CLINICAL/SCIENTIFIC NOTES OPEN ACCESS

Acute disseminated encephalomyelitis after SARS-CoV-2 infection

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Acute disseminated encephalomyelitis (ADEM) is a rare autoimmune disease of the CNS that often after viral infections and mainly affecting children. ADEM is characterized by the onset of multifocal neurologic symptoms, encephalopathy, with brain MRI showing demyelinating abnormalities in the acute phase.[1] Coronavirus disease 2019 (COVID-19) is a novel entity caused by the pandemic severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), which is characterized by influenza-like symptoms, pneumonia, and in severe cases respiratory insufficiency.[2] Many neurologic complications occurring in patients with COVID-19 have been described,[3] and it has been hypothesized that, in some cases, SARS-CoV-2 might exhibit a neurotropic behavior.[4]

Results

We report on a 64-year-old woman with a history of vitiligo, hypertension, and monoclonal gammopathy of undetermined significance who developed an influenza-like syndrome in mid-March 2020 that lasted for 2 weeks. The patient also reported the development of smell and taste deficit that rapidly reached anosmia and ageusia. Starting from April 10, the patient developed bilateral vision impairment associated with sensory deficit on her right leg. She reached the emergency department of our hospital and was referred for ophthalmologic evaluation. Visual acuity was hand motion bilaterally, and relative afferent pupillary defect was detected. Ocular motility and fundus examination were unremarkable, whereas visual field test showed profound defects bilaterally. Neurologic examination, performed on hospitalization, showed mild behavioral abnormalities (irritability), headache, bilateral relative afferent pupillary defect, ageusia and anosmia, severe visual loss, right abdominal sensory level, and left-sided lower limb hyper-reflexia with the Babinski sign. The patient underwent a brain and spine MRI scan (figure), with evidence of multiple T1 post-Gd enhancing lesions of the brain, associated with a single spinal cord lesion at the T8 level and with bilateral optic nerve enhancement. A lumbar puncture was performed and showed lymphocytic pleocytosis with 22 cells/mm^3 (reference range: 0–5 cells/mm^3), mainly represented by $CD3^+CD4^+$ T-cells, with mild hyperproteinorrachia (452 mg/L, reference range: 150–450 mg/L), and identical immunoglobulin G oligoclonal bands were present in the CSF and serum (mirror pattern). PCR for SARS-CoV-2 tested negative on nasal swab and positive on CSF sample. The patient's serum tested positive for anti-SARS-CoV-2 immunoglobulin G and negative for antiaquaporin-4 (AQ4) antibody (ab) and antimyelin oligodendrocyte glycoprotein (MOG) ab; the levels of interleukins were not assessed in serum and CSF.

ADEM disease was suspected, and high-dose steroids (IV methylprednisolone 1 g/d for 5 days tapered with oral prednisone 75 mg/d) associated with IV immunoglobulins (2 g/kg in 5 days) were administered. The patient reported significant improvement in visual symptoms and progressive recovery of visual acuity. After 14 days of treatment, vision was 20/30 in the

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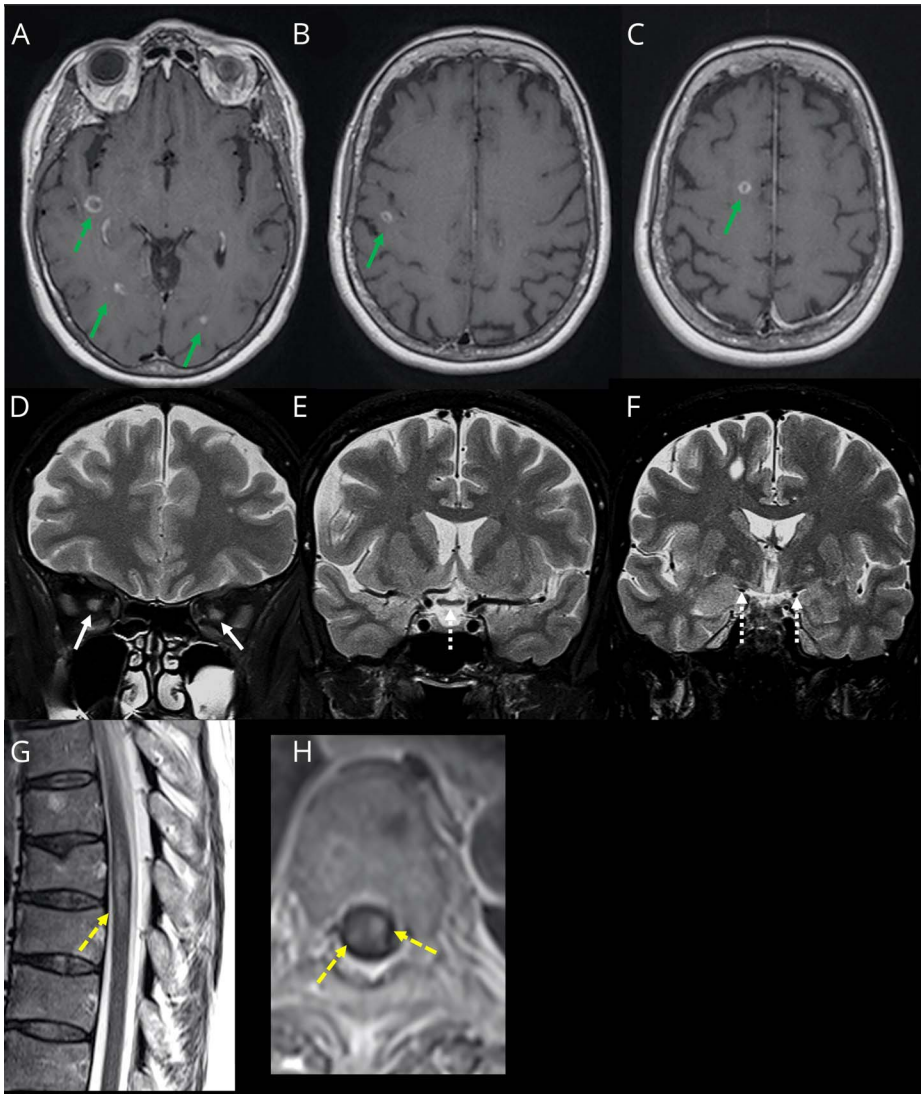
Figure Brain and spine MRI



