

Neuro-ophthalmologic manifestations of corona virus disease (COVID-19): A case series

Mohammad Afzal Mahfuzullah, Md Sharfuddin Ahmed, Md Zafar Khaled, Nuzhat Choudhury, Shah Noor Hassan, Mehjabin Haque, SM Rashed Ul Islam

Article Info

Department of Ophthalmology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Shahbag, Dhaka. (MAM, MZK, NC, SNH, MH), Department of Community Ophthalmology (MSA), Department of Virology (SMRUI), Bangabandhu Sheikh Mujib Medical University (BSMMU), Shahbag, Dhaka.

For Correspondence:

Mohammad Afzal Mahfuzullah
E-mail: ?????

Received: 22 May, 2021
Accepted: 27 June, 2021
Available Online: 07 July, 2021

ISSN: 2224-7750 (Online)
2074-2908 (Print)

DOI: <https://doi.org/10.3329/bsmmuj.v14i3.54680>

Keywords: Corona virus disease 19 (COVID-19), Neuro-ophthalmological manifestation, Optic neuritis.

Cite this article:

Mahfuzullah MA, Ahmed MS, Khaled MZ, Choudhury N, Hassan SN, Haque M, Islam SMRU. Neuro-ophthalmologic manifestations of corona virus disease (COVID-19) A case series. Bangabandhu Sheikh Mujib Med Univ J. 2021; 14 (COVID-19 Supplement): 42-44.

Copyright:

The copyright of this article is retained by the author(s) [Attribution CC-BY 4.0]

Available at:
www.banglajol.info

A Journal of Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh



Abstract

Manifold neuro-ophthalmological signs & symptoms have been described in association with corona virus disease 19 (COVID-19). These presenting manifestations probably due to the result of a range of pathophysiological mechanisms throughout the course from acute illness to recovery phase & late recovery phase. Optic nerve dysfunction like optic neuropathy is associated with post COVID-19 infection. In this case series we want to highlight about the course, sequelae & association of optic neuropathy in COVID-19 patients.

Introduction

The novel coronavirus is identified for the first time in December 2019 after a series of acute atypical pneumonia cases occurred in Wuhan, China.¹ Human angiotensin-converting enzyme 2 (ACE-2) is recognized as a functional receptor. The severe acute respiratory syndrome corona virus 2 (SARS-CoV-2) binds and uses ACE-2 as a cell entry receptor to epithelial cells via the spike (S) protein.² Various neuro-ophthalmological manifestations have been described in association with corona virus disease 19 (COVID-19). These symptoms and signs may be the result of varying underlying pathophysiological mechanisms. These are hypoxia, severe hypertension, toxic metabolic processes, ischemic and hemorrhagic strokes as well as para-infectious and post-infectious inflammatory processes.³ Here, we want to describe 3(three) cases which was diagnosed as a case of optic neuritis which is associated with COVID-19 infection in different stage of COVID-19 disease.

Case: 1 (one)

A 45-year-old man developed sudden dimness of vision in his right eye associated with retro-orbital pain & headache for 3(three) days. After taking meticulous history he states that he had a history of fever & malaise 21 days back, for this reason he attended in the fever clinic after 3 (three) days of onset of symptoms subsequently he was tested

positive for COVID-19 by RT-PCR. After 21 days, he developed dimness of vision. On ocular examination, his vision was 3/60 in his right eye which was not improved with pinhole and refraction & 6/6 in his left eye. Relative afferent pupillary defect (RAPD) grade (II) was present in his right eye and color vision was impaired in his right eye. Anterior segment was normal in both eyes, fundoscopic examination and color fundus photograph showed right sided optic disc swelling & left sided optic disc was normal (figure-1). The hematological parameters & magnetic resonance imaging (MRI) findings were within normal limit, Patient was treated with intravenous methyl prednisolone 1 gm daily for consecutive 3 days then was treated with oral prednisolone. On follow up his vision was improved to 6/9 in his right eye with this treatment (table-I).

Case:2 (two)

A 28-year-old woman, came to the ophthalmology department with dimness of vision in her left eye for 1(one) day. She had no retro-orbital pain & headache. She was tested positive for COVID-19 by RT-PCR from nasal swab four weeks back and recovered uneventfully before she developed dimness of vision. On ocular examinations her vision was 6/6 in his right eye., 6/36 in her left eye which was not improved with pinhole and refraction, RAPD (grade1) present in left eye, color vision was impaired in left eye. The

Table-1**Changes of visual acuity of all 3(three) patients after injection methyl prednisolone**

Case	Age	Duration of poor vision	Eye	Pre injection Visual acuity	Post injection visual acuity
Case-1	45	3 days	Right	3/60	6/9
Case-2	28	1 days	Left	6/36	6/6
Case-3	40	15 days	Right	3/60	6/24

anterior segment reveals within normal limit in both eyes, fundoscopic examination and color fundus photograph showed left sided optic disc swelling which was marked in nasal part & right sided optic disc was normal. The blood counts & MRI findings were within normal limit (figure-2). The patient was treated with intravenous methyl prednisolone 1 gm for consecutive 3(three) days then with oral prednisolone. Her vision was improved to 6/6 in her left eye after treatment on follow up (table-1).

