Journal of NeuroVirology (2021) 27:787–790
https://doi.org/10.1007/s13365-021-01006-7

CASE REPORT

Extensive longitudinal myelitis due to cytomegalovirus infection

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Received: 12 April 2021 / Revised: 15 July 2021 / Accepted: 3 August 2021 / Published online: 27 August 2021

Abstract
Neurological cytomegalovirus (CMV) infections especially extensive longitudinal myelitis are extremely rare in immunocompetent adults. However, we hereby report a case of cervical, thoracic, and lumbosacral myelitis caused by CMV infection in a healthy adult patient. The patient was treated properly and had a good outcome. The etiopathogenesis and the prognostic factors for this affection are not well established and are still being debated by authors. Further clinical data would contribute to a better understanding of this pathology in order to provide a better prognosis.

Keywords Cytomegalovirus · Myelitis · Immunocompetent · Infections

Introduction

Cytomegalovirus (CMV) is a common benign virus that usually causes asymptomatic infections in healthy adults. However, it can be responsible for opportunistic infections occurring typically in immunocompromised patients. Despite its apparent harmfulness, its neurological complications can be fatal and can cause encephalitis, meningitis, and myelitis (Hooi et al. 2018). We hereby report a case of myelitis due to CMV encountered in an immunocompetent host.

Case report

A previously healthy 20-year-old Tunisian male, with no family history, developed a sudden-onset of a progressive bilateral lower limb weakness, numbness with a persistent fever. The symptoms had started 5 days before admission. The next day, motor dysfunction extended to the upper limbs and the patient was catheterized for acute urine retention. The neurological examinations showed a flaccid tetraplegia (0/5 strength in the lower and upper extremity) with a bilateral Babinski sign and all reflexes were abolished. He had anesthesia below the level of the T6 dermatome and acute urinary retention. His cranial nerves were intact. A systemic examination showed fever (40 °C), blood pressure at 112/70 mmHg, and oxygen saturation at 97%. The rest of the examination was unremarkable.

Urgent MRI revealed no abnormalities in the brain, but we identified a diffuse high T2 signal throughout the cervical, thoracic, and lumbosacral cord (Figs. 1 and 2) with intensive contrast enhancement, which suggested a pseudotumoral aspect.

On admission, the first cerebrospinal fluid (CSF) analysis showed 10 WBCs/µL (80% lymphocytes), 1200 RBCs/µL, protein at 0.21 g/L, and glucose at 3.2 mmol/L. This analysis was carried out on day ten after the onset of weakness and revealed 30 WBCs/µL (90% lymphocytes), 10 RBCs/µL, protein at 0.46 g/L, and glucose at 3.4 mmol/L.

The biological features showed a normal white blood cells count (7400/mm^3) with lymphopenia (900/mm^3), a normochromic normocytic anemia with positive direct antiglobulin test and elevated LDH indicative of autoimmune hemolytic anemia, elevated liver enzymes (ALAT = 64 U/L, ASAT = 60 U/L, GGT = 225U/L), and hyperferritinemia (798 µg/L). The serologic testing for HIV, syphilis, and Lyme was negative, whereas serology for EBV showed only IgG reactivity. Antinuclear antibody and autoantibodies of neuromyelitis optica spectrum disorder were absent. A CMV serology was performed and it showed positive IgM and reactive IgG, indicating a recent seroconversion. A molecular research for the CMV genome by polymerase chain reaction (PCR) was conducted on the blood and CSF. It showed

