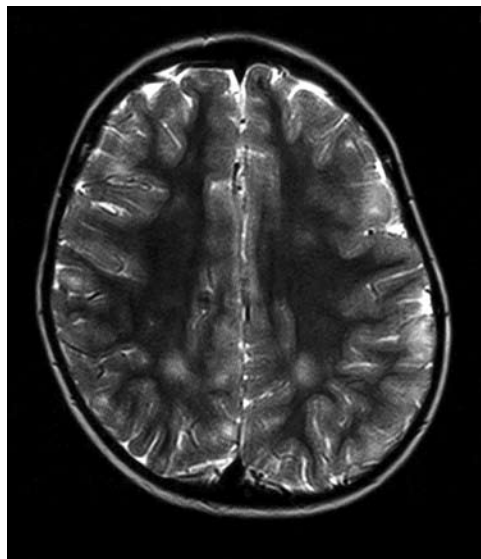
On physical examination he was afebrile, alert, but was appeared tired.

His vital signs were: pulse 110 beats per minute, respiratory rate 24 breaths per minute, and blood pressure 112/70 mmHg. His weight was 16.1 kg. He obeyed commands with some effort; his speech was clearly dysarthric with a scanning and aphasic component to it. There was an occasional tendency of the tongue to deviate to the left side. He had some degree of difficulty protruding his tongue, as if he had a mild apraxia. The rest of the cranial nerves exam was normal. Sensory exam was normal. Reflexes were 2+ and symmetrical in the upper and lower extremities. Meningeal signs were negative. His gait was mildly ataxic. The rest of the physical exam was normal.

Computed tomography of the head without contrast performed on the day of admission was normal. Toxicology screen was negative. Complete blood count revealed hemoglobin of 11.9 gm/dl, (1.84 mmol/L), hematocrit 34.4% (0.34), erythrocyte count  $4.18 \times 10^6/\text{mcL}$  ( $4.18 \times 10^{12}/\text{L}$ ) with normal red blood cell indices, leukocyte count of  $8.99 \times 10^3/\text{mcL}$  ( $8.99 \times 10^9/\text{L}$ ), with 9% bands, 41% segmented neutrophils, 43% lymphocytes. Serum comprehensive metabolic panel, including sodium, potassium chloride, bicarbonate, urea, creatinine, calcium, glucose, albumen, total protein, alkaline phosphatase, bilirubin and AST were normal. An LP showed 7 WBC/mm<sup>3</sup> (100% mononuclear), and CSF chemistry was within normal limits. CSF gram stain and culture were negative.

MRI of the brain demonstrated patchy areas of increased T2 signal within the

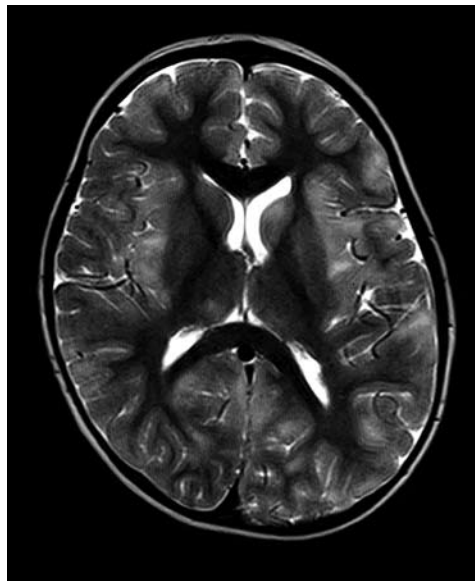
peripheral white matter at the gray-white junction, involving all lobes of the brain, most predominantly the temporal lobes (Figure 1).



**Figure 1** MRI of the brain (TR 7500, TE 119) demonstrating symmetrical patchy areas of increased T2 signal within the peripheral white matter at the gray-white junction

**Slika 1** NMR mozga (TR 7500, TE 119) pokazuje simetrične multifokalne promjene povećanog T2 signala unutar periferne bijele mase i na spoju bijele i sive mase

High dose methylprednisolone (approximately 1mg/kg) was started as an IV push and changed to IV infusion after the patient became combative and irritable. He demonstrated marked improvement within the first 24 hours after steroid initiation. He continued to improve through the remainder of



**Figure 2** MRI of the brain, T2 weighted axial image showing lesions typical for ADEM in the gray matter; including the caudate nuclei and the thalamus

**Slika 2** NMR mozga, T2 axialni presjek pokazuje lezije tipične za ADEM, u sivoj masi, uključujući nucleus caudatus i thalamus

his hospitalization. After five days of hospitalization he was discharged home on high dose oral prednisone and subsequent taper over the following two weeks. To our knowledge this patient recovered completely, and did not have any hospitalizations for the relapse of ADEM.

## DISCUSSION

ADEM in children is considered a monophasic acute demyelinating

disorder of the central nervous system. It is characterized by sudden onset of multifocal neurological signs and symptoms that lead to hospitalization within a week. Although the pathogenesis is unknown, it is considered an immune-mediated inflammatory process with some evidence of cytokine/chemokine involvement (3). It appears to occur in a seasonal distribution, predominantly in winter and spring (4).

ADEM was first described in the early 18<sup>th</sup> century, typically following measles or chickenpox, and it was associated with significant mortality and morbidity. Although, nowadays, in most cases a specific etiologic agent cannot be identified, approximately 70 % of patients report a preceding illness, most commonly an upper respiratory tract infection days to weeks before the onset of symptoms (4). ADEM has also been reported after certain immunizations.

In approximately 2/3 of cases patients have systemic signs and symptoms, such as fever, nausea/vomiting, and headache (5). The presenting symptom in the majority of patients is motor deficit, including ataxia and paresis, but altered consciousness can be present in approximately 45-70% of patients (4,5).

The diagnosis of ADEM is made by the clinical picture coupled with evidence of multifocal lesions of demyelization on neuroimaging. Laboratory findings, including routine blood tests, are nonspecific and often unremarkable (6). Cerebrospinal fluid analysis is often performed secondary to the presenting

symptoms of fever, headache and lethargy, and could usually reveal a lymphocytic pleocytosis, with variable elevation of total protein level (7).

CT scan of the brain is typically normal. However, MRI is strongly suggestive because of its high sensitivity in detecting changes in the white matter. It usually demonstrates subcortical white matter involvement, with occasional white-gray junction, thalamic, hypothalamic, basal ganglia, brain stem and spinal cord involvement (8). A review of previously reported ADEM cases in pediatric patients demonstrated that MRI results were positive in 100% of cases (8).

Differential diagnosis includes early onset multiple sclerosis (MS). The following should be considered to clarify the diagnosis: young age of a child, fever at the onset of disease, preceding illness, relapse occurring shortly after steroid discontinuation. Each favors the diagnosis of ADEM (9). Predominantly periventricular lesions on MRI may be indicative of MS.

High dose corticosteroid therapy is the treatment of choice. It is thought to shorten the duration of neurological symptoms, although controlled studies have not been done. Intravenous immunoglobulin and plasmapheresis have reportedly been used, mainly for failure to improve on steroid therapy (10).

Prognosis of ADEM in the pediatric population is favorable, with overall good outcome (7). However, residual neurological deficit has been reported in

approximately 20% of cases, and relapses up to 25% of cases after steroid taper has been seen. Complete resolution on MRI is associated with normal neurological outcome, although MRI changes could persist for up to 18 months (11). Careful

follow up (including MRI minimum 6 months after initial presentation, when clinically indicated) is important to differentiate ADEM and MS, since early diagnosis and treatment of MS could prevent the progression of the disease.

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