(A–C) Postgadolinium (Gd) T1-weighted (T1w) sequence of the brain in the axial plane showing 6 enhancing lesions (green arrows), most of which with ring enhancement and some of which with nodular enhancement. Incomplete ring enhancement is shown about the right temporal lesion (dashed green arrow). (D–F) T2-weighted (T2w) fat saturated sequence in the coronal plane with evidence of (D) hyperintense signal of the optic nerves bilaterally (white arrows), which is best seen when compared with the normal signal within (E) the optic chiasm and (F) the optic tracts (dashed white arrows). (G) T2w sequence of the thoracic spine in the sagittal plane showing a hyperintense spindle-like T8 lesion, involving less than 2 metameric levels (dashed yellow arrow). (H) Post-Gd T1w sequence of the spine in the axial plane at the level of T8 showing eccentric areas of enhancement respectively located posteriorly to the right and anteriorly to the left (dashed yellow arrow).

right eye and 20/25 in the left eye. Visual-evoked potential showed increased latency in both eyes (p100 wave latency: 114 ms right eye, 120 ms left eye, reference: <100 ms). A follow-up brain MRI scan also showed a partial improvement with a reduction in the number of Gd-enhancing lesions. On April 27, the patient was discharged with oral prednisone tapering.

Discussion

We report a rare case of an immune-mediated CNS disease that occurs after SARS-CoV-2 infection. Phenotypically, the disease resembled an atypical form of neuromyelitis optica spectrum disorder; however, (1) the hyperacute dynamic of the disease, (2) the presence of multiple, synchronous, enhancing brain lesions, (3) the lack of anti-AQ4 or anti-MOG abs, (4) the absence of longitudinally extended transverse myelitis, and (5) the presence of a viral infection preceding the development of neurologic symptoms do not support this hypothesis, favoring ADEM diagnosis.

Since COVID-19 is currently a pandemic disease, neurologists should be aware that autoimmune neurologic complications involving the CNS might occur and should be promptly recognized and treated to reduce permanent neurologic disability.

Study funding

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Disclosure

G. Novi: received speaker honoraria from Merck, Novartis, and Roche. T. Rossi: reports no disclosures relevant to the manuscript. Enrico Pedemonte: received speaker honoraria or consultation fees from Biogen and Merck-Serono. L. Saitta: reports no disclosures relevant to the manuscript. C. Rolla: reports no

disclosures relevant to the manuscript. L. Roccatagliata: reports no disclosures relevant to the manuscript. M. Inglese: received honoraria or consultation fees from Roche, Biogen, Merck-Serono, Novartis, and Genzyme and research grants from NIH, NMSS, FISM, and Teva Neuroscience. D. Farinini: reports no disclosures relevant to the manuscript. Go to Neurology.org/NN for full disclosures.

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Appendix Author

Name	Location	Contribution
Giovanni Novi, MD	San Martino Hospital, Genova	Major role in the acquisition of data, interpreted the data, design and conceptualized study, analyzed the data, and drafted the manuscript
Tommaso Rossi, MD	San Martino Hospital, Genova	Major role in the acquisition of data
Enrico Pedemonte, MD	San Martino Hospital, Genova	Major role in the acquisition of data
Laura Saitta, MD	San Martino Hospital, Genova	Major role in the acquisition of data
Claudia Rolla, MD	San Martino Hospital, Genova	Major role in the acquisition of data
Luca Roccatagliata, MD, PhD	University of Genova, Genova, Italy	Analyzed the data and revised the manuscript for intellectual content
Matilde Inglese, MD, PhD	University of Genova, Genova, Italy	Interpreted the data, design and conceptualized study, analyzed the data, and revised the manuscript for intellectual content
Daniele Farinini, MD	San Martino Hospital, Genova	Revised the manuscript for intellectual content

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CORRECTION

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In the Clinical/Scientific Note "Acute disseminated encephalomyelitis after SARS-CoV-2 infection" by Novi et al.,[1] there is an error in the opening paragraph. The first sentence should read, "Acute disseminated encephalomyelitis (ADEM) is a rare autoimmune disease of the CNS, that often develops after viral infections and mainly affecting children." The publisher regrets the error.

Reference

1. Novi G, Rossi T, Pedemonte E, et al. Acute disseminated encephalomyelitis after SARS-CoV-2 infection. Neurol Neuroimmunol Neuroinflamm 2020;7:e797. doi:10.1212/NXI.0000000000000797.