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Original article

Neuromyelitis optica spectrum disorder after presumed coronavirus (COVID-19) infection: A case report



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ARTICLE INFO

Keywords:

NMOSD
Optic neuritis
Coronavirus
SARS-CoV-2

ABSTRACT

Neuromyelitis optica spectrum disorder is an inflammatory autoimmune condition, predominantly affecting the optic nerves and spinal cord. It has been stated that viral infections play a role in the development of neuromyelitis optica. Several murine coronaviruses can cause inflammatory demyelinating diseases, including optic neuritis. Here we report, to the best of our knowledge, the first human case linking a presumed SARS-CoV-2 infection to the development of NMOSD.

1. Introduction

Neuromyelitis optica spectrum disorder (NMOSD), also known as Devic's disease, is an inflammatory condition of the central nervous system (CNS) that frequently involves the optic nerves and the spinal cord. The core clinical symptoms of NMOSD involve acute optic neuritis, acute myelitis, area postrema syndrome and acute brainstem syndrome (Lana-Peixoto and Talim, 2019). NMOSD is regarded as an autoimmune disorder. The exact pathogenic mechanisms of NMOSD remain unknown. A growing body of evidence suggests that infectious agents, mostly viral illnesses, can play a triggering role in the development of NMOSD (Koga et al., 2011).

A novel coronavirus infection with a lot of global attention at the moment, is COVID-19, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Since the outbreak of COVID-19 in December 2019 in Wuhan, China, several cases have been described of autoimmune diseases being triggered by SARS-CoV-2 (Toscano et al., 2020). It is known that murine coronaviruses can cause inflammatory demyelinating diseases, including optic neuritis (Seah and Agrawal, 2020). Here we report a case of a young boy who developed anti MOG positive bilateral optic neuritis following a presumed infection with SARS-CoV-2. To our knowledge, this is the first case linking a presumed SARS-CoV-2 infection to NMOSD.

2. Case report

A previously healthy 15-year old Caucasian boy presented at our hospital with subacute visual loss over the course of seven days. At onset, he experienced blurred vision with photopsias and frontal

continuous headache. Since then, his visual loss deteriorated rapidly, until at presentation he was almost completely blind.

A few weeks before presentation he had been ill for a period of about 10 days with fever, nausea and a cough. This febrile illness started a few days after he had celebrated Dutch carnival, which later turned out to be one of the big initial spreading events of SARS-CoV-2 in The Netherlands. At that time, he was not tested for SARS-CoV-2 because he did not fit the Dutch case description. After he recovered, both his mother and later on his father became ill with high fever, cough and dyspnea. Both were diagnosed with pneumonia and tested positive for SARS-CoV-2.

At the moment of presentation, he looked pale and was somewhat bradypneic. His vital functions were normal. Ophthalmologic examination revealed papillary edema in both eyes and a vision of 1/300 (OD) and 1/70 (OS). General neurological examination was normal. The visual fields seemed intact using confrontation techniques.

His laboratory results showed no abnormalities. A lumbar puncture was performed. Cerebrospinal fluid analysis showed also no abnormalities, including no oligoclonal bands.

MRI scanning of the brain showed no intracranial pathology and sinus thrombosis was excluded. A MRI scan of the orbita revealed a bilateral edematous optic nerve lesion (right more than left), characteristic for bilateral optic neuritis (Fig. 1). The diagnosis of bilateral optic neuritis was made, probably as part of NMOSD. He was treated with intravenous methylprednisolone (1g/day for three days), leading to a significant improvement of symptoms. Two weeks after the treatment, his symptoms had (almost fully) resolved.

Additional testing for serum anti AQP4-IgG was negative. However, testing for anti MOG-IgG was positive.

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<https://doi.org/10.1016/j.msard.2020.102474>

Received 18 May 2020; Received in revised form 14 August 2020; Accepted 29 August 2020

Available online 01 September 2020

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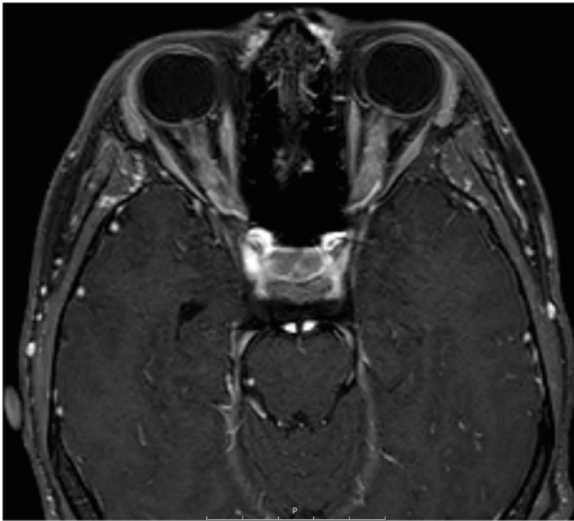


Fig. 1. Axial bilateral edematous optic nerve lesion with an enhancing signal on fat-suppressed T1-weighted images.

3. Discussion

Neuromyelitis optica spectrum disorder (NMOSD) is a rare inflammatory disease, mainly characterized by recurrent optic neuritis and transverse myelitis. Other clinical characteristics of NMOSD are area postrema syndrome, acute brainstem syndrome, symptomatic narcolepsy/acute diencephalic clinical syndrome, and symptomatic cerebral syndrome with NMOSD-typical brain lesions. The prevalence of NMOSD ranges from 0.5-10 per 100.000, mostly occurring at an age of around 35-45 years (Lana-Peixoto and Talim, 2019). Limited data exist on pediatric-onset optic neuritis. The incidence of optic neuritis in children is estimated around 1-5 per 100.000 per year (Jonzzon et al., 2020). To confirm the diagnosis, serum detection for antibodies against AQP4-IgG and MOG-IgG should be done.

Infection can play an important role in the pathophysiology of NMOSD. Evidence shows serological prove of acute viral infections in about half of the patients with anti-AQP4 antibody detected positive NMOSD. Viral infections play a role in increased permeability of the BBB, allowing antibodies to cross it. Also, viruses can activate the immune system through molecular mimicry, and promote autoimmune responses through bystander activation (Koga et al., 2011).

Several viruses have been suggested to be related to the

development of NMOSD, including Epstein-Barr virus (EBV), varicella-zoster virus (VZV), herpes simplex virus (HSV) and human cytomegalovirus (HCMV) (Koga et al., 2011).

SARS-CoV-2, currently causing a pandemic, is a novel virus and has been implicated in several autoimmune diseases including acute inflammatory demyelinating polyneuropathy (Guillain-Barré syndrome) (Toscano et al., 2020). It is well known that murine coronaviruses can affect the central nervous system. As a matter of fact, the murine coronavirus JHM is utilized to create an animal model for multiple sclerosis (MS), while another murine coronavirus is used for an animal model of a severe acute respiratory syndrome (Seah and Agrawal, 2020). Furthermore, the murine coronavirus MHV-A59 has been utilized for the creation of viral-induced optic neuritis models (Seah and Agrawal, 2020). Therefore, it seems very likely that there is a causal link in our patient between the presumed infection with SARS-CoV-2 and the subsequent development of anti-MOG positive bilateral optic neuritis.

Author statement

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Rob Gons: Writing – Review & Editing

Gerald Hengstman: Writing – Review & Editing, Supervision

Declaration of Competing Interest

The authors declare that there is no conflict of interest.

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