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Optic Neuritis in a Child: A Rare Association post COVID-19 infection

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Abstract

Optic neuritis is inflammation of the optic nerve leading to sudden onset of visual loss. The coronavirus disease 19 (COVID-19) pandemic has caused significant mortality and morbidity worldwide. COVID-19 affects multiple organ systems of the body, including the central and peripheral nervous systems. Reports of neuro-ophthalmological manifestation with COVID-19 are still scarce. We report a rare case of COVID-19-related bilateral optic neuritis in a 7-year-old girl.

Keywords: NIL

Introduction

Optic neuritis is inflammation of the optic nerve, it has varied etiology, including autoimmunity, infections, granulomatous disease, paraneoplastic disorders, and myelin depletion[1]. A wide range of bacterial, fungal, parasitic and viral agents can cause optic neuritis, with varied symptoms. The usual presentations are anterior neuritis(papillitis), with visible edema of optic nerve head and retrobulbar neuritis, where signs of inflammation are not apparent on the ocular fundus. The nervous system involvement by severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2) is by various mechanisms: directly, by neurotoxic action, when the virus reaches the nervous system by different routes and binds to angiotensin-converting enzyme 2 (ACE2) receptors, cytokine storm with blood-brain barrier disruption and immunological mediation, and by increased blood coagulation and blood clot formations.[2] Keeping in mind that the SARS-CoV-2 is increasing worldwide and that the knowledge related to such presentation is limited, it is important to report all the conditions that may be triggered by it. We would like to draw reader's attention to a rare case of post COVID-19 Optic neuritis.

Case Presentation

A 7-year-old developmentally normal and previously healthy girl was admitted to our institution with history of fever 25 days back lasting for 5-6 days. She remained well for 10 days. Now she complained of sudden onset of diminution of vision in both eyes (right more than left) for 10 days. She had no history of pain/redness/discharge in the eyes, vomiting, headache, seizures, ear infection or trauma. On initial examination, the patient's vitals were stable. On ophthalmologic examination, there was no conjunctivitis. Her eye movements were normal and unrestricted, but she had color blindness in the Ishihara test. On fundoscopic examination, there was bilateral optic disk swelling. Visual acuity (VA) was finger counting at 2 meters in the right eye and 6/60 in the left one. Other cranial nerve and neurological examinations were normal. On evaluation by a pediatric ophthalmologist, she was diagnosed to be having optic neuritis of bilateral eyes. The orbit's magnetic resonance imaging (MRI) revealed subtle

post contrast enhancement in the bilateral Optic nerves (Fig.1). The MRI of the brain and CSF analysis was normal (Table 1). Cerebrospinal fluid (CSF) viral PCR for COVID-19 and other viral agents were not done. She was screened for autoimmune optic neuritis including anti-neuromyelitis optica antibodies, anti-myelin oligodendrocyte glycoprotein antibodies and aquaporin-4 antibodies which were unremarkable, ruling out multiple sclerosis and neuromyelitis optica. Her COVID-19 polymerase chain reaction (PCR) was negative, but the serology was reactive (IgG-61.82). Thus, a diagnose of COVID-19 induced Optic neuritis was established. She was initiated on intravenous pulsed methylprednisolone(30mg/kg/day) followed with oral prednisolone(2mg/kg/day). Her vision started improving after five days of hospital stay. On discharge her vision was 6/36 in the right eye and 6/18 in the left one. Presently she is on follow up with tapering doses of oral prednisolone. The maximum sensitivity for combined antibody tests after 22–35 d of symptom onset was 96%, while it was 88.2% for IgG after 15–21 d of symptom onset [3]. For our patient, serology was tested within 25 d of onset of fever, which suggests that it was COVID-19 induced.

