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Acute Transverse Myelitis Secondary to SARS-CoV-2 Vaccine

Arthur Cecchini DO[1*], Syed Sadiq DO[1], Ahmad Rashad Othman MD[1], Koushik Sanku MD[1], Amanda Cecchini DO[2]

[1]Department of Internal Medicine, East Tennessee State University, USA

[2]Department of Pulmonology and Critical Care, Eastern Virginia Medical School, USA

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[*]**Corresponding author:** Arthur Cecchini. Department of Internal Medicine, East Tennessee State University, USA

ABSTRACT

Acute transverse myelitis secondary to the SARS-CoV-2 vaccine is a rare yet documented phenomenon. We present a case of a 31-year-old male who presented with severe weakness, numbness, tingling, and neuropathic pain below the umbilicus who had recently received the Moderna mRNA SARS-CoV-2 vaccine. An extensive workup revealed no other likely etiology, and he was subsequently diagnosed with MRI-negative acute transverse myelitis related to the SARS-CoV-2 vaccine. A rapid improvement in symptoms and near full recovery occurred with high-dose methylprednisolone and physical therapy.

Keywords: SARS-CoV-2; Vaccine; Hypertension

CASE REPORT

A 31-year-old male with a history of hypertension, alcohol use disorder, and tobacco use disorder presented to the hospital with one week of an inability to have a bowel movement. He also expressed progressive pain, weakness, and sensory loss involving his lower abdomen and bilateral lower extremities. The weakness progressed to the point that he was unable to ambulate and had difficulty initiating micturition. There was no urinary or fecal incontinence, dysphagia, difficulty breathing, nausea, vomiting, fever, headache, neck pain, rash, or changes in taste or smell. He denied any recent illness but did receive his second SARS-CoV-2 vaccine three weeks before the onset of symptoms. He admitted to similar but less severe symptoms after his first COVID-19 vaccine.

Vital signs on admission were unremarkable. The physical examination revealed circumferential loss of temperature, two-point discrimination, and vibration below the umbilicus. Light touch to the area provoked severe discomfort. Reflexes of the lower extremities were 0/5 bilaterally, strength was 1/5 bilaterally, and decreased rectal tone was noted with a stool-filled rectum on the digital rectal exam. The rest of the neurological exam revealed no cranial nerve deficits, 5/5 strength in the upper extremities, reflexes of 2/5 in the upper extremities, and intact mental status.

A clear level of sensory and motor dysfunction was noted at the level of the T 10 dermatome with abnormal findings below and normal findings above this level.

Laboratory evaluation revealed a negative SARS-CoV-2 nasal Polymerase Chain Reaction (PCR), normal blood counts, metabolic panel, thyroid function, complement levels, immunofixation, serum protein electrophoresis, antinuclear antibodies, hepatitis serologies, sedimentation rate, C-reactive protein, rheumatoid factor, rapid plasma reagent, human immunodeficiency virus screening, creatine phosphokinase, scleroderma antibodies (anti-Ro, anti-La), Lyme disease serology (IgM, IgG), aquaporin-4 antibodies, anti-oligodendrocyte glycoprotein antibodies, anti-neutrophil cytoplasmic antibodies, vitamin E levels, B1 levels, B12 levels, and heavy metal screen (zinc, cadmium, copper, lead). Serum IgG was within normal range, vitamin B 6 was mildly low at 4.6 (5-50 µg/L), and myelin basic protein (MBP) was elevated at 11.7 (0.0-3.8 ng/mL).

Cerebrospinal Fluid (CSF) analysis revealed a negative infectious meningitis PCR panel and a negative CSF gram stain and culture. Cell counts revealed one white blood cell (WBC) per µL(0–5 cells/µL) but were otherwise normal. The glucose was 92 (50-75 mg/dL), protein level 77 (15-45 mg/dL), cryptococcal antigen was negative, and a mildly elevated CSF IgG of 5.7 (0-4.5 mg/dL) was noted. No oligoclonal bands were detected.

Magnetic Resonance Imaging (MRI) without and with contrast enhancement of the brain was unrevealing for the patient's symptoms, as no tumors, masses, ventricular abnormalities, white matter disease, or grey matter disease were seen. MRI without and with contrast of the cervical, thoracic, and lumbar spine revealed no abnormality.

