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Case Report

Acute Disseminated Encephalomyelitis Following Sputnik V COVID-19 Vaccine: A Case Report -

Davood Shalilahmadi and Nastaran Farahmand Porkar*

Department of Neurology, Ahvaz Jundishapur University of Medical Sciences, Iran

***Address for Correspondence:** Nastaran Farahmand Porkar, Department of Neurology, Ahvaz Jundishapur University of Medical Sciences, ahvaz, Iran, Tel: +98-613-374-3001; Fax: +98-613-374-3030; E-mail: nstrnfarahmand69@gmail.com

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ABSTRACT

A 29-year-old woman who presented with encephalopathy and right hemiparesis after the second dose of COVID-19 vaccine. Brain MRI demonstrated acute multifocal demyelinating lesions, and CSF examination not revealed a direct cerebral infection or positive test for oligoclonal bands. Administration of High-dose steroids followed by a course of plasma exchange and rituximab was performed, and the patient MMSE scores rather improved after several weeks. Therefore, acute disseminated encephalomyelitis should be considered a potentially treatable cause of encephalopathy or multifocal neurological manifestations in patients with history of recent COVID-19 vaccination.

Keywords: COVID-19; Vaccination; Acute disseminated encephalomyelitis

ABBREVIATIONS

COVID-19: Coronavirus-19; ADEM: Acute Disseminated Encephalomyelitis; MMSE: Mini-Mental State Examination; PCR: Polymerase Chain Reaction; NMO: Anti-aquaporin-4; MOG: Anti-Myelin Oligodendrocyte; SARS-CoV-2: Severe Acute Respiratory Syndrome Coronavirus 2

INTRODUCTION

Coronavirus-19 (COVID-19) has become a global pandemic with multiple neurological complications [1]. With the onset of COVID -19 vaccination, neurologists are facing with questions about potential neurological complications, benefits, and timing of vaccination [1].

Acute Disseminated Encephalomyelitis (ADEM) is usually a para or post-infectious immune-mediated syndrome characterized by the onset of multifocal neurologic symptoms, encephalopathy and demyelinating abnormalities in MRI [2].

Here in, we reported a rare case of adult-ADEM after receiving COVID-19 vaccine.

CASE PRESENTATION

A 29-year-old woman presented to Golestan hospital in Ahvaz with a two weeks history of progressive memory decline, low-grade fever, vomiting, and reduced appetite. She had no coughing, dyspnea or diarrhea. She has no significant medical history.

Three weeks prior, she received a 0.5 cc from second dose of COVID-19 vaccine, including recombinant serotype 5 adenoviral particles, containing the SARS-CoV-2 protein S gene in the amount of (1.0 ± 0.5) x 10 particles per dose (Sputnik V, Gamaleya National Center of Epidemiology and Microbiology, Russia) (Figure1). The patient reported generalized malaise and low grade fever during the first week after receiving her first and second dose of vaccination.

On admission, her body temperature was 37.8°C, oxygen saturation was 98% without oxygen, and all other examinations were unremarkable.

On neurological examination, she had mild behavioral abnormalities (irritability) and poor verbal interaction to answer the physician's questions. The patient showed 14 out of 30 from MMSE score. Pupils were reactive to light, extraocular motor movements were normal, and the face was symmetrical. Motor examination demonstrated normal bulk and tone in bilateral upper and lower extremities, strength in right upper and lower extremities was 4/5 and left extremities was noted to be 5/5 in proximal and distal muscles, with preserved deep tendon reflexes, and bilateral flexor plantar responses.

The patient's laboratory data showed hemoglobin: 13.3 g/dL, white blood cells: 10000 (lymphocyte count: 1089/ mm3, normal range: 4000-10000/mm3), platelet: 166000 (normal range: 122000-455000/mm3), CRP was negative, and ESR: 40 mm/h (normal < 20 mm/h). Serum creatinine levels, sodium, potassium, TSH, and FT4 levels were within the normal range. HIV, autoimmune vasculitis, anticardiolipin, and anti-nuclear antibody tests of blood were all negative. Nasopharyngeal and oropharyngeal swab PCR was negative for SARS-CoV-2.

CSF examination revealed a clear appearance, glucose 84 mg/dl (normal < 80 mg/dL), protein: 28.4 mg/dl (normal < 45 mg/dL), WBC: 0 and RBC: 270 mm3 (total cell = 270). Her CSF was negative for cultures of bacteria and fungi and PCR for viruses such as herpes simplex, varicella-zoster, cytomegalovirus, Epstein-Barr virus and SARS-CoV-2. Moreover, we not found oligoclonal bands in CSF and IgG index was normal.

NMO and MOG antibodies were negative in serum.

The chest Computed Tomography (CT) scan indicates no pathologic lesions in favor of COVID-19 and transthoracic echocardiogram was normal.

Figure 1: A. Component 1 containing 5 dose vial for 3 ml.
B: component 2 containing 5 dose vial for 3 ml.
C: Covid-19 vaccine card of patient.

