

Received: 2021.01.19

Accepted: 2021.02.18

Available online: 2021.03.31

Published: 2021.04.30

# Low Visual Acuity Due to Acute Macular Neuroretinopathy Associated with COVID-19: A Case Report

## Authors' Contribution:

Study Design A  
Data Collection B  
Statistical Analysis C  
Data Interpretation D  
Manuscript Preparation E  
Literature Search F  
Funds Collection G

ABCDEF **Mariana Nadais Aidar**  
BCEF **Thaís Mota Gomes**  
BCE **Márgara Zanotele Hemeryly de Almeida**  
ABCDE **Eric Pinheiro de Andrade**  
DEF **Pedro Durães Serracarbassa**

Ophthalmology Service, Institute of Medical Assistance to the State Public Servant (IAMSPE), São Paulo, SP, Brazil

**Corresponding Author:** Mariana Nadais Aidar, e-mail: [aidarmariana@gmail.com](mailto:aidarmariana@gmail.com)

**Conflict of interest:** None declared

**Patient:** Female, 71-year-old  
**Final Diagnosis:** Acute macular neuroretinopathy  
**Symptoms:** Anosmia • loss of vision  
**Medication:** —  
**Clinical Procedure:** —  
**Specialty:** Ophthalmology

**Objective:** Rare co-existence of disease or pathology

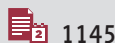
**Background:** Retinal sequelae have been reported in patients who have had COVID-19. This is a case report of acute macular neuroretinopathy (AMN), presenting with low visual acuity in the left eye, 14 days after the first symptoms of COVID-19 infection.

**Case Report:** A 71-year-old woman presented for ophthalmological evaluation complaining of low visual acuity in the left eye, 14 days after the first symptoms of COVID-19 infection. COVID-19 was confirmed by a reverse-transcription polymerase chain reaction (RT-PCR) test. The left eye examination showed visual acuity of 0.5 logMAR, funduscopy showed foveal pigment mobilization, fluorescein angiography revealed a hypofluorescent fovea surrounded by irregular hyperfluorescent defects, and spectral-domain optical coherence tomography showed central foveal thinning with disrupted interdigitation and ellipsoid zones. Given the clinical and imaging findings, the diagnosis of AMN was finalized. AMN usually resolves without specific treatment.

**Conclusions:** This case report shows that patients with COVID-19 can develop retinal involvement. AMN can be due to a viral infection, including COVID-19, and usually resolves without specific treatment. In the present case, there was no improvement in the patient's clinical condition in a 2-month follow-up to date.

**Keywords:** COVID-19 • Fovea Centralis • Ophthalmology

**Full-text PDF:** <https://www.amjcaserep.com/abstract/index/idArt/931169>



1145



—



2



17



## Background

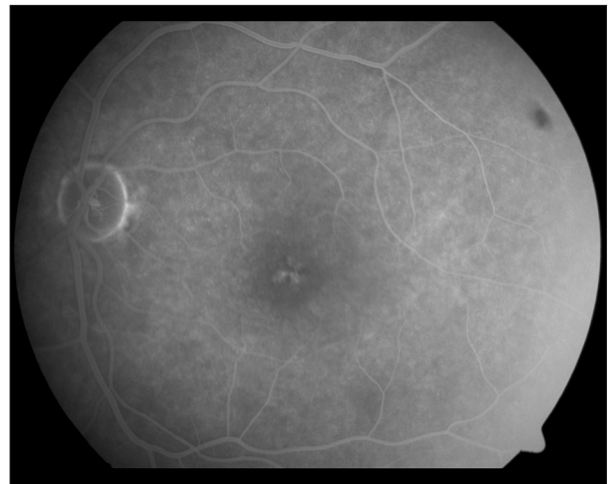
Since the beginning of the COVID-19 pandemic, the literature has reported that the virus affects different parts of the body. The first description of ocular involvement due to COVID-19 was a patient whose first manifestation of the disease was ocular conjunctivitis [1]. Other descriptions of extra-ocular involvement in cases of COVID-19 have been described [2,3]. A case series by Wu et al, including 38 patients with COVID-19, observed that 12 patients had ocular manifestations, including epiphora, conjunctival congestion, and chemosis [2]. A literature review by Bertoli et al reported conjunctivitis to be the first sign of the disease and the main ophthalmological manifestation in COVID-19 infections [3].

Studies report the presence of the virus in the eyes, conjunctiva, limbus, and cornea. The presence of the receptor for COVID-19 [ACE2] was found by immunohistochemical analysis of these tissues [4], as well as enucleations done during autopsies of the eyes of deceased patients, with confirmed COVID-19 infection; the RNA of the virus was detected in the retina [5]. COVID-19 can affect retinal vasculature, particularly the veins, and the inner retinal layers. These vein changes (dilated veins and tortuous vessels) were directly correlated to disease severity and it was not possible to determine whether the retinal changes were caused by the virus itself or by the body's immune response [6].