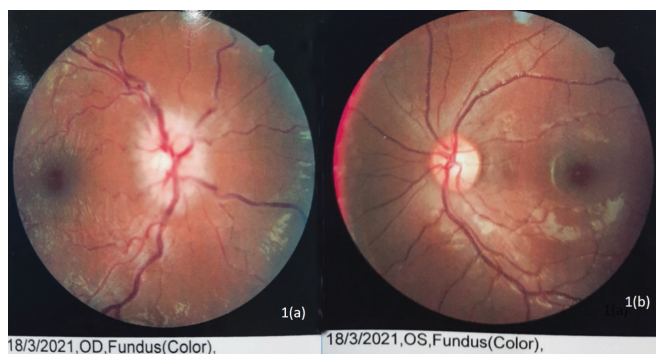


Figure-1: Color fundus photograph (CFP) shows 1(a). Optic disc swelling of Right optic disk side picture. 1(b). Normal optic disk of the left eye.

Case: 3 (three)

A 40-year-old female came to the department with the complaint of dimness of vision in his right eye for 15 days. Her dimness of vision was not associated with orbital pain & redness of eye. She had fever, loss of taste and smell 2(two) months back. On that time her oxygen saturation was normal & took home treatment but did not do RT-PCR for COVID-19 test. On ocular examinations her vision is 3/6 in her right eye which was not improved with pinhole & refraction, RAPD (grade-II) present in right eye, color vision was impaired in right eye and 6/6 in her left eye. Anterior segment reveals within normal limit in both eyes, fundoscopic examination and color fundus photograph showed right sided optic disc swelling with star shaped macular exudate (figure-3). Blood picture was within normal limit, MRI findings was normal. Patient is treated with intravenous methyl prednisolone for consecutive 3 days then with systemic steroid & vision was improved to 6/24 in her right eye.

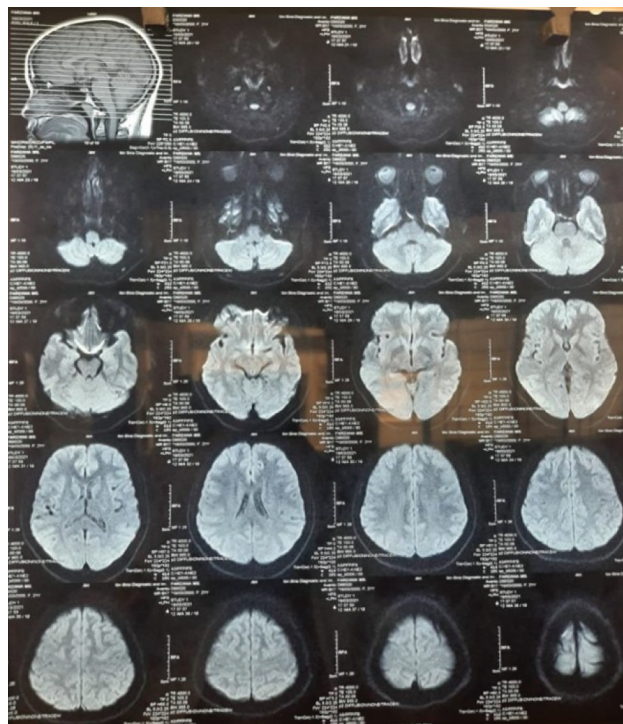


Figure-2: Magnetic resonance imaging (MRI) showing no abnormalities.

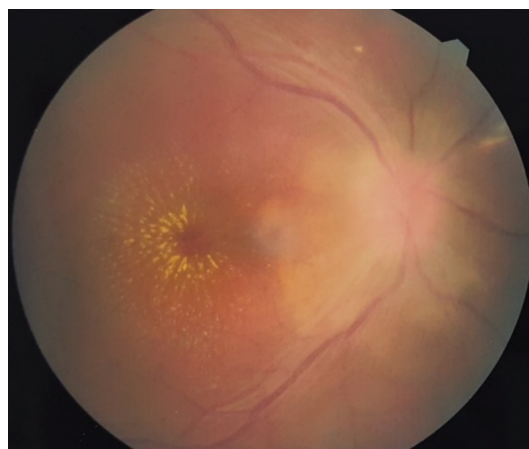


Figure-3: Color fundus photograph shows right sided optic disc swelling with star shaped macular exudate.

Discussion

Cases of SARS-CoV-2 have been known to associated with conjunctivitis and asymptomatic non-neuropathic retinal lesions.^{4,5,6} The virus also can be present in tears.⁷ Moreover, the studies in animals showed, other corona viruses can cause conjunctivitis, anterior uveitis, retinitis, and disc neuritis.⁵ Though the ability of SARS-CoV-2 to induce serious ocular disease has been unknown. Actually optic neuritis is a clinical diagnosis based on the history and examination findings. Because important findings on fundoscopic examination help to differentiate typical from atypical cases of optic neuritis.

