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LETTER TO THE EDITORS

Spontaneous spinal cord ischemia during COVID-19 infection

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A 52-year-old woman without known relevant medical history, came to the emergency department for a sudden onset of severe four limbs weakness.

At admission, the patient appeared alert, afebrile, agitated and in discomfort for thoracic pain. Vital parameters were normal. Thoracic, abdominal and vascular examinations were unremarkable. Electrocardiogram and urgent laboratory tests, including leukocyte count (5780/μL), C-reactive protein (0.12 mg/L) and troponin I, were normal. Routine COVID-19 nasopharyngeal swab test, performed as per protocol, was positive.

Neurological examination demonstrated severe upper limb hyposthenia, paraplegia, and loss of tactile and pinprick sensation from C6 below, with preserved proprioception. Deep tendon reflexes were absent in lower limbs and cutaneous plantar response was indifferent bilaterally. Cranial nerves were preserved and there was no evidence of neck stiffness. Urine retention required catheterization. American Spinal Injury Association (ASIA) Impairment Score (AIS) was C [1].

Electrocardiogram monitoring was negative for arrythmias. Thoraco-abdominal computer tomography (CT) scan with contrast material showed normal aorta. Whole spine magnetic resonance imaging (MRI) scan revealed a weak T2-weighted anterior spinal cord hyper-intensity, extending from C6 to T1 level, without contrast enhancement.

Following spinal MRI, acute ischemic anterior myelopathy was suspected. Nevertheless, since the time interval between symptoms onset and MRI was almost ten hours, intravenous (i.v.) thrombolysis was not performed due to the overrun of time window [2]. Acetyl salicylic acid and i.v. methylprednisolone were initiated, the latter due to initial concern of a possible autoimmune etiology.

Coagulation panel showed mild elevation of D-dimer (582 ng/ml [reference values 0–500]), and reduced fibrinogen levels (161 mg/dL [reference values 180–380]). Factor II and V, C/S protein and anti-phospholipid antibodies were normal. Antinuclear, anti-extractable nuclear antigen, anti-neutrophil cytoplasmic and anti-double-strand-DNA antibodies, lupus anti-coagulant and cryoglobulin were negative. Complement fractions C3 and C4 were normal.

CSF examination showed normal levels of protein, glucose, lactate and cells, with type I oligoclonal bands. Screening for Lyme disease and tick-borne encephalitis was negative.

Somatosensory-evoked potentials showed no delay of central conduction latency. Motor-evoked potentials demonstrated slowing of central conduction time at upper limbs, while no motor response was obtained for lower limbs.

A diagnosis of spontaneous ischemic myelopathy was made after exclusion of alternative diagnoses.

On day 6, the patient developed fever (40 °C), oxygen desaturation, pleural effusion and bilateral lower lobes interstitial pneumonia. Dexamethasone and oxygen support were initiated. By day 12, fever had resolved and on day 21, oxygen therapy was weaned successfully.

On day 43, the patient was transferred to Neurorehabilitation Unit, able to move upper limbs against little resistance and lower limbs on a flat surface, while bilateral brisk patellar reflexes (+++) and Babinski sign became evident. Follow-up spinal MRI scan is shown in Fig. 1.

At three months of follow-up, gait was possible only with the aid of a walker, mild somatosensory alterations were still evident, but starting at a lower level (T3) and AIS score was D.

Spinal cord ischemia is a rare entity, accounting for only 1% of ischemic strokes [3, 4]. Common etiologies are aortic disease (usually procedure-related), mechanical compression of radicular arteries, dissection, atherosclerosis, embolism, vasculitis, or hypercoagulable states. Vascular risk factors and preceding physical maneuvers (i.e., Valsalva, load

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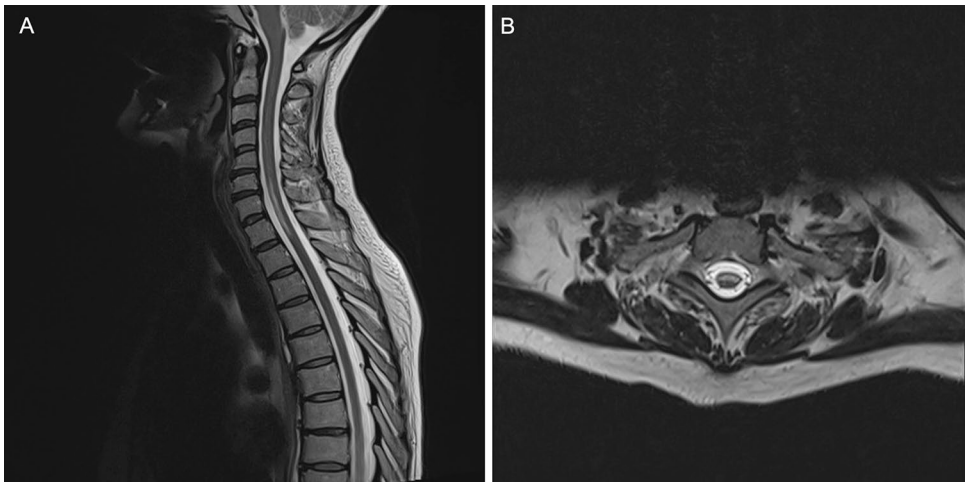