A case series was conducted by Louzada et al in 2 referral centers for COVID-19 treatment in Rio de Janeiro, Brazil. Forty-seven eyes from 25 hospitalized patients with severe or critical confirmed illness were evaluated, and only 3 patients (12%) manifested convincing retinal changes (microhemorrhages, flame-shaped hemorrhage, and nerve fiber layer infarcts). However, it was unclear whether the alterations were due to the virus itself or the septic condition of the patients, as the ocular alterations are similar [7]. Marinho et al demonstrated sub-clinical retinal changes in patients infected by COVID-19 using spectral-domain optical coherence tomography (SD-OCT). Hyperreflective lesions were observed in both eyes of all examined patients [8], although some experts do not agree that those findings were correlated to the COVID-19 infection [9].

The literature contains cases of reported macular involvement due to the COVID-19 infection [10-12]. Virgo and Mohamed described 2 patients who developed paracentral scotomas [11] and Gascon et al described lesions consistent with acute macular neuroretinopathy (AMN) and paracentral acute middle maculopathy related to COVID-19 infections [12].

This is a case report of AMN associated with COVID-19 infection in a 71-year-old woman who presented with low visual acuity in the left eye.



**Figure 1.** Fluorescein angiography of the left eye showed a hypofluorescent fovea surrounded by irregular hyperfluorescent defects, suggestive of acute macular neuroretinopathy.

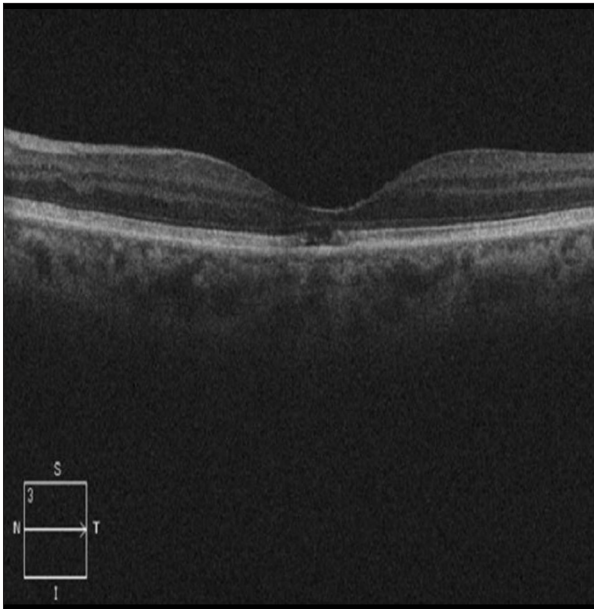
## Case Report

A 71-year-old woman presented with low visual acuity in the left eye 1 week after a 7-day hospitalization due to COVID-19 infection. COVID-19 was confirmed by a reverse-transcription polymerase chain reaction (RT-PCR) test (Company Charité Protocol-Adolfo Lutz, São Paulo, Brazil).

Seven days after recovering from COVID-19, she came for an ophthalmological examination, complaining of low visual acuity, starting that day, 14 days after the first COVID-19 infection symptoms. During anamnesis, she reported an episode of bilateral itchy eyes associated with subconjunctival hemorrhage in the left eye, 4 days after the beginning of systemic COVID-19 symptoms, that resolved after 3 days. She also reported fever, anosmia, dysgeusia, dyspnea, and adynamia in the acute phase of COVID-19. Her past medical history included arterial hypertension and a kidney transplant due to hepatitis C. She had no history of sunbathing or ingestion of any medications.

On examination of the left eye, visual acuity was 0.5 LogMAR, funduscopy showed foveal pigment mobilization, fluorescein angiography revealed a hypofluorescent fovea surrounded by irregular hyperfluorescent defects (**Figure 1**), and SD-OCT showed central foveal thinning with disrupted interdigitation and ellipsoid zones (**Figure 2**). Other findings from the examination of the left eye were unremarkable.

Our approach was to follow up the patient monthly, without medication or interventional treatment. In our 2-month follow-up so far, there has been no improvement in her condition. The patient gave written consent for publication of this



**Figure 2.** Spectral-domain optical coherence tomography of the left eye showed central foveal thinning with disrupted interdigitation and ellipsoid zones, suggestive of acute macular neuroretinopathy.

case report. The institution's Ethics Committee approved the publication of this case report.

## Discussion

Case reports about the COVID-19 pandemic are important, as it is a new infection and there is little knowledge about it. It is essential to study other similar reports already described in the literature to understand the possible long-term sequelae of the disease to the eye.

The majority of studies correlate ocular findings with greater disease (COVID-19) severity. Wu et al found that among patients with COVID-19, 31.6% had ocular abnormalities, and the majority of them showed severe systemic manifestations or abnormal findings on blood tests [2]. They suggested that ocular symptoms are common in patients with severe pneumonia. Bertoli et al reported that patients with ocular symptoms from COVID-19 (compared with COVID-19 patients with no ocular manifestations) had higher white blood cell counts, neutrophil counts, levels of procalcitonin, C-reactive protein, and higher lactate dehydrogenase levels [3]. A meta-analysis by Loffredo et al concluded that conjunctivitis in COVID-19 patients is usually associated with a more severe form of the disease [13].

