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Case Report

# COVID-19 Induced Inflammatory Orbital Apex Syndrome

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**Received:** March 14, 2023; **Published:** April 27, 2023

## Abstract

The Covid-19 pandemic, courtesy to the SARS-Cov-19 virus took the lead in emergence of many multisystem pathologies and complications. In specific, the magnitude of ophthalmic case presentations reporting what the virus had left behind is growing. As per a recent review, the prevalence of ophthalmic manifestations among COVID-19 patients ranges from 2 - 32% [1]. However, COVID-19 associated neuro-ophthalmic manifestations, in specific, are infrequent and only a handful of isolated cases were reported.

Of the reported ocular diagnoses is orbital apex syndrome (OAS). Also known as Jacob's syndrome, OAS is an afferent neuro-ophthalmic disorder that can arise on a multi-etiological background including infections, inflammations, neoplasms, traumas, vasculitis. OAS manifests as sudden visual loss, ophthalmoplegia and ophthalmalgia secondary to partial or total involvement of cranial nerves II, III, IV, V, VI.

In this article, we report a case of orbital apex syndrome that had an initial presentation of COVID-19 induced optic neuritis. While neuro-ophthalmic sequela is usually well recognized in older, comorbid patient populations; our case is unique as it presented in healthy young patient affected by Covid-19 infection.

***Keywords:*** *COVID-19; Neuro-Ophthalmic Manifestations; SARS-CoV-2; Optic Neuritis; Ophthalmoplegia; Orbital Apex Syndrome*

## Introduction

Papillophlebitis, optic neuritis, Adie's tonic pupil, Miller Fisher Syndrome, neurogenic ptosis, visual loss secondary to cerebrovascular accidents and cranial nerve palsies are all examples of the neuro-ophthalmic manifestations reported in association with COVID-19 infection. Of the rare entities, orbital apex syndrome is one. According to our literature review, only a few cases about orbital apex syndrome occurring in conjunction with COVID-19 were reported [2-5]. The orbital apex is an anatomical territory containing the orbital canal and the superior orbital fissure, both acting as entry points for various structures including nerves and vessels. Any lesion along this trajectory would result in a constellation of neuro-ophthalmological signs and symptoms depending on the structural involvement.

## Clinical Case

A 29-year-old previously healthy female was referred to our emergency department from a private clinic due to reduced right eye vision. Upon further questioning the patient reported that she developed right sided headache associated with sudden onset, right eye

pain few days after she tested positive for COVID-19 which had an uncomplicated course. Approximately two-weeks later, these symptoms progressed to grossly reduced right eye vision, diplopia and colour desaturation accompanied by pain with eye movements. She denied recent history of the following: head trauma, orbital trauma, fever, blindness, scotoma, amaurosis fugax, photophobia, phonophobia, eye discharge, neck stiffness, skin rash, nausea/vomiting, or any sensory-motor deficits.

On examination, visual acuity in the right eye was 6/12 and left eye was 6/6. She had right afferent pupillary defect. Slit lamp examination revealed normal anterior segment. Dilated fundus examination showed right optic nerve hyperemia with blurring of inferonasal margins of the optic disc with disc elevation as shown in figure 1. Extraocular examination showed limitation of right eye abduction, adduction, elevation, and depression as shown in figure 2. Right extraocular movements as follows: -2 lateral rectus limitation, -1 medial rectus limitation, -2 inferior oblique limitation, -2 superior rectus limitation, -2 inferior rectus limitations. There is no diplopia on primary gaze, patient had more of horizontal diplopia on horizontal gaze. Red colour desaturation noted in the right eye. The Humphrey's visual field confirmed right eye superior field defect. The patient was examined by the neurology team; no neurological deficits were noted.

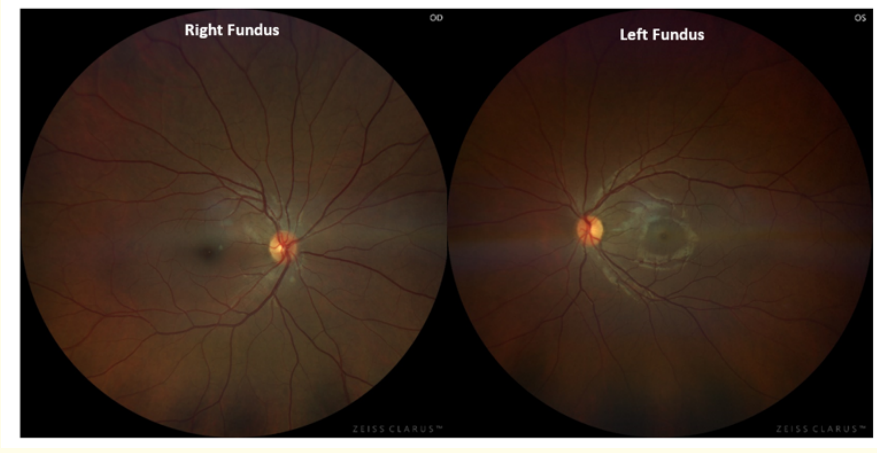


***Figure 1:*** *Fundus photo showing right optic nerve hyperemia with blurring of inferonasal optic disc margins in addition to disc elevation. Normal Left fundus.*

