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CASE REPORT

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A rare presentation of undiagnosed multiple sclerosis after the COVID-19 vaccine

Ariana R. Tagliaferri, George Horani, Katherine Stephens and Patrick Michael

Department of Internal Medicine, St. Joseph's Hospital, Paterson, NJ, USA

ABSTRACT

Multiple sclerosis (MS) is an auto-immune mediated neurological disorder that affects the central nervous system and leads to myelin sheath destruction. The pathogenesis of MS involves T helper cells causing inflammation and eventual death of the oligodendrocytes. Etiologies for the development of MS include a combination of genetic, environmental, and immune factors. Vaccines have been proposed to increase the immune response and have reportedly activated some autoimmune disorders. Although certain vaccines such as hepatitis B have been associated with MS, studies have refuted these cases. We present a rare case of a 32-year-old patient who presented with symptoms and suggestive of MS a few days after receiving the COVID vaccine. Laboratory and imaging findings confirmed the diagnosis of MS, and she was started on steroids and discharged in a stable condition a few days after.

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KEYWORDS
COVID-19; Pfizer vaccine; multiple sclerosis; weakness; TIA

1. Introduction

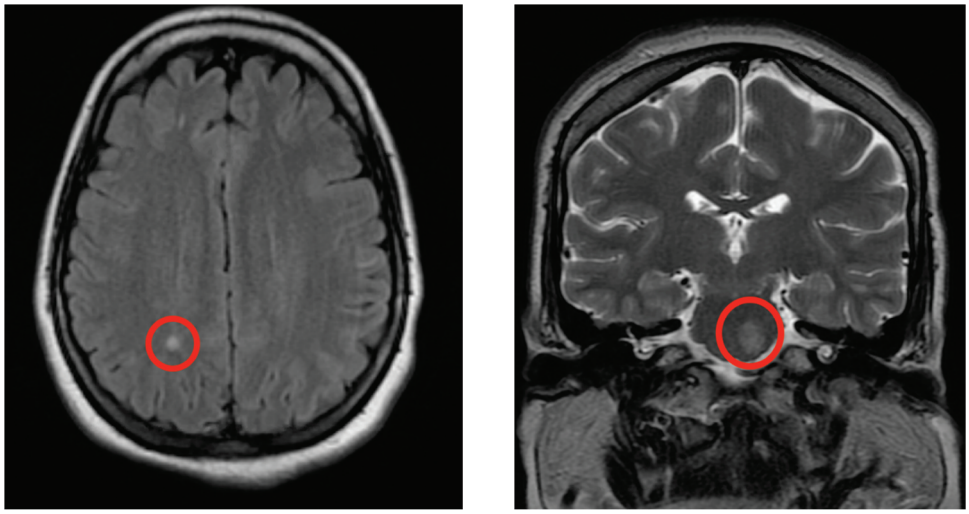
Multiple sclerosis is a chronic autoimmune disorder affecting the central nervous system. The proposed pathophysiology of MS is demyelination and inflammation of upper motor neurons, resulting in axonal damage [1]. Common presentations include optic neuritis, diplopia, weakness, spasticity, and sensory manifestations. The diagnosis is made with a combination of physical exam, laboratory, and imaging findings. MRI of the brain can reveal periventricular plaques and hyperintensities while cerebrospinal fluid findings include increased IgG levels, myelin basic protein, and oligoclonal bands. Although the exact etiology of MS is not entirely clear, a combination of genetic, environmental, and immune factors has been described [1]. Vaccines have been associated with some autoimmune diseases such as rheumatoid arthritis, lupus, and MS; however, studies have failed to demonstrate a clear relationship between the two. Vaccines can cause an increased immune response which triggers the immune system, and this can be a proposed mechanism behind vaccines triggering autoimmune diseases [2].

