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CASE REPORT Open Access

Transverse myelitis with positive dengue virus serology: a case report

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Abstract

Background: Transverse myelitis is an inflammation of the spinal cord that spreads along the horizontal plane of a section of the spinal cord. Arboviruses, including dengue virus, are rare but known causative factors. However, this association and underlying pathophysiology is unclear. We report a case of transverse myelitis in a patient with a dengue viral infection.

Case presentation: A 38-year-old man presented with fever followed by acute paraplegia and urinary retention. His workup was positive for serum IgM antibodies against dengue virus and imaging of the spine showed inflammation in multiple sections of the spinal cord. A diagnosis of TM secondary to a dengue infection was made. He was managed with high dose of methylprednisolone for 5 days followed by oral tapering dose. The weakness subsequently improved with full recovery on follow-up visits.

Conclusions: TM secondary to acute dengue infection is a rarely reported consequence. Timely diagnosis and treatment can cause significant reduction in the otherwise resultant morbidity.

Keywords: Transverse myelitis, TM, Dengue fever, Dengue hemorrhagic fever, Methylprednisolone, Arboviruses

Background

Dengue fever is one of the most common mosquito-borne viral diseases affecting 50–100 million persons annually worldwide [1]. It is also endemic in Pakistan with a wide spectrum of clinical presentations [2]. Although neurologic manifestations in dengue fever are reported in the literature, more studies are warranted considering a rise in the cases reported with involvement of the central and peripheral nervous system. Transverse myelitis (TM) has also been reported in association with the dengue virus, albeit rarely [3, 4]. We are reporting a case of a young man who presented with dengue fever followed by paraplegia and bladder dysfunction. Detection of serum antibodies against dengue virus and positive findings on spinal imaging led to the diagnosis of TM secondary to dengue virus.

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Case presentation

A 38-year-old man presented to the emergency department with complaints of high-grade fever for four days followed by bilateral lower limb weakness and urinary retention for 1 day. Fever was intermittent, associated with chills, rigors, and body aches, and temporarily relieved with antipyretics. He denied abdominal pain, burning micturition, sore throat, cough, ear discharge, skin rash, backache, or trauma. His past medical was unremarkable. On examination, he had a blood pressure of 118/70 mmHg, a heart rate of 102 per minute, and a temperature of 99.8F (37.7°C). There was no skin rash. Neurological examination revealed normal higher mental state and cranial nerve examination. Motor examination of the upper extremities was unremarkable while the bilateral lower extremities had decreased muscle tone with a Medical Research Council (MRC) grading of 0/5 in all muscle groups. Bilateral knee and ankle reflexes were exaggerated, and plantar responses were equivocal. An ill-sustained ankle clonus was elicited bilaterally. A sensory level was noted at the T4 segment.

Our lesion localization was at the upper thoracic cord with TM being our top differential. Other possible differentials included spinal cord infarction, compressive myelopathy, and demyelinating conditions, such as multiple sclerosis or neuromyelitis optica.

Baseline laboratory workup including platelet count was normal except for a mildly elevated total leukocyte count of 13.1×10^9/L. Magnetic Resonance Imaging (MRI) of the brain and whole spine with contrast studies (1.5-T Avanto; Siemens, Munich, Germany) was done on day 1. The findings were suggestive of an inflammatory process involving multiple segments of the spinal cord (see Figs. 1, 2). Cerebrospinal fluid (CSF) showed an opening pressure of 35 cm H2O and a white cell count of 104/μL with lymphocytic pleocytosis of 95%, CSF proteins were mildly elevated at 45 mg/dl (normal: 15–40 mg/dl), and CSF glucose was 86 mg/dl with serum blood glucose at 121 mg/dl. A Biofire® Film Array Meningitis Encephalitis (FAME) panel was negative. Further workup was negative for malarial parasite, human immunodeficiency virus, syphilis, and viral hepatitis. Serological autoimmune workup was also negative. Serum IgM

