

Transverse myelitis after immunization against SARS-CoV-2: A case report

Daniel Antunes Pereira, Luiza Eyer Leme, Shara Aline Bueno Dantas, Marco Antônio Orsini Neves, Gilberto Canedo M. Jr, Antonio Marcos da Silva Catharino

ABSTRACT

Introduction: Transverse myelitis (TM) is a clinical syndrome of varied etiology, one of its causes being the immune-mediated lesion caused by the COVID-19 vaccine. It causes sensory, motor, and autonomic dysfunctions that can be bilateral, unilateral, or asymmetrical and that can change rapidly. The clinical presentation of TM is mainly represented by bilateral weakening of the lower limbs (LL), but it varies depending on the level of the spinal cord involved. Early diagnosis and treatment can benefit recovery and prevent a recurrence.

Case Report: We report the case of a 50-year-old man, an engineer by profession, who reported that in the second dose of immunization against SARS-CoV-2, he began to have a tingling sensation (dysesthesia) in the lower limbs. After four months, between the second and third doses, about five months, a new clinical picture of paresis had erupted, associated with tactile, thermal, and painful hypoesthesia.

Conclusion: Due to the significant impact of COVID-19 on health, especially about neurological impacts, disorders associated with the vaccine should always be considered when approaching patients after vaccination. Post-vaccination TM, as it has a difficult diagnosis (excluding other causes) and a variable prognosis (from total recovery without damage to complete paraplegia, respiratory failure, or upper cervical injury), establishing its diagnosis in an early diagnosis is essential for a better prognosis.

Keywords: COVID-19, Transverse myelitis, Vaccine

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INTRODUCTION

The TM is a condition that develops after spinal cord injury and is characterized by spinal cord inflammation. It alters motor, sensory, and autonomic functions. Demyelination and cell death that affects the gray and white matter are its defining characteristics. The pathology presents characteristic findings, such as lymphocytic infiltrates and monocytes associated with varying degrees of demyelination, axonal injury, and astroglial and microglial activation. An obstruction of ascending and descending neuroanatomical pathways

in the transverse plane of the spinal cord results in clinical symptoms. Since the disease first appears below the affected segment, the clinical presentation varies depending on the level of the spinal cord involved [1, 2].

The etiology of TM is varied and divided into comprehensive and non-comprehensive causes. Compressive myelopathies result from trauma and extraspinal tumors, and non-compressive etiologies can be classified as delayed effects of radiation, ischemic, paraneoplastic, infectious or parainfectious, or systemic autoimmune diseases. Among the latter, it may be associated with systemic lupus erythematosus (SLE), Sjögren's syndrome (SS), sarcoidosis, Behçet's disease, other connective tissue diseases, and antiphospholipid syndrome (APS), either primary or secondary to Sjögren's syndrome. However, the etiology remains unknown in a substantial portion of cases classified as idiopathic. Thus, after analyzing the lesions generated by infections, radiation, connective tissue comorbidities, paraneoplastic alterations, infarction, and sarcoidosis, and the etiology remains unknown, an idiopathic disease should be considered [3, 4].

The symptoms can be bilateral, unilateral, or asymmetric and can change quickly—within a few hours or over days and weeks. Under the vertebral lesion, variations in the SM's functionality lead to a loss of motility and sensitivity. Thus, it manifests with the bilateral weakening of the LL and, less frequently, in the upper limbs [1].

Symptoms like back, leg, or abdomen pain are frequently experienced in any age group. In addition to sexual dysfunction, other clear autonomic signs of the pathology include urinary urgency, difficulty urinating, bowel incontinence, or constipation. The clinical picture can progress to spastic paralysis, with clinical signs of injury to the first upper motor neuron, such as the presence of Babinski's sign, hyperreflexia, and reduction or abolition of cutaneous-abdominal and cremaster muscle reflexes [1, 5].

Although acute transverse myelopathies can develop at any age, older studies on the age of onset have revealed a bimodal distribution with peaks between ages 10–20 and 30–40. According to age and sex groups, the incidence rate of transverse myelitis ranges from 1 to 4 per 100,000 person-years [4, 6].

The diagnosis is based on inclusion and exclusion criteria. It becomes necessary to exclude a compressive cord injury. Imaging tests, such as magnetic resonance imaging (MRI), indicate a hyper signal on the T2 sequence in the central region, especially in the thoracic segments. Cerebrospinal fluid (CSF) is a marker for TM and shows pleocytosis and/or a high IgG index [1, 4].

The TM prognosis ranges from total recovery without damage to total paraplegia or, in most cases, death from respiratory failure or an upper cervical lesion. Complete remission or irreversible sequelae are the two possible outcomes. In pediatric patients, the disease has a much more favorable prognosis compared to adults. 33–50% of

affected children have a complete recovery, while a poor outcome occurs in 10–20% of cases [1, 4, 7].

Treatment is conducted according to each patient's clinical condition, comorbidities, and needs. Corticosteroids reduce the inflammatory process and minimize the sequelae generated by transverse myelitis.

Numerous cases were found in the literature about the correlation between TM and vaccination, both in case reports and in systematic reviews. In some works, questions are observed regarding the genetic susceptibility of the cases [8–11].