2. Case

A 32-year-old female with no past medical history presented to the emergency department with right-sided weakness which started one week after receiving the first dose of the BNT162b2 Coronavirus disease-19 (COVID-19) vaccine. Immediately following the first dose, the patient experienced left arm soreness at the site of injection, subjective fevers, and chills. Three days later, she developed fine motor weakness in the right hand, word slurring, and gait instability which eventually progressed into diffuse right-sided weakness in her upper and lower extremities. The patient denied a history of similar symptoms and has no personal or family history of autoimmune or neurological disease. On arrival, her vital signs were unremarkable. On physical examination, the cranial nerves were grossly intact; however, strength was 3/5 and sensation was diminished in the right upper and lower extremities compared to the left. Laboratory findings were remarkable for an elevated white blood cell count of 11.3 (4.5–11×10^3/mm^3) and ESR at 24 (0–20); however, CRP was within normal limits. Vitamin D level was low at 12.2 (30–100 ng/mL). Computerized Tomography of the head without contrast did not show any abnormalities. Magnetic Resonance (MR) Imaging showed multiple round hyperintensities in the white matter with restricted diffusion in the left pons, concerning for possible demyelinating disease (Figures 1 and Figures 2). MR angiography and MR venography of the brain showed normal vasculature (Figure 3). Further workup included a lumbar puncture and

CONTACT Ariana R. Tagliaferri axt173@jefferson.edu Department of Internal Medicine, St. Joseph's Hospital, 703 Main Street, Paterson, NJ 07503, USA

Tagliaferri, A., MD, Horani, G MD and Stephens K BS., performed the literature review and wrote the manuscript. All authors assisted in the collection of the patient's clinical data and edited the manuscript. All work was performed at St. Joseph's University Medical Center.



a. b.

Figure 1. (a) and (b) Magnetic resonance imaging of the brain demonstrating demyelinating disease. Multi-slice/multi-sequence study of the brain performed without and with administration of gadolinium. There are multiple round white matter hyperintensities seen on FLAIR concerning for demyelinating disease (red circle) Figure (a). There is a rounded lesion in the left pons without mass effect (red circle) Figure (b).

3. Discussion

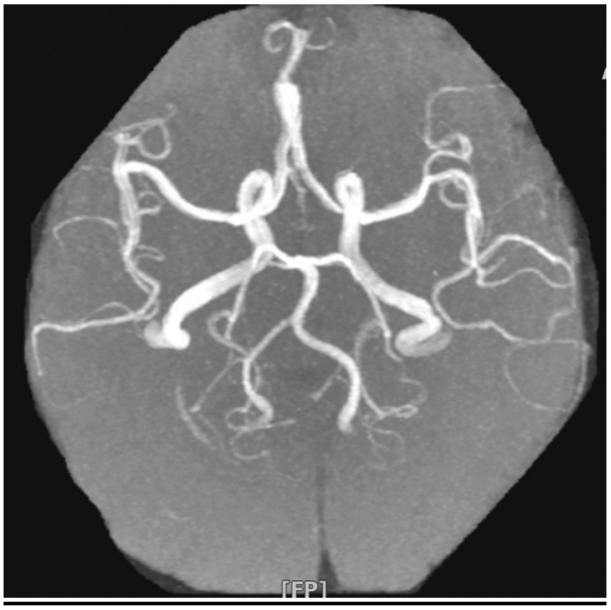


Figure 2. Magnetic resonance angiography of the brain. 3D time of flight MRA of the Circle of Willis is obtained without contrast. The vertebrobasilar junction is normal. The anterior and posterior circulations are within normal limits. There are no aneurysms, AVMs, or intravascular stenosis.

the cerebrospinal fluid results were significant for elevated myelin basic protein 13.3 (0–3.7) and greater than six oligoclonal bands (0–3) were seen on cytology, diagnostic for multiple sclerosis. The patient was started on intravenous Methylprednisolone 1 g for 3 days and was subsequently discharged on Prednisone 60 mg for 11 days.