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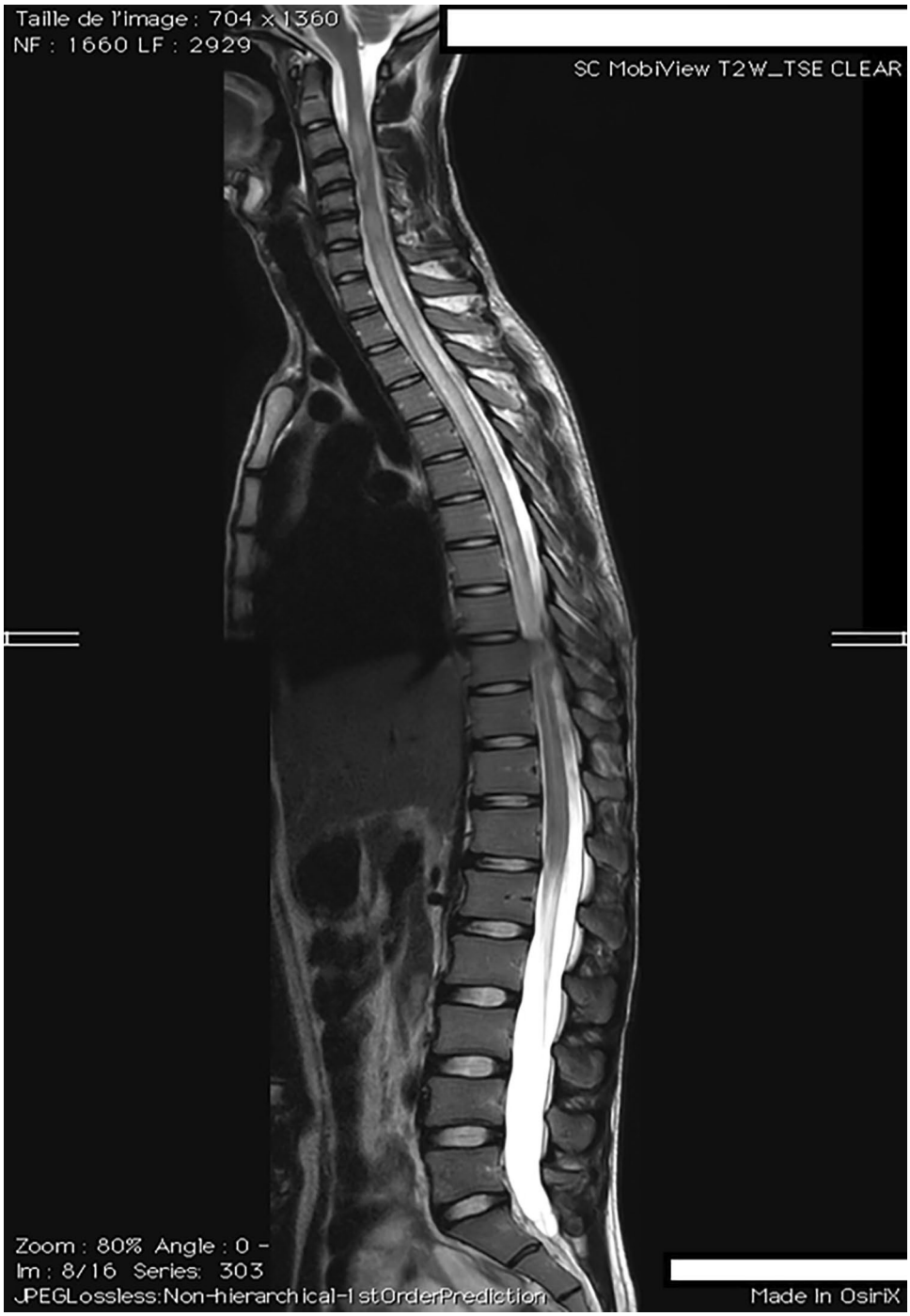

Fig. 1 MRI showing high-signal intensity on T2 sequence in the sagittal plane throughout the cervical, thoracic, and lumbosacral cord

the presence of the virus genome in the blood (8100 ui/mL) and its absence in CSF. PCR was negative for EBV, VZV, and HSV in the blood and CSF. The rest of the biological exams was normal as well as blood serology (VIH, HCV, HBV, Lyme, EBV, syphilis, and mycoplasma).

A few days later, we isolated a reactive arthritis in our patient's left knee. An ophthalmological examination and a transthoracic echocardiography were conducted and no signs of CMV retinitis or of pericarditis were revealed.

The diagnosis of extensive longitudinal myelitis due to cytomegalovirus infection was confirmed. The patient was started on intravenous (IV) ganciclovir for 21 days and 5 days of IV methylprednisone pulse therapy (1 g/day).

CMV blood PCR carried out 5 weeks from the ganciclovir treatment was negative. The patient was transferred to a long-term rehabilitation facility. He made a progressive subtotal recovery. In the 6-month follow-up, he presented with a spastic gait, strength in the upper extremities was