The patient underwent a brain and spine cervical MRI with and without gadolinium contrast on hospitalization (Figure2) showed diffuse confluent scattered white matter hyperintensity lesions on FLAIR and T2 imaging in deep hemispheric and juxta-cortical white matter. These lesions were hyperintense on diffusion weighted imaging (DWI), and no found restricted diffusion on the Apparent Diffusion Coefficient (ADC). All of the lesions showed enhancement with gadolinium contrast. Spinal cervical cord MRI did not show abnormalities.

ADEM disease was suspected and Methylprednisolone 1 g IV for 5 consecutive days was administered without any complications and followed by oral prednisone 20 mg/d. No clinical improvement was seen after administration of corticosteroids. Therefore, the patient underwent plasma exchange of 250 mL/kg in seven sessions over 14 days followed by administration of 1000 mg/m2 rituximab.

Repeat brain MRI on day 21 of hospitalization showed similar primary lesions in size and locations and gadolinium enhancement was reduced (Figure 3).

After 40 days of treatment, her MMSE scores improved to 20/30 and right hemiparesis was completely improved.

DISCUSSION

We describe a case of ADEM followed by a second dose of COVID-19 vaccine injection that presented with memory impairment and bilateral multifocal white matter lesions on brain MRI.

Our patient was compatible with the diagnosis of ADEM related to COVID-19 vaccine according to the encephalopathy, hemiplegia, neuroimaging displayed multifocal white matter abnormalities, 1 week prior history of vaccination, negative oligoclonal bands and lack of the previous history of demyelinating diseases, such as multiple sclerosis.

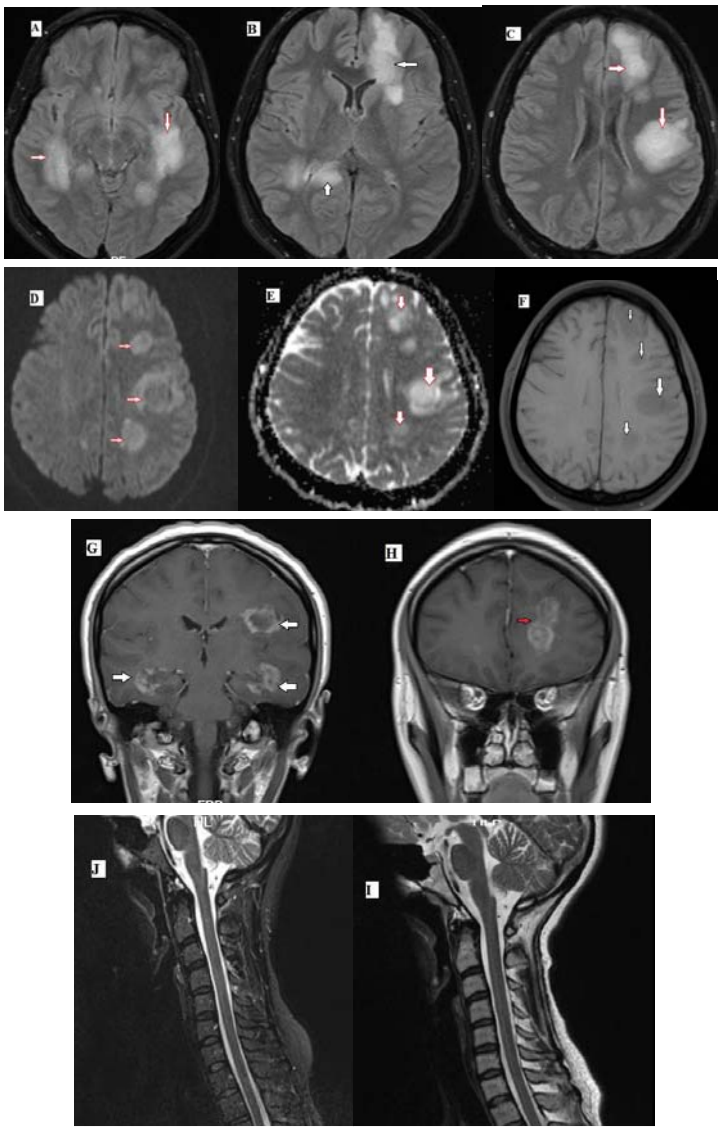

Figure 2: MRI studies on hospitalization. Axial fuid-attenuated inversion recovery (FLAIR, A-C, arrows) MRI of the brain shows multifocal areas of hyperintensity in both cerebral hemispheres involving bilateral medail temporal lobe and sylvian fissure, left centrum semiovale gray matter, right splenium of corpus callosum, while T1-W (F) shows low signals in left centrum semiovale gray matter. The difusion-weighted image shows the lesions in the left centrum semiovale to be mildly hyperintense (arrow) without areas of restricted diffusion on Apparent Diffusion Coefficient (ADC) (D-E). Postgadolinium (Gd) T1-weighted (T1w) sequence of the brain in the coronal plane showing enhancing lesions (arrows) (G-H). Cervical MRI shows no signifcant change on Sagital T2-weighted and FLAIR images (I-J).