Discussion

COVID-19 mainly affects the respiratory system causing significant mortality and morbidity. However, neurological, ocular, gastrointestinal, renal, and cardiac complications have also been reported. Around 32% of patients infected with beta coronavirus have neurological complications[4]. These include encephalitis, meningoencephalitis, stroke, Guillain syndrome -Barré, cranial nerve palsy and optic neuritis[5]. COVID-19 with involvement of cranial nerves corroborates the hypothesis of neurovirulence[6]. In 2004, a seven-month-old infant presented with bronchiolitis and conjunctivitis in whom human coronavirus NL63 was detected. The same virus was detected in tear samples of many patients[7]. Interestingly, feline coronavirus (which affects cats) and murine coronavirus (which affects mice) have caused ocular complications in humans probably due to underlying vasculitis[8-9]. COVID-19 is caused by a beta-coronavirus that enters the cells using angiotensin-converting enzyme-2 receptors (ACE-2) which are widely expressed in the central nervous system, including the retina and its vessels[10 - 12]. In COVID-19 patients, the ocular vascular microangiopathy could be due to a hypercoagulable state or vasculitis. There are a few case reports of optic neuritis associated with COVID-19 in adults.[13,14,15,16] All these cases had anti-myelin oligodendrocyte glycoprotein (MOG) antibodies. Similarly, there are 5 case reports of optic neuritis associated with COVID-19 in children. Two children had positive IgG SARS CoV antibodies and negative RT-PCR, similar to our case. Bilateral involvement was seen in 2 cases. Only one of these reported cases had Anti- MOG antibody positivity.[17,18,19] Treatment with intravenous methylprednisolone (IVMP) followed by oral prednisolone was started in these cases leading to visual recovery and resolution of disc edema. The index case also showed prompt response to corticosteroids. Agrawal et al. reported that steroids are the mainstay of noninfectious uveitis treatment[20] although the treatment of optic neuritis in children due to COVID-19 has not been described in the literature. Corticosteroids are especially used to treat acute viral neuritis due to their anti-inflammatory effects[21]. Our case was thoroughly investigated, and all other causes, including immune-mediated etiologies and infections, were ruled out. However, studies related to the pathophysiological mechanisms involved in this process are essential to establish the casual relationship between these two clinical entities.

Conclusion

Only a handful of reports are available in the literature stating the association of Optic neuritis with COVID-19 infection. The purpose of this case report is to increase awareness among health care professionals about this vision threatening complication of COVID-19. COVID-19 associated optic neuritis should be included in differential diagnosis of unexplained cases of optic neuritis in children and a detailed evaluation of patients using fundoscopy and MRI of the orbit should be done.

References

1. Bennett JL. Optic Neuritis. *Continuum*. 2019;25(5):1236-64.
2. Baig AM, Sanders EC. Potential neuroinvasive pathways of SARS-CoV-2: deciphering the spectrum of neurological deficit seen in