Ophthalmologic examination can be considered in the clinical evaluation. Other causes of optic neuritis were ruled out due to the clinical features of the patient, imaging, and laboratory tests. It is notable that although initial disc edema was mild to moderate in this patient, it may lead to severe atrophy in untreated patient. Other viruses (eg, varicella-zoster virus) have also been reported to have this effect.⁸ The pathophysiology of neurological involvement is still not fully understood in COVID-19 patients. One of the theories suggests that coronavirus is a neurotrophic and neuro-invasive virus and that hypogeusia and anosmia are manifestations of peripheral nervous system involvement.^{9,10} Since the central and peripheral nervous system can be affected, we believe that neuro-ophthalmological manifestations can occur. Neurologic complications in patients with COVID-19 are common in hospitalized patients.^{11,12} More than 80 percent of hospitalized patients may have neurologic symptoms during their disease course.¹² Some reports support the evidence for direct viral invasion of the nervous system.^{13,14}

We report a case series of two unilateral optic neuritis & one case of unilateral neuroretinitis those are seems to be late complication of SARS-CoV-2 infection. The initial clinical impression of unilateral Vogt-Koyanagi-Harata(VKH) was ruled out due to the absence of bilateral involvement, meningism, and the existence of structural and functional damage at the level of the optic disc compatible with optic neuritis.¹⁵

It is difficult to determine whether optic neuritis is due to true ischemia or inflammation. Probable cause of inflammation is due to direct infiltration of the virus in the ocular tissue, or it is a consequence of inflammation of the choroid which need to be evaluated by further study.

Conclusion :

The neuro-ophthalmological manifestations associated with COVID-19 infection are diverse and span the course of infection through the recovery phase & late recovery phase. The COVID-19 virus infection & its extent is still poorly understood and explained. Neuro-ophthalmological presentation should not be neglected. Complete ophthalmological examination of these patients should be performed to fully describe ocular manifestations related to COVID19 infections.

Ethical consideration

Written informed consent was taken from the patients for publishing the history and pictures. Utmost respect and sympathy were shown to the patients during the course of treatment.

References :

1. Zhu, N. et al. A novel coronavirus from patients with pneumonia in China, 2019. *N. Engl. J. Med.* 2020; 382:727-33
2. Walls, A. C. et al. Structure, function, and antigenicity of the SARS-CoV-2 spike glycoprotein. *Cell* 2020;18:281-92
3. Doria M. Gold et al. Neuro-ophthalmologic complications of coronavirus disease 2019 (COVID-19). *Neurosci Lett.* 2021 ;18: 742: 135531.
4. Wu P, Duan F, Luo C, et al. Characteristics of ocular findings of patients with coronavirus disease 2019 (COVID-19) in Hubei province, China. *JAMA Ophthalmol.* 2020;138(5):575-78
5. Seah I, Agrawal R. Can the coronavirus disease 2019 (COVID-19) affect the eyes? a review of coronaviruses and ocular implications in humans and animals. *Ocul Immunol Inflamm.* 2020;28(3):391-95
6. Marinho PM, Marcos AAA, Romano AC, Nascimento H, Belfort R Jr. Retinal findings in patients with COVID-19. *Lancet* 2020;395(10237):1610. doi:10.1016
7. Xia J, Tong J, Liu M, Shen Y, Guo D. Evaluation of coronavirus in tears and conjunctival secretions of patients with SARS-CoV-2 infection. *J Med Virol.* 2020;92(6):589-94
8. Kedar S, Jayagopal LN, Berger JR. Neurological and ophthalmological manifestations of varicella zoster virus. *J Neuro ophthalmol.* 2019;39(2):220-31
9. Li YC, Bai WZ, Hashikawa T. The neuro invasive potential of SARS-CoV2 may play a role in the respiratory failure of COVID-19 patients. *J Med Virol.* 2020;92(6):552-55
10. Li Z, Liu T, Yang N, et al. Neurological manifestations of patients with COVID-19: potential routes of SARS-CoV-2 neuro invasion from the periphery to the brain. *Front Med.* 2020. doi:doi:10.1007/s11684-020-0786-5
11. Mao L, Jin H, Wang M, et al. Neurologic Manifestations of Hospitalized Patients With Coronavirus Disease 2019 in Wuhan, China. *JAMA Neurol* 2020; 77:683.
12. Liotta EM, Batra A, Clark JR, et al. Frequent neurologic manifestations and encephalopathy-associated morbidity in Covid-19 patients. *Ann Clin Transl Neurol* 2020; 7:2221.
13. Matschke J, Lütgehetmann M, Hagel C, et al. Neuro-pathology of patients with COVID-19 in Germany: a post-mortem case series. *Lancet Neurol* 2020; 19:919.
14. Song E, Zhang C, Israelow B, et al. Neuro invasion of SARS-CoV-2 in human and mouse brain. *bioRxiv* 2020.
15. Du L, Kijlstra A, Yang P. Vogt-Koyanagi-Harada disease: novel insights into pathophysiology, diagnosis and treatment. *Prog Retin Eye Res.* May 2016;52:84-111.