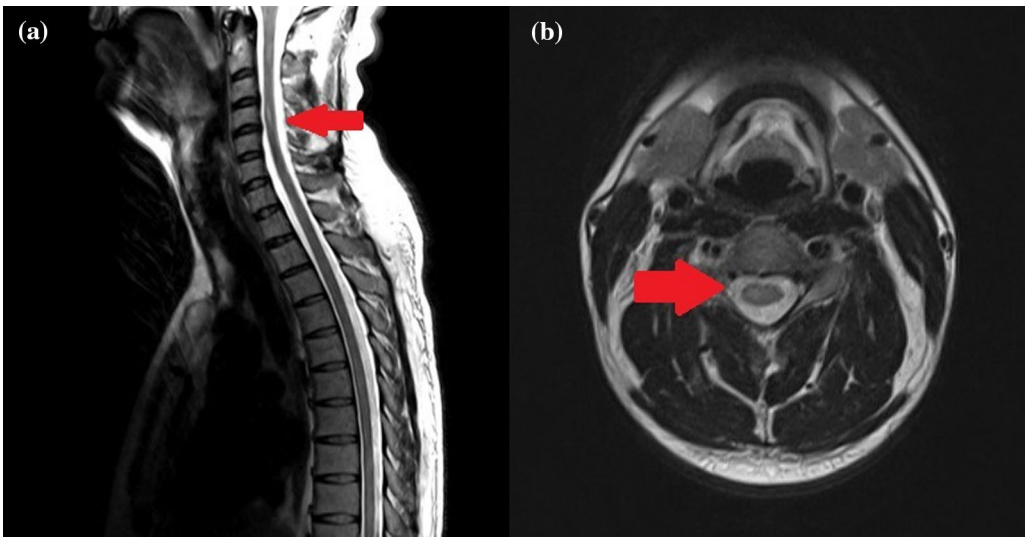

Fig. 1 **a** Multifocal T2 hyperintense signals involving the spinal cord. There are multiple skip segments without continuous involvement. The red arrows indicate T2 hyperintense signals in the spinal cord at C4 level in both sagittal (**a**) and axial planes **(b)**

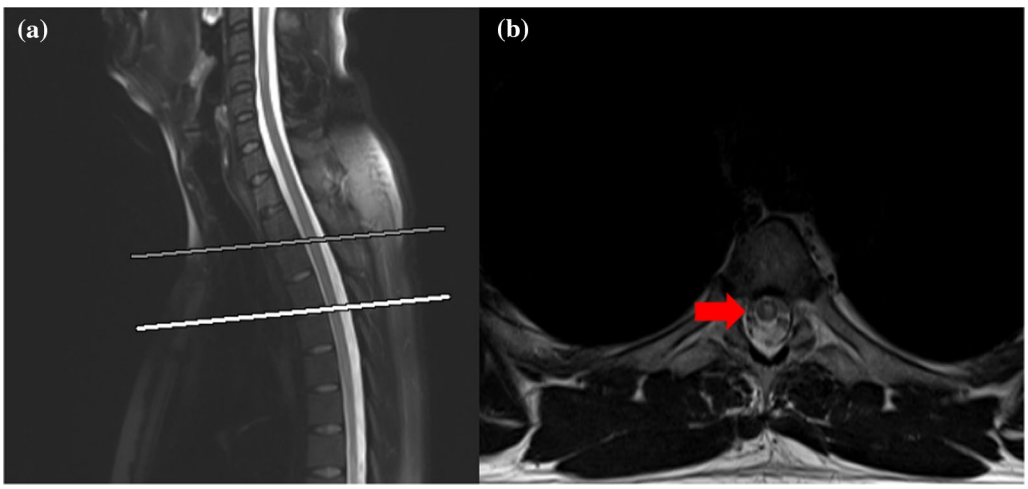

Fig. 2 **a** Multifocal T2 hyperintense signals involving the cervical and dorsal cord. There are multiple skip segments without continuous involvement. The red arrow indicates T2 hyperintense signals in the spinal cord at T4/5 level in axial plane (**b**)

antibodies against dengue virus were detected. CSF polymerase chain reaction (PCR) testing, however, was negative for dengue virus as well as the West-Nile virus.

Patient was diagnosed with dengue virus-associated TM and managed with high-dose intravenous methylprednisolone therapy 1000 mg daily for 5 days, followed by oral steroid tapering dose, along with physiotherapy. He remained afebrile during the hospital stay and muscle strength of the lower limbs improved from an MRC grade of 0/5 to 3/5 bilaterally by the day of discharge (day 5). On his follow-up visit to the clinic 2 weeks later, there was a full recovery in muscle strength. He was able to ambulate independently and had regained bladder control.

Dengue fever is caused by an arbovirus of the *Flaviviridae* family. It is a vector-borne infection transmitted by *Aedes aegypti* mosquitoes [1]. It is caused by four distinct dengue virus serotypes (DENV 1–4). Circulation of these different serotypes has been reported in various parts of Pakistan [2]. There is a noticeable seasonal surge of cases during monsoons. The World Health Organization (WHO) estimated more than 47,000 confirmed cases of dengue virus in Pakistan, including 75 deaths, in four months from July to November 2019 [5].