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coronavirus disease-2019 (COVID-19). *J Med Virol*. 2020;92(10):1845–1857.
3. Watson J, Richter A, Deeks J. Testing for SARS-CoV-2 antibodies. *BMJ*. 2020;370:m3325.
4. Hayreh SS. Distúrbios isquêmicos agudos do nervo óptico: patogênese, manifestações clínicas e controle. Ophthalmol Clin North Am. 1996; 9:407-42.
5. Nunes NSM, Nascimento JSF, Nascimento JKF, et al. Brain and Covid-19: An Integrative Review. EC Neurology. 2020:101-107.
6. Zhao H, Shen D, Zhou H, et al. Guillain-Barré syndrome associated with SARS-CoV-2 infection: causality or coincidence? Lancet Neurol. 2020; 19:383-384.
7. van der Hoek L, Pyrc K, Jebbink MF, et al.: Identification of a new human coronavirus. Nat Med. 2004, 10:368-373.
8. Hohdatsu T, Okada S, Ishizuka Y, Yamada H, Koyama H: The prevalence of types I and II feline coronavirus infections in cats. J Vet Med Sci. 1992, 54:557-562.
9. Kipar A, May H, Menger S, Weber M, Leukert W, Reinacher M: Morphologic features and development of granulomatous vasculitis in feline infectious peritonitis. Vet Pathol. 2005, 42:321-330.
10. Hooks JJ, Percopo C, Wang Y, Detrick B: Retina and retinal pigment epithelial cell autoantibodies are produced during murine coronavirus retinopathy. J Immunol. 1993, 151:3381-3389.
11. Zhang H, Penninger JM, Li Y, Zhong N, Slutsky AS: Angiotensin-converting enzyme 2 (ACE2) as a SARS-CoV-2 receptor: molecular mechanisms and potential therapeutic target. Intensive Care Med. 2020, 46:586-590.
12. Duan Y, Beli E, Li Calzi S, et al.: Loss of angiotensin-converting enzyme 2 exacerbates diabetic retinopathy by promoting bone marrow dysfunction. Stem Cells. 2018, 36:1430-1440. 13. Sawalha K, Adeodokun S, Kamoga GR. COVID-19-induced acute bilateral optic neuritis? J Investig Med High Impact Case Rep. 2020;8.
13. Zhou S, Jones-Lopez EC, Soneji DJ, Azevedo CJ, Patel VR. Myelin oligodendrocyte glycoprotein antibody–associated optic neuritis and myelitis in COVID-19 J Neuroophthalmol. 2020.
14. Kogure, Chio MD[a]; Kikushima, Wataru MD, PhD[a,*]; Fukuda, Yoshiko MD[a]; Hasebe, Yuka MD[a]; Takahashi, Toshiyuki MD, PhD[b,c]; Shibuya, Takashi MD[d]; Sakurada, Yoichi MD, PhD[a]; Kashiwagi, Kenji MD, PhD[a] Myelin oligodendrocyte glycoprotein antibody-associated optic neuritis in a COVID-19 patient, Medicine: May 14, 2021 - Volume 100 - Issue 19 - p e25865.
15. Catharino AMS, Neves MAO, Nunes NSM, Nascimento JSF, Nascimento JKF, et al., COVID19 Related Optic Neuritis: Case Report. J Clin Neurol Neurosci 2020; 1:10
16. Parvez Y, Alzarooni F, Khan F (March 24, 2021) Optic Neuritis in a Child With COVID-19: A Rare Association. Cureus 13(3): e14094.
17. Eslamiyeh H, Jafari M. Binocular Optic Neuritis in an Eight-Year-Old Boy Due to COVID-19 Infection. Iran J Pediatr.31(4): e111798.
18. Celia Fernández Alcalde, Maria Granados Fernández, Maria Nieves Moreno, Cristina Calvo Rey, Iker Falces Romero, Susana Noval Martín World J Pediatr. 2021 Feb 22: 1–6.
19. Agrawal R, Testi I, Lee CS, et al.: Evolving consensus for immunomodulatory therapy in noninfectious uveitis during the COVID-19 pandemic. Br J Ophthalmol. 2020, 2020:316776.
20. Gal RL, Vedula SS, Beck R. Corticosteroids for treating optic neuritis. *Cochrane Database Syst Rev*. 2015;(8). CD001430.

TABLE 1

Hemoglobin	13.3mg/dl
White blood cell count	11.60 thou/µL
Platelet count	130thou/µL
WBC differential count	N60% L32% E2%

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C-Reactive Protein	>/=6, <12 mg/L
Blood Urea Nitrogen	10mg/dL
Creatinine	0.33mg/dL
Total Bilirubin	0.89mg/dL
Aspartate Aminotransferase (AST)	62U/L
Alanine Aminotransferase (ALT)	17U/L
Alkaline Phosphatase	157U/L
Total protein	7.6mg/dL
Vitamin B12	475pg/mL
Serum Sodium	139mmol/L
Serum Potassium	4mmol/L
Serum Chloride	102mmol/L
Anti- NMO antibody/AQUAPORIN 4	Negative
Anti-MOG antibody	Negative
SARS-CoV-2(COVID-19) antibody IgG	61.82
CSF cells	Acellular
CSF protein	32mg/dL
CSF sugar	122mg/dL
Urine routine examination	normal

Fig.1 T1+C (fat sat) sequence showing subtle post contrast enhancement in the bilateral Optic nerves

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