Fig. 1 Cervical and thoracic spinal cord MRI of Covid-19 related ischemic myelopathy, obtained 37 days after onset of symptoms. T2-weighted sagittal section showing anterior spinal cord hyper-intensity extending from C6 to T1 (**a**). T2-weighted axial section at the T1 level showing anterior spinal cord hyper-intensity (**b**). No evidence of osteoarthritis

lifting, back hyperextension) are frequent among patients [3–5].

As often is the case [3–5], no cause for spontaneous spinal cord ischemia was found in this patient. Moreover, the MRI alteration exceeded localization that is usually reported for such lesions [3, 5–7]. This element, along with the absence of a reported physical maneuver preceding the onset of symptoms, makes compression of radicular arteries unlikely as pathogenetic mechanism. On the other hand, the young age and the complete absence of risk factors for vascular disease point to an unusual pathogenetic mechanism.

Although a causal relationship cannot be proved, the temporal relation of the patient's motor symptoms with the infection suggests that COVID-19, a possible trigger of neurovascular injury [8, 9], may have played a role in causing the spinal cord ischemia. This case illustrates how vascular neurological complications may precede infection symptoms, in contrast with what has been reported for ischemic strokes that seem to present as a late complication of the infection, usually after two weeks from onset [10]. However, large vessels strokes have also been reported as the first disease manifestation in young individuals [11], supporting the role of a precocious inflammatory and hypercoagulable state as a disease driver in this setting.

We are aware of only one other report of spontaneous, possibly ischemic, myelopathy in a COVID-19 patient without concomitant vascular risk factors [12]. However, in this case, no CSF examination was performed, thus alternative diagnoses were not excluded.

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Declarations

Conflict of interest The authors report no disclosure relevant to the manuscript.

References

1. Kirshblum S, Snider B, Rupp R, Read MS (2020) Updates of the international standards for neurologic classification of spinal cord injury. Phys Med Rehabil Clin N Am 31(3):319–330. https://doi.org/10.1016/j.pmr.2020.03.005
2. Nardone R, Pikija S, Mutzenbach JS et al (2016) Current and emerging treatment options for spinal cord ischemia. Drug Discov Today 21(10):1632–1641. https://doi.org/10.1016/j.drudis.2016.06.015
3. Novy J, Carruzzo A, Maeder P, Bogousslavsky J (2006) Spinal cord ischemia. Arch Neurol 63(8):1113
4. Zalewski NL (2021) Vascular myelopathies. CONTINUUM Lifelong Learn Neurol 27(1):30–61. https://doi.org/10.1212/con.0000000000000905
5. Zalewski NL, Rabinstein AA, Krecke KN et al (2019) Characteristics of spontaneous spinal cord infarction and proposed diagnostic criteria. JAMA Neurol 76(1):56. https://doi.org/10.1001/jamaneurol.2018.2734
6. Robertson CE, Brown RD, Wijdicks EFM, Rabinstein AA (2011) Recovery after spinal cord infarcts: long-term outcome in 115 patients. Neurology 78(2):114–121. https://doi.org/10.1212/wnl.0b013e31823efc93
7. Masson C (2004) Spinal cord infarction: clinical and magnetic resonance imaging findings and short term outcome. J Neurol Neurosurg Psychiatry 75(10):1431–1435
8. Vogrig A, Gigli GL, Bnà C, Morassi M (2021) Stroke in patients with COVID-19: clinical and neuroimaging characteristics. Neurosci Lett 743:135564
9. Zubair AS, McAlpine LS, Gardin T, Farhadian S, Kuruvilla DE, Spudich S (2020) Neuropathogenesis and neurologic manifestations of the coronaviruses in the age of coronavirus disease 2019. JAMA Neurol. https://doi.org/10.1001/jamaneurol.2020.2065
10. Li Y, Wang M, Zhou Y et al (2020) Acute cerebrovascular disease following COVID-19: a single center, retrospective, observational study. SSRN Electron J. https://doi.org/10.2139/ssrn.3550025
11. Oxley TJ, Mocco J, Majidi S et al (2020) Large-vessel stroke as a presenting feature of Covid-19 in the young. N Engl J Med 382(20):e60. https://doi.org/10.1056/nejmc2009787
12. Khedr EM, Karim AA, Soliman RK (2020) Case report: acute spinal cord myelopathy in patients With COVID-19. Front Neurol. https://doi.org/10.3389/fneur.2020.610648