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Multisystem Inflammatory Syndrome in a Child Presenting with Acute Hemiparesis as a Rare Neurologic Manifestation

Nadir Bir Nörolojik Bulgu Olarak Akut Hemiparezi ile Başvuran Çocukta Multisistem İnflamatuar Sendrom

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ABSTRACT

The coronavirus pandemic has emerged as one of the most significant global health crises, affecting people worldwide and resulting in the loss of millions of lives. It was officially named "Coronavirus disease 2019" (COVID-19) when it first appeared at the end of 2019. Multisystem Inflammatory Syndrome in Children (MIS-C) is a relatively new disease entity that has arisen in the wake of the COVID-19 pandemic. While MIS-C is recognized to manifest with various symptoms, our understanding of it continues to evolve as more articles and case reports are published in the scientific literature. Although MIS-C affects multiple organ systems, there have also been reported cases of neurological involvement. According to the literature, cases of hemiparesis without imaging findings in MIS-C have rarely been reported. To the best of our knowledge, this is a rare reported case of hemiparesis without intracranial and spinal pathology in the context of MIS-C reported in this article.

Key Words: Acute hemiparesis, Child, COVID-19, MIS-C, Neurologic manifestation

ÖZ

Koronavirüs pandemisi tüm dünyayı etkisi altına alan ve milyonlarca insanın ölümüne neden olan en önemli hastalıklardan biri haline gelmiştir. 2019 yılının sonunda başladığı için Koronavirüs hastalığı-2019 (COVİD-19) olarak adlandırılmış ve çocuklarda Multisistem İnflamatuar Sendromu (MIS-C), COVİD-19 pandemisi sonucu ortaya çıkan, yeni bir hastalık tanımı olarak literatürde yerini almıştır. MIS-C'nin birçok farklı semptoma neden olduğu bilinmesine rağmen, literatürde daha fazla makale ve vaka sunumu yayınlandıkça bilgimiz katlanarak artmaktadır. MIS-C birçok sistemi etkilemekle birlikte çeşitli nörolojik tutulumlar da bildirilmiştir. Literatüre göre MIS-C'de görüntüleme bulgusu olmaksızın hemiparezi olgusu nadiren bildirilmiştir. MIS-C tanısında intrakraniyal ve spinal patoloji olmaksızın nadir olarak görülen hemiparezi vakası bu yazıda bildirilmiştir.

Anahtar Kelimeler: Akut hemiparezi, Çocuk, COVİD-19, MIS-C, Nörolojik belirtiler

INTRODUCTION

Coronaviruses (CoV) are pathogens that affect both humans and animals. In late 2019, a new variant emerged in China, officially named Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) (1). COVID-19 in most children is typically asymptomatic and less severe than in adults (2). In children with COVID-19, the most common symptoms are cough and fever (3). As our understanding of COVID-19 continues to evolve, we now know that SARS-CoV-2 can rarely progress to MIS-C (Multisystem Inflammatory Syndrome in Children). The diagnostic criteria for MIS-C involve fever lasting at least 24 hours, laboratory evidence of inflammation, involvement of two or more organ systems, hospitalization, and exposure to a COVID-19 case within one month of symptom onset (4). Symptoms are associated with dysfunction in affected

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systems, which can include conjunctivitis, rash, gastrointestinal symptoms, myocardial dysfunction, and fever (5). While MIS-C affects various organ systems, there have been reports of neurological involvement, which has been documented in 6% to 58% of MIS-C patients (1,2). To the best of our knowledge, there have been rare reported cases of hemiparesis with MIS-C without magnetic resonance imaging findings. In this report, we describe a rare case presenting with hemiparesis without intracranial and spinal pathology in the context of MIS-C.

CASE REPORT

An 11-year-old patient was admitted to the hospital with a severe headache in the frontal region, which was not accompanied by any other findings such as photophobia, double vision, speech disturbances, dizziness, memory loss, or confusion, was unaffected by light and sound, and did not respond to analgesics. She had never experienced a similar headache before. Fundus examination and cranial Computed Tomography (CT) were normal. Three days later, the patient developed a high fever, and a COVID-19 test returned positive. Her initial symptoms included vomiting, severe headaches, conjunctival hyperemia, and maculopapular rashes on her extremities. During her illness, weakness developed in her left upper and lower extremities, leading to a neurological deficit, and her motor strength was assessed as 3/5 according to the MRS scale. Her vital signs were generally normal, except for a fever of 38.7°C. Tendon reflexes were normal and symmetrical. There was no pain, warmth, swelling, or tenderness in the extremities. No sensory deficits were found in the comprehensive neurological examination.

According to her medical history, two months prior, her uncle had tested positive for COVID-19, but the COVID-19 PCR tests for her entire family had returned negative. There was no family history of diagnosed headaches, such as migraines.