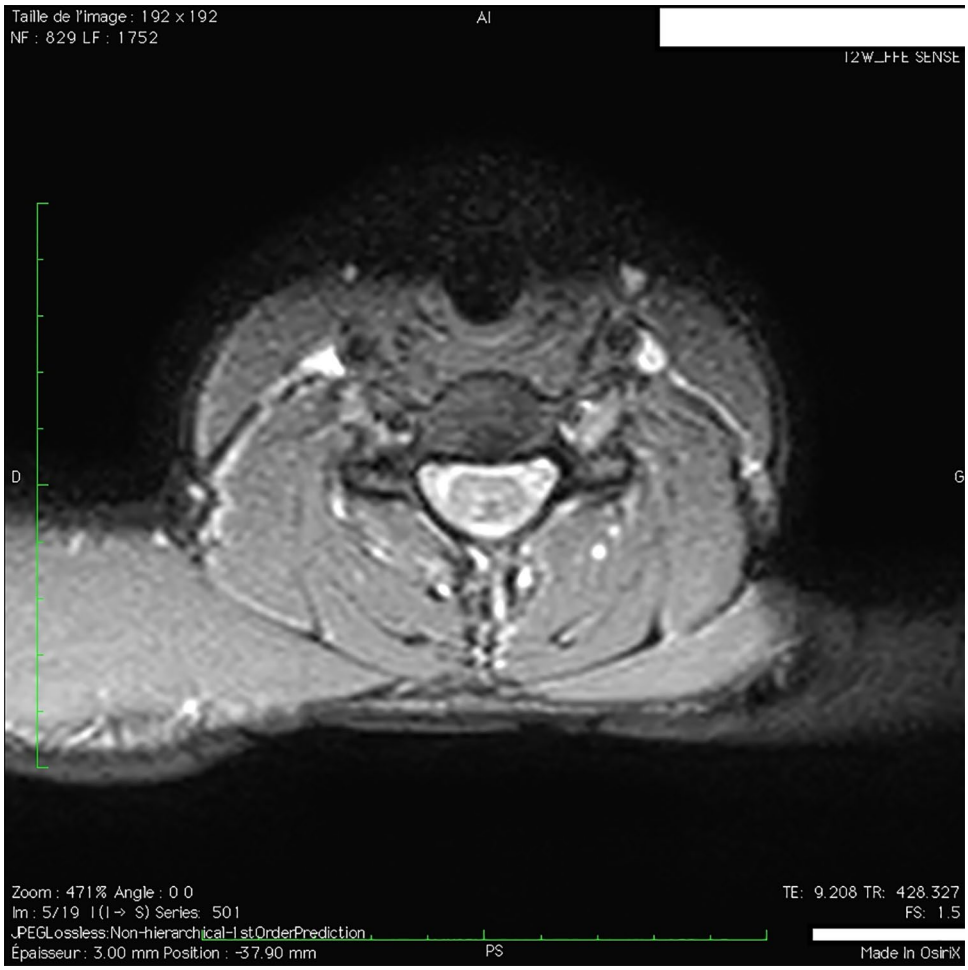

Fig. 2 A high-T2 signal on an axial MRI sequence

5/5 and approximately 3/5 in the lower extremities, and all reflexes were exaggerated with bilateral ankle clonus and without sensory deficits. An MRI repeated 6 months later showed a partial resolution of the cord signal abnormalities.

Discussion

We hereby report a rare case of an extensive longitudinal myelitis due to primary CMV infection in an immunocompetent host. CMV is rarely described as responsible for central neurologic affections and especially as a cause of myelitis. Inspecting the literature between 1973 and 2020, we found only 17 reported cases of this infection (Hooi et al. 2018; Budhram et al. 2019; Merchan-del Hierro and Halalau 2017; Chin et al. 1973; Rigamonti et al. 2005; Ben Abdelhafidh et al. 2006). In 5 of these cases, similar microbiological and immunological profiles to our case were described (Hooi et al. 2018; Budhram et al. 2019; Rigamonti et al. 2005; Ben Abdelhafidh et al. 2006). The pathogenesis was debated by the authors. Two main hypotheses were put forward. The first one postulated that the damage could be the consequence of a humoral and cellular immunologic cytotoxic response. It was due to the recognition of the virus antigens explained by the resemblance between the structure of the major capsid protein of human CMV and a central nervous system's epitope which is found in both myelin and the oligodendrocyte protein MOG34-56 (Budhram et al. 2019; Merchan-del Hierro and Halalau 2017; Brok et al. 2007). The second one is rarer and stated that the damage could have resulted from a direct viral invasion, according to CMV DNA positivity in CSF (Karunarathne et al. 2012). The combination of these mechanisms with a two-stage attack was also suggested (Daida et al. 2016). In our case, based on the absence of the viral genome in CSF and the ascent of CSF protein level, an immune-mediated invasion seems to be the likely hypothesis. However, a direct viral invasion remains plausible and that depends on PCR sensitivity. Furthermore, other studies suggested a virus-induced vasculitis particularly in immunecompromised patient (Koeppen et al. 1981).

There are various spinal MRI findings. In general, transverse myelitis involves the cervical and/or the thoracic column of the spinal cord. However, in some cases, the MRI does not show any abnormalities (Ben Abdelhafidh et al.

2006). To our knowledge, extensive longitudinal myelitis including cervical, thoracic, and lumbosacral cord, involved in our patient, has never been reported.

The prognosis of CMV myelitis is characterized by a poor outcome and prognostic factors remain unknown (Budhram et al. 2019). Despite the severity (clinical and radiological presentation) of our case, the patient recovered well. This could be probably explained by his young age, his immunological state, and the rapid initiation of an adequate treatment.

Conclusion

This case suggests that primary CMV infection can induce an extensive longitudinal myelitis. The uncertainty about the damage of neural cell represents the originality of published studies. Further clinical data would contribute to a better understanding of this pathology in order to provide a better prognosis.

Declarations

Conflict of interest The authors declare no competing interests.

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