The woman in the present case report fits the profile described in the majority of these studies, since she had a severe

COVID-19 infection with  $\leq 93\%$  oxygen saturation and ocular involvement. On the other hand, Lani-Louzada et al state that ocular manifestations are likely to be secondary to the clinical intercurrents or comorbidities and not due to the virus itself [7].

In 2013, Sarraf et al proposed that paracentral acute middle maculopathy (PAMM) can represent a novel variant of AMN that affects the middle layers of the macula above the outer plexiform layer as diagnosed with SD-OCT imaging. By definition, PAMM is an optical coherence tomography finding, which is seen in patients with retinal capillary ischemia and unspecific persistent scotomas [14]. AMN is described as symptomatic photopsias and paracentral scotomas, associated with mild loss of vision [15].

Although the woman in the present case report did not present with scotomas, she presented low visual acuity after a viral infection associated with the disruption of the ellipsoid zone with reddish-brown, wedge-shaped lesions, where the apices tend to point toward the fovea, suggesting the diagnosis of AMN after COVID-19 [15]. Other case reports have described the possibility of AMN after COVID-19 [11,12].

AMN is a self-limiting disease, which usually resolves without specific treatment [16,17]. However, the woman in the present case report has shown no change in her imaging findings and visual acuity in the 2-month follow-up so far.

## Conclusions

This case report demonstrates that patients with COVID-19 infection can present with retinal involvement. AMN can be due to viral infection, including COVID-19, and usually resolves without specific treatment, although the woman in the present case report has not improved her clinical condition in a 2-month follow-up to date.

## Department and Institution Where Work Was Done

Ophthalmology Service, Hospital do Servidor Público Estadual de São Paulo.

## Acknowledgements

Thanks to Dr. Luis Antônio Aidar for encouragement and inspiration.

## Conflict of Interest

None.

## References:

1. Lu CW, Liu XF, Jia ZF. 2019-nCoV transmission through the ocular surface must not be ignored. *Lancet*. 2020;395(10224):e39
2. 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
3. Bertoli F, Veritti D, Danese C, et al. Ocular findings in COVID-19 patients: A review of direct manifestations and indirect effects on the eye. *J Ophthalmol*. 2020;2020:4827304
4. Zhou L, Xu Z, Castiglione GM, et al. ACE2 and TMPRSS2 are expressed on the human ocular surface, suggesting susceptibility to SARS-CoV-2 infection. *Ocul Surf*. 2020;18(4):537-44
5. Casagrande M, Fitzek A, Püschel K, et al. Detection of SARS-CoV-2 in human retinal biopsies of deceased COVID-19 patients. *Ocul Immunol Inflamm*. 2020;28(5):721-25
6. Invernizzi A, Torre A, Parrulli S, et al. Retinal findings in patients with COVID-19: Results from the SERPICO-19 study. *Lancet*. 2020;27:100550
7. Lani-Louzada R, Ramos CdVF, Cordeiro RM, et al. Retinal changes in COVID-19 hospitalized cases. *PLoS One*. 2020;15(12):e0243346
8. Marinho PM, Marcos AAA, Romano AC, et al. Retinal findings in patients with COVID-19. *Lancet*. 2020;395(10237):1610
9. Vavvas DG, Sarraf D, Sadda SR, et al. Concerns about the interpretation of OCT and fundus findings in COVID-19 patients in recent Lancet publication. *Eye (Lond)*. 2020;9:2153-54
10. D'Aloisio R, Nasillo V, Gironi M, et al. Bilateral macular hemorrhage in a patient with COVID-19. *Am J Ophthalmol Case Rep*. 2020;20:100958
11. Virgo J, Mohamed M. Paracentral acute middle maculopathy and acute macular neuroretinopathy following SARS-CoV-2 infection. *Eye (Lond)*. 2020;34(12):2352-53
12. Gascon P, Briantais A, Bertrand E, et al. Covid-19-associated retinopathy: A case report. *Ocul Immunol Inflamm*. 2020;28(8):1293-97
13. Loffredo L, Pacella F, Pacella E, et al. Conjunctivitis and COVID-19: A meta-analysis. *J Med Virol*. 2020;92(9):1413-14
14. Sarraf D, Rahimy E, Fawzi AA, et al. Paracentral acute middle maculopathy: A new variant of acute macular neuroretinopathy associated with retinal capillary ischemia. *JAMA Ophthalmol*. 2013;131(10):1275-87
15. Bhavsar KV, Lin S, Rahimy E, et al. Acute macular neuroretinopathy: A comprehensive review of the literature. *Surv Ophthalmol*. 2016;61(5):538-65
16. Amin P, Cox TA. Acute macular neuroretinopathy. *Arch Ophthalmol*. 1998;116(1):112-13
17. Neuhann IM, Inhoffen W, Koerner S, et al. Visualization and follow-up of acute macular neuroretinopathy with the Spectralis HRA+OCT device. *Graefes Arch Clin Exp Ophthalmol*. 2010;248(7):1041-44