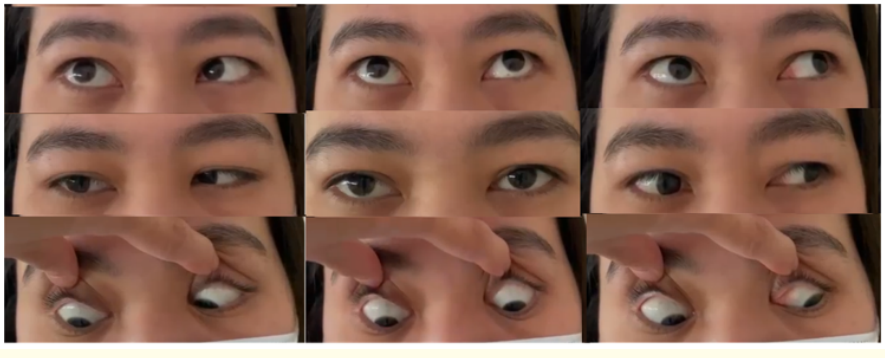

***Figure 2:*** *Nine gaze photo of the patient restricted extraocular movement in the right eye.*

The patient was admitted for further evaluation. Cerebrospinal fluid analysis, immunological profile, viral panel and infectious disease microbiology were unremarkable. MRI brain showed few tiny FLAIR and T2-weighted hyperintense foci in subcortical white matter of both parietal regions, however, these neither specific nor characteristic of demyelination. CT head venography showed no evidence of sinus venous thrombosis. MRI orbit with and without contrast showed right intraorbital optic nerve and orbital apical enhancement as shown in figure 3. Based on the above findings and investigations, the patient was diagnosed with post COVID-19 inflammatory orbital apex syndrome.


***Figure 3:*** *Fundus examination or right eye showing improvement after steroid therapy.*

Patient's case was discussed in a multidisciplinary meeting where neuro-ophthalmology, neurology and infectious disease were onboarded. Consensus to start the patient on pulse steroid therapy; 1g of intravenous methylprednisolone for five days. After therapy, patient exhibited improvement in extraocular movements, diplopia, visual acuity and colour vision. Patient was discharged on oral prednisolone and Fresnel prisms for residual diplopia. Upon follow up at almost seven months after the initial presentation, the patient reported complete resolution of symptoms of ophthalmoplegia and diplopia.

## Discussion

In literature, the prevalence of ophthalmic manifestations among COVID-19 patients ranges from 2 - 32% [1]. Moreover, a recent systematic review and meta-analysis including more than 6000 patients yielded that the pooled prevalence of ocular manifestations in COVID-19 patients was estimated to be 11.03%. The results suggest that approximately one out of ten COVID-19 patients in that study showed at least one ocular symptom [6].

There have been many postulations regarding the pathophysiology of ocular manifestations among patients diagnosed with COVID-19. While still to be elucidated, one of the established hypotheses is post viral inflammatory syndrome. This is a sequela of a proinflammatory state with hypercoagulability and hypercytokinemia resulting in systemic abnormalities including hypoxia and severe hypertension.

Reported COVID-19 related neuro-ophthalmic cases are few and far between. These neuro-ophthalmological pathologies can be classified into afferent and efferent disorders. Afferent pathologies such as optic neuritis, papillophlebitis, papilledema, visual disturbance associated with posterior reversible encephalopathy syndrome (PRES), and vision loss caused by stroke. Efferent neuro-

ophthalmic complications include cranial neuropathies, Miller Fisher syndrome, Adie's pupils, ocular myasthenia gravis, nystagmus, and eye movement disorders [7].

One such rare complex entity relevant to our case report is orbital apex syndrome (OAS). OAS refers to a constellation of neuroophthalmological signs and symptoms secondary to the involvement of various structures including cranial nerves and ocular muscles present in the orbital apex territory by a disease process. Different aetiologies such as a compressive lesion, inflammation, autoimmune conditions, vascular problems like stroke, vasculitis, fistula, or aneurysms exist. Other causes include infectious processes, trauma as well neoplastic pathologies being primary tumour or metastatic infiltration.

## Conclusion

Like in our case report, a young, previously healthy female presented with post COVID-19 optic neuritis as the first symptom of orbital apex syndrome. As per our literature review, there has been only two case of post COVID inflammatory apex syndrome reported in young, healthy patients [3,5]. New onset ocular manifestations, especially in previously healthy individuals who are unlikely to develop such condition; should alert clinicians about a possible relation to COVID-19 infection; bearing in mind that these manifestations could develop before a positive COVID swab or weeks after recovery. Our article is by no mean inclusive but potpourri of instructive information with a take home message. Early identification of these high morbidity conditions is key to allow for optimal treatment and improved outcomes.

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**Volume 14 Issue 5 May 2023**