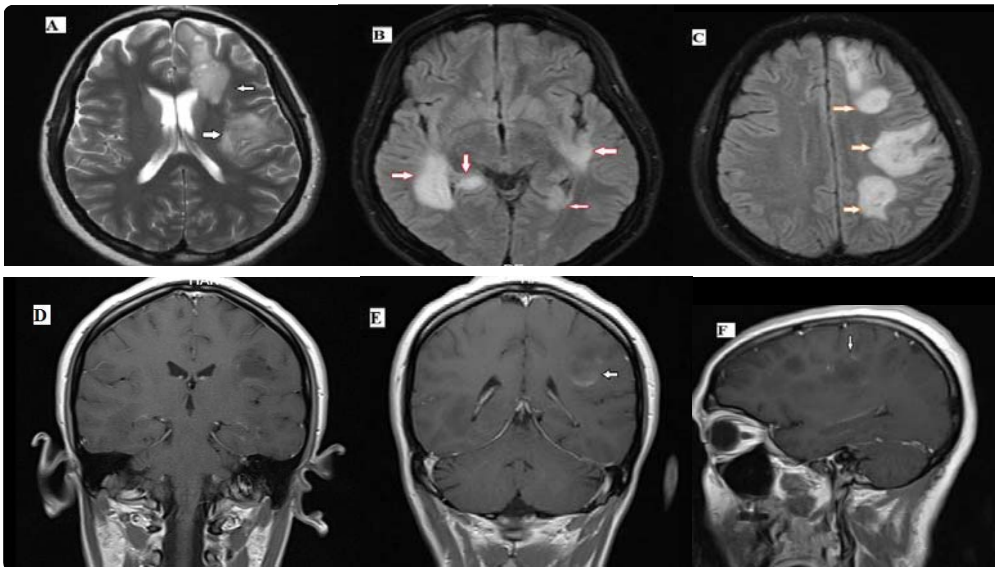

Figure 3: Repeated MRI after 3 weeks of hospitalization reveals similar hyperintense lesions on axial T2-weighted and FLAIR images with slightly gadolinium enhancement in T1-weighted (T1w) sequence (A-F, arrows).

ADEM is rare an acute demyelinating inflammatory disease of the CNS characterized by encephalopathy and multifocal neurological defects with multiple risk factors, including post-viral and a more rarely in vaccination [3].

In the adult population, less information is available on ADEM due to its lower incidence. The course of ADEM is more aggressive and clinical outcomes are poorer in adults than children. Due to the lack of specific biomarkers or confirmatory tests, the diagnosis of ADEM based on a combination of clinical and radiological features and the exclusion of other similar conditions is possible [4].

Since the pandemic outbreak and constantly increasing numbers of SARS-CoV-2 infection, several types of vaccines being used all over the world against this infection. Understanding the side effects of vaccination is crucial. Few cases of neurological complications have been observed in vaccinated individuals [1].

According to the review of literatures, only two cases similar to ours of ADEM disease have been reported following SARS-CoV-2 vaccination. The first case report describes a 24 woman presented with memory decline, extremity weakness and typical brain MRI for ADEM disease after receiving a SARS-CoV-2 vaccine two weeks ago. CSF analysis reveals a mild pleocytosis and elevated protein levels, but it is generally negative for OCB. The patient has an excellent response to gamma-globulin [2]. The second case describes a 46-year-old woman with an adem-like presentation after receiving her second dose of inactivated coronavirus vaccine (Sinovac). She presented with the first tonic-clonic seizure in her life. She had an alone history of Hashimoto's thyroiditis. Her neurological examination was entirely normal. MRI was shown scattered hyperintense lesions in the left thalamus, bilateral corona radiata, left diencephalon, and right parietal cortex on T2 and FLAIR sequences with mild restricted diffusion on DWI. MRI spectroscopy did not show choline elevation. Her serum Thyroid-Stimulating Hormone (TSH) level and Cerebrospinal Fluid (CSF) studies were normal. She was well treated with a 1 g/day steroid for 7 days [3].

Despite the differences in clinical presentation, MRI findings in the two cases are similar to our patients. CSF showed only mild protein elevation in one case, and CSF PCR for SARS-CoV-2 was negative in all cases.

Treatment of ADEM consists of immunotherapies, such as intravenous pulse methylprednisolone, plasma exchange and IVIg. The use of high-dose intravenous corticosteroids is widely accepted as first-line therapy, and was associated with substantial clinical improvement in adults [4,5].

Our patient had been placed on IV methylprednisolone pulse plasma exchange and rituximab 1 gr due to progressive clinical state and had a moderate response to immunotherapies. In the first case report, patient with good response to corticosteroid and IVIg with 29/30 MMSE score in 15 days after treatment. The second case had improvement only with corticosteroid in clinical presentation and MRI finding.

RESULTS

Therefore, it is recommended to treat each patient according to the clinical condition and response to treatment and follow the patient closely.

CONCLUSION

It is not surprising that ADEM disease occurs after COVID -19 vaccination.

Therefore, it is vital to be aware of the neurologic manifestations in patients with a history of recent COVID-19 vaccination for a quick and accurate diagnosis to initiate treatment and prevent serious sequelae.

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