Dengue viral fever commonly presents with fever, thrombocytopenia, headache, myalgia, arthralgia, bleeding, and skin rash. Various neurological complications, involving central and peripheral nervous systems, have been reported in the literature [3, 4], similar to the other arboviruses [6, 7]. A systematic review studied 2672 dengue cases and noticed neurological complications in 10.8% of them (289/2672). TM was seen in 2.3% of dengue cases (61/2672) [8].

There is a paucity of studies evaluating the pathogenesis of TM due to the dengue virus. Since in the most cases, CSF IgM antibodies against dengue virus are present, the postulated mechanisms reported are either direct viral invasion of the spinal cord or by active viral replication within the spinal cord [3, 4]. In our patient, CSF PCR for dengue virus was negative, but we could not check for the CSF IgM antibodies. Dengue virus may have cleared when we tested the CSF or there is a possibility of a systemic autoimmune reaction to dengue virus resulting in TM that rapidly responded to steroids. Further studies are needed to evaluate this pathophysiology. In addition, the presence of CSF IgM antibodies against the dengue virus suggests that patients with TM may have a CSF–blood barrier dysfunction. Detection of CSF dengue IgM has shown high specificity (97%), but limited sensitivity (46–73%), for neurological conditions [9].

A spinal MRI is crucial in reaching the diagnosis of TM. Typically, hyperintense T2-weighted signals found in spinal MRI scans support the diagnosis of TM [3, 4]. The detection of dengue virus nucleic acid in the CSF is a marker for the central nervous system (CNS) acute-phase infection caused by this virus. Importantly, the time that the virus can be detected in serum and CSF is brief, but the test is of high yield during the viremia period. Therefore, molecular testing should be performed within the first week following the onset of symptoms [9]. After this time, serologic testing is the preferred method for the diagnosis of dengue infection. In addition, it is advisable to exclude other CNS viral infections.

A Brazilian study reported a method for rapidly diagnosing CNS involvement by dengue virus with detection of the non-structural 1 antigen (NS1 Ag) by ELISA in the CSF. It was found in the CSF samples of 13 out of 26 dengue-positive patients exhibiting a sensitivity of 50% and specificity of 100%. The combined use of CSF NS1 Ag and dengue IgM antibodies increased the sensitivity of CNS dengue infection to 92% [10].

There is no specific antiviral therapy for dengue fever. Treatment is mainly supportive and depends on the clinical presentation and severity of illness. Steroids (high-dose intravenous methylprednisolone and oral prednisolone) have been advocated as therapy to treat dengue immune-mediated neurological complications including TM. According to a retrospective study, 26 of 61 cases with neurologic complications of dengue fever were diagnosed with TM. The patients with severe sensorimotor symptoms and sphincter dysfunction showed excellent responses to intravenous corticosteroids [11].

Conclusion

Dengue fever is endemic in many countries of the world, including Pakistan. As neurological complications during dengue fever are uncommon, they are mainly identified during dengue fever outbreaks. The prognosis of TM secondary to dengue fever is excellent when diagnosed early and treated appropriately. Hence, the physicians must be made aware of these neurological manifestations for better patient outcomes.

Abbreviations

CNS: Central nervous system; CSF: Cerebrospinal fluid; DENV: Dengue virus; ED: Emergency department; ELISA: Enzyme-linked immunosorbent assay; GBS: Guillain Barre syndrome; IgM: Immunoglobulin M; MRC: Medical Research Council; MRI: Magnetic resonance imaging; NS1Ag: Non-structural protein 1 antigen; PCR: Polymerase chain reaction; TM: Transverse myelitis; WHO: World Health Organization.

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Author contributions

LJ, ES and NS analyzed and interpreted the patient's clinical presentation. LJ, SH and ES wrote the manuscript. LJ, SH and DK contributed significantly to analysis and manuscript preparation; LJ and NS contributed to the conception of the study. All authors have read and approved the manuscript.

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Availability of data and materials
The data used to support the findings of this study are present in this article.

Declarations

Ethics approval and consent to participate
The study was given exemption of ethical clearance due to anonymous data utilization and lack of any identifiers.

Consent for publication
Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

Competing interests
The authors declare that they have no competing interests.

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