CASE REPORT

We report the case of a 50-year-old man, an engineer by profession, who reported that in the second dose of immunization against SARS-CoV-2 (inactivated vaccine), which was the necessary dose for immunization recommended by the Brazilian Ministry of Health, he started to have a tingling sensation (dysesthesia) in the lower limbs a few days after vaccination, without major immunization-related complaints. Four months later, between the second and third doses (a booster dose indicated by the Brazilian Ministry of Health), a new clinical picture of paresis appeared, associated with tactile, thermal and painful hypoesthesia. Physical Examination: muscle atrophy and paresis (grade 2) in the main myotomes of the lower limbs. Hypoesthesia was more evident in dermatomes L5-S1. Unable to maintain orthostatism. Flabby intestine and bladder. Brain magnetic resonance imaging (MRI): normal. Magnetic resonance imaging of the thoracic spine: extension of the signal alteration with a little expansive aspect in the lower portion of the thoracic spinal cord in the convalescence phase (Figure 1). Magnetic resonance imaging of the cervical and lumbar spine: normal. Liquor: Non-reactive anti-aquaporin antibody; Non-reactive anti-MOG



Figure 1: MRI of the thoracic and lumbar spine showed an extensive signal alteration with a little expansive aspect in the lower portion of the dorsal medulla and medullary cone, without contrast enhancement, suggesting an inflammatory alteration in the convalescent phase.

antibodies. Proteins: 80 mg/mL. Negative infectious and tumor panel. Normal electroneuromyography. Normal renal and urinary tract ultrasonography. The patient denied allergies and denied having been affected by COVID-19. Diagnosis: MT due to probable post-vaccination immune-mediated dysfunction. Permanent disability.

DISCUSSION

The TM is a clinical syndrome characterized by sensory, motor, and autonomic dysfunctions caused by an immune-mediated spinal cord lesion. Generally, the leading causes of TM are infections and autoimmune diseases (mainly multiple sclerosis and neuromyelitis optica). However, after the recent COVID-19 pandemic and the widespread vaccination that was carried out to control this pathology, some cases of TM associated with COVID-19 infections and complications of COVID-19 vaccines have been described in the literature [12, 13].

The relationship between the COVID-19 vaccine and TM can be explained by the presence of adjuvants in the composition of vaccines that cause autoimmunity and lead to spinal cord inflammation [13]. This autoimmunity happens due to a molecular mimicry between the infectious antigens (vaccine adjuvants) and the autoantigens, which activate the lymphocytes and induce the immune response [12].

The diagnosis of TM is based on exclusion and inclusion criteria, such as excluding a compressive cord lesion by magnetic resonance imaging (MRI) and confirming the diagnosis by MRI and analysis of cerebrospinal fluid (liquor or CSF). Furthermore, the best markers for TM are an inflammatory CSF (with pleocytosis or an elevated IgG index) or a spinal MRI that demonstrates an active breakdown of the blood-brain barrier (with a lesion that increases gadolinium and with a hyper signal on the T2 sequence in the central region mainly in the thoracic segments) [13].

According to the case, the patient was diagnosed with TM due to a probable post-vaccine immune-mediated dysfunction. Transverse myelitis appeared in the patient after the second immunization dose against COVID-19 and manifested through dysesthesia in the lower limbs. Furthermore, after four months, between the second and third doses of the vaccine, he presented a new clinical picture of paresis associated with tactile, thermal, and painful hypoesthesia. That is, the onset of symptoms was temporally associated with the vaccine for COVID-19, which corroborated the diagnosis of TM due to probable post-vaccine immune-mediated dysfunction [14, 15].

According to the tests carried out on the patient, hyperproteinorrachia (80 mg/mL) was found, which indicates an inflammatory condition and an absence of anti-aquaporin and anti-mog antibodies in the CSF, which rules out demyelinating conditions (such as neuromyelitis optica and multiple sclerosis) [13, 16].

Another important exam finding was the MRI of the thoracic spine, which showed a signal change in the spinal cord's lower portion, a diagnostic inclusion factor for TM. In this way, the symptoms and exams evidence the diagnosis of post-vaccination transverse myelitis once all other potential causes have been excluded [7, 17].

CONCLUSION

Due to the significant impact of COVID-19 on health, especially concerning neurological consequences, disorders associated with the vaccine should always be considered when approaching patients after vaccination. In this way, safety concerns must be maintained vaccine benefits that arise after vaccination must be immediately evaluated. In addition, it is worth mentioning that the vaccine's benefits continue to outweigh the risks since mass vaccination has been the main policy to overcome the COVID-19 pandemic.

Regarding post-vaccination TM, as it has a difficult diagnosis (which consists of excluding other causes) and a variable prognosis (from total recovery without damage to complete paraplegia, respiratory failure, or upper cervical injury), establishing its early diagnosis is essential so that the treatment is immediate and confers the best prognosis according to the patient's clinical condition, to prevent any delay from causing sequelae to patients.

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Daniel Antunes Pereira – Conception of the work, Design of the work, Analysis of data, Interpretation of data, Drafting the work, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Luiza Eyer Leme – Conception of the work, Interpretation of data, Drafting the work, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

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Conflict of Interest

Authors declare no conflict of interest.

Data Availability

All relevant data are within the paper and its Supporting Information files.

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