Laboratory examinations revealed the following results: Alanine transaminase is 279 U/L (0–55), and aspartate transaminase is 290 U/L (5–34). Serum electrolytes, coagulation factors, and complete blood counts were within normal ranges. Acute phase reactants (AFR) showed elevated levels: C-reactive protein 36 mg/L (0–5), procalcitonin 0.58 µg/L (<0.5), ferritin 510.52 µg/L (4.63-204), D-dimer 1595 mg/L (0–275), and fibrinogen 175 mg/dL (180-350). Immunoglobulins (Ig) were assessed before immunoglobulin therapy: IgA 1.69 g/L, IgG 29.76 g/L, IgM 1.45 g/L, and total IgE 1506 IU/mL. Cranial Magnetic Resonance Imaging (MRI), including diffusion tensor and susceptibility-weighted imaging (SWI), revealed no abnormalities to explain the hemiparesis.

A diagnosis of MIS-C was established based on several findings. The patient had ongoing fever, involvement of at least two organ systems (maculopapular rash and conjunctival hyperemia as dermatological involvement and elevated liver enzyme levels as gastrointestinal involvement), elevated AFR, and evidence of recent SARS-CoV-2 infection. Echocardiography to assess myocardial function was normal. Chest radiography and tomography showed no abnormalities. The patient was initiated on MIS-C treatments, including favipiravir, intravenous immunoglobulin (2 g/kg), aspirin (80 mg/kg), antibiotics, and corticosteroids (2 mg/kg). By the third day of follow-up, her weakness had completely resolved, and no motor deficits remained. The therapies were gradually tapered and eventually discontinued. No additional issues were observed during the three-month outpatient follow-up.

DISCUSSION

COVID-19 has rapidly spread worldwide since late 2019. While it primarily affects the pulmonary system, neurological symptoms have become increasingly recognized as part of the clinical spectrum of the disease. In addition to the well-documented symptoms of dysgeusia and anosmia in the neurological system, myalgia, headaches, and dizziness have become common in the early stages of infection (6, 7). A study revealed that 57% of adult COVID-19 patients experienced various neurological symptoms, with myalgias, headaches, dizziness, and anosmia being the most common, along with myopathy, cerebrovascular diseases, seizures, and movement disorders (7). In a retrospective case series of 214 hospitalized adult COVID-19 patients, neurologic manifestations were observed, including central nervous system manifestations (headaches, acute cerebrovascular disease, and seizures), peripheral nervous system manifestations (anosmia, nerve pain), and skeletal muscular injuries. More severe infections were associated with more life-threatening symptoms (8).

In contrast, neurological manifestations in children with COVID-19 are relatively rare. A systematic review of 3.707 pediatric patients found nonspecific neurological symptoms like fatigue, headache, and myalgia in 15.6% of patients and specific neurological manifestations, such as seizures, encephalopathy, and meningeal signs, in 1% (9).

In April 2020, reports emerged of a condition in children resembling toxic shock syndrome (5). Subsequently, MIS-C, a rare complication of COVID-19, was identified (10, 11). The main clinical manifestations of MIS-C encompass the cardiovascular, dermatological, neurological, respiratory, and renal systems (10–15). In a case series study involving 27 children with MIS-C, four had neurological manifestations, including headaches, encephalopathy, muscle weakness, cerebellar signs, and reduced reflexes, and they exhibited MRI abnormalities such as splenium signal changes (16). In a study of 1,695 patients with MIS-C, 365 (22%) showed documented neurologic involvement, with 81 having underlying neurologic

disorders. Transient manifestations occurred alongside other life-threatening symptoms, including cerebral edema, stroke, severe encephalopathy, central nervous system infection, or demyelination (17). Children with MIS-C appeared to have a higher prevalence of severe neurological symptoms than COVID-19 (17, 18). In a retrospective study, encephalopathy and left hemiparesis were reported in a 10-year-old patient with MIS-C who also had sickle cell anemia. Brain CT/MRI images revealed right frontal intraparenchymal hemorrhage and infarction (18).

However, in the case of our patient, no pathology was detected in the cranial CT and MRI, including diffusion tensor imaging Although many studies have reported weakness as a neurological involvement in MIS-C patients, a rare case of hemiparesis like ours has been reported. Unlike other patients, our patient's initial symptom was a severe headache; her MRI and tendon reflexes were normal, and motor weakness was prominent. Fortunately, her neurological problems were completely resolved.

Differential diagnosis of acute hemiparesis in children is a critical process that involves evaluating various potential underlying causes. In children, common differential diagnoses include hemiplegic migraines, stroke, infections, demyelinating disorders such as multiple sclerosis, and structural lesions such as brain tumors or vascular malformations. Precise clinical assessment, imaging studies, and laboratory tests are essential in identifying the specific cause and guiding appropriate treatment (19). Hemiplegic migraine is a severe subset of migraine with aura, with symptoms including reversible hemiparesis in addition to other aura symptoms (20). In our case, hemiparesis occurred three days after the onset of a headache, with no other clinical manifestations such as aura symptoms, such as visual disturbances, speech difficulties, or sensory changes. The MRI sequences done to exclude other diagnoses for hemiparesis, including SWI and diffusion-tensor imaging, showed normal results.

To the best of our knowledge, this is a rare case presenting with transient hemiparesis without intracranial pathology in the diagnosis of MIS-C.

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