Nerve conduction and electromyographic studies of the bilateral lower extremities were unremarkable and inconsistent with a demyelinating or myopathic disorder.(Figure 1A-D)

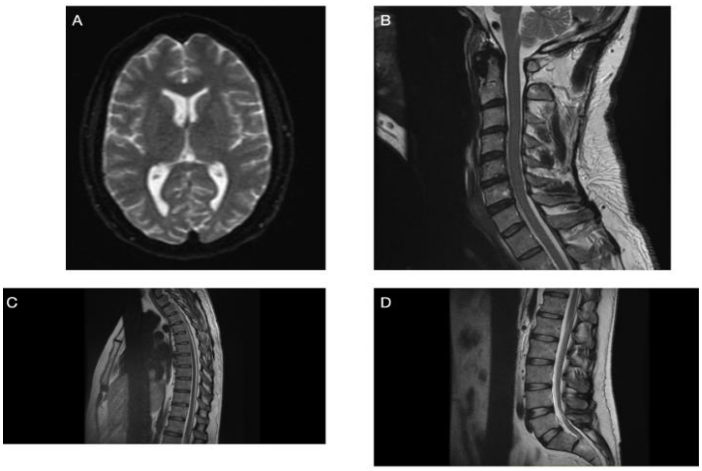

Figure 1A-D: Unremarkable contrast enhanced magnetic resonance imaging of the brain, cervical spine, thoracic spine, and lumbar spine

The patient was treated with one gram of methylprednisolone daily for five days and transitioned to 90 mg (1mg/kg) of prednisone per day. Physical therapy was provided during the hospital course and the patient showed clinical improvement by day three of the hospitalization. The clinical course also included pain control with gabapentin and duloxetine. The patient's severe constipation was treated with docusate, polyethylene glycol, and mineral oil enemas. By the day of discharge, the patient was able to ambulate without assistance, have normal bowel movements, and was pain-free.

DISCUSSION

Transverse myelitis is a relatively rare central nervous system disorder. It is defined by inflammation of the spinal cord leading to sensory alteration, weakness, and autonomic dysfunction attributable to specific spinal cord levels.[1] Symptoms often progress over hours, days, or weeks.[1] Etiologies include inflammatory, autoimmune, and infectious causes.[1] The main differential diagnosis that must always be considered is multiple sclerosis.[2] Other differential diagnoses include Neuromyelitis Optica (NMO), Acute Disseminated Encephalomyelitis (ADEM), systemic autoimmune disorders (systemic lupus erythematosus, Sjogren syndrome, Behcet disease, sarcoidosis), infectious (Borrelia burgdorferi), neoplastic disease, tumors, radiation-induced myelitis, metabolic deficiencies (B12, copper), and vascular myelopathies (anterior spinal artery infarction, arteriovenous malformations).[3]

Criteria for the diagnosis of transverse myelitis include abnormal neurological findings attributable to the spinal cord, bilateral signs and symptoms, a clear sensory level of dysfunction, exclusion of a compressive etiology causing the symptoms, evidence of inflammation in the spinal cord (elevated IgG index, MRI with gadolinium enhancement, or CSF pleocytosis), and a progressive worsening of symptoms over 4 hours to 21 days.[3] Exclusion criteria include a history of radiation to the spine in the previous ten years, neurological defects attributable to the anterior spinal artery, abnormal voids of flow in the spinal cord, evidence of systemic autoimmune disease, documented or CNS manifestations attributable to infectious etiology, MRI of the brain showing lesions suggestive of multiple sclerosis, or a history of optic neuritis.[3]

The diagnosis of transverse myelitis is made with the history, physical exam, CSF studies, and MRI of the spinal cord. MRI of the brain is often also performed to evaluate for lesions suspicious of multiple sclerosis.[1,3] Evaluation for the most likely etiology is also suggested.[1-3] MRI of the spinal cord often shows gadolinium enhancement in the affected segments but may be negative early in the disease course.[4-6]

Transverse myelitis after receiving the SARS-CoV-2 vaccine has been reported in the literature.[2,7-12] The most reported signs and symptoms in vaccine-related transverse myelitis include sensory, motor, and autonomic dysfunction including pain and weakness of the lower extremities.[12] Most patients also had abnormal imaging on MRI and elevations in protein and white blood cells in the CSF, but normal imaging findings with MRI have been

reported.[12] A comprehensive or near-comprehensive workup was performed in most patients with reported post-vaccine transverse myelitis.[8-12]

No strict guideline-recommended treatments are available for post-vaccine-related transverse myelitis though success has been shown with high-dose glucocorticoids ± plasmapheresis.[8-12]

CONCLUSION

Post-vaccine transverse myelitis is a rare but reported complication of the SARS-CoV-2 vaccine. Exclusion of alternative etiologies should still be performed when the disease is suspected. Treatment is most often with high-dose glucocorticoids. Plasmapheresis may be used in patients who do not respond adequately to glucocorticoids.

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