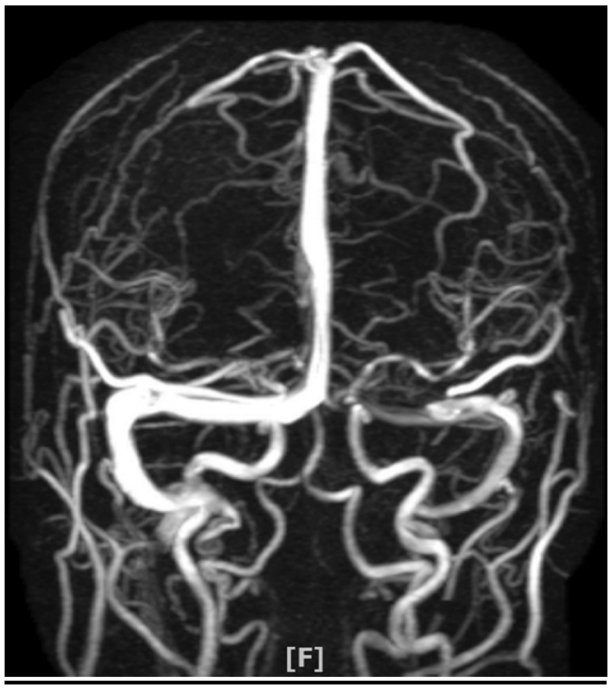


Figure 3. Magnetic resonance venography of the brain. 2D and 3D technique was performed to obtain imaging. The superficial and deep venous system are normal. There are some filling defects which are arachnoid granulations. There is no superficial or deep venous thrombosis. Cortical veins were normal.

Multiple sclerosis (MS) is an auto-immune mediated neurological disorder that affects the central nervous system (CNS) and leads to myelin sheath destruction from the death of

oligodendrocytes [1]. With a prevalence of approximately 400,000 individuals in the USA, MS is one of the most prevalent neuromuscular disorders [3]. The age of onset is between 20 and 40 years with a 2.5:1 female to male predominance [1,3]. Although the exact etiology of MS is not entirely clear, a combination of genetic, environmental, and immune factors has been described. In general, the pathogenesis of MS involves T helper (Th) cells and the interaction between antigen presenting cells (APCs) with T lymphocytes, which subsequently lead to inflammation and oligodendrocyte death [1]. Environmental factors include infections such as Epstein Barr virus, human herpes virus type 6, smoking, vitamin D deficiency, and exposure to ultraviolet radiation [1]. Immune associations involve the activation of Th1 and Th17 by unknown antigens, which attach to the CNS endothelium and cross the blood-brain barrier. This subsequently causes cross-reactivity between the antigens and brain tissue leading to inflammatory-mediated damage [3]. Patients can present with a variety of symptoms, and these can include motor (weakness, loss of balance, tremor), sensory (numbness, tingling, itching), visual disturbances (diplopia, blurry vision, optic neuritis), dizziness, vertigo, and urinary and bowel dysfunction (constipation, bladder dysfunction) [1]. In general, multiple autoimmune disorders including MS, rheumatoid arthritis, systemic lupus erythematosus, and others have been reported after vaccination with either hepatitis B, tetanus, or influenza vaccines [2]. In the case of MS, a potential link between the hepatitis B vaccine and MS has been proposed by some studies or case reports [4,5]; however, this remains controversial as other studies have disproved these claims [6,7].

A few cases of transverse myelitis, another autoimmune disease affecting the CNS, have been reported after the ChAdOX1 (AstraZeneca) novel Coronavirus disease-19 (COVID-19) vaccine [8,9] which is an mRNA vaccine. However, to date, there are no reported cases or any evidence of the COVID-19 vaccine causing MS. In our case, the patient presented with new onset MS a few days after receiving the BNT162b2 (Pfizer) vaccine, which was confirmed with imaging and laboratory findings. Although it remains completely unclear, we associated the MS with the vaccine based on the temporal relationship between receiving the vaccine and onset of symptoms. It has been proposed that vaccines can cause an increased immune response which in turn can trigger self-antigens of the CNS [8]; however, other environmental factors could have played a role. The purpose of this paper is not to definitely associate the COVID vaccine with the disease; rather, we aim to shed light on the possibility of this rare occurrence. More data is needed to further study the correlation or thereby lack of between the COVID vaccine and MS.

4. Conclusion

Vaccines are proposed to cause an increased immune response, which in turn triggers the self-antigens of the immune system; however, there is no definitive causative association between the two. This paper reports a rare case of MS triggered a few days after receiving the COVID-19 vaccine. The time between vaccination and onset of symptoms favors this association, supported by the lab and imaging findings which confirmed the diagnosis. However, more data is needed regarding the association between COVID-19 vaccines and activation of MS or other autoimmune diseases.

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Disclosure statement

The authors report no conflict of interest. Ethical review is not necessary, because this is a case report. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Consent

As this is a case report, consent was obtained for the purpose of this paper.

ORCID

Ariana R. Tagliaferri http://orcid.org/0000-0001-5535-3485
Patrick Michael http://orcid.org/0000-0002-3030-9565

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