

Retinal microvascular abnormalities, cotton wool-like lesions, and macular edema following COVID-19 in a patient previously vaccinated with AstraZeneca and idiopathic myopathy

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Abstract

In this case study, the authors describe peculiar bilateral cotton wool-like retinal lesions associated with macular edema in a patient with COVID-19 who was vaccinated with a single dose of AstraZeneca one month earlier. This patient had no pulmonary or systemic cardiovascular complications from COVID-19, as reported in other papers that found retinal lesions. However, the patient was diagnosed with idiopathic myopathy when discovering the SARS-CoV-2 infection. The patient was a 22-year-old white female with no previous history of morbidity, complaining of blurred vision in both eyes seven days after testing positive for SARS-CoV-2 by PCR (using nasal and oral swab) and confirmed through ELISA blood test (IgM positive). There was no ancillary test revealing diabetes mellitus. The patient presented with scattered whitish cotton wool-like lesions and a few hemorrhages on the posterior pole in fundus examination. On spectral domain optical coherence tomography (SD-OCT), there were hyperreflective lesions in the nerve fiber layer, ganglion cell layer, inner nuclear layer, and inner and outer plexiform layers at the site corresponding to the whitish cotton wool-like lesions in the posterior fundus photos. Moreover, the macula of both eyes had intraretinal and subretinal fluid, reversible with corticosteroid therapy. In conclusion, COVID-19 has been associated with capillary disorders at different target sites such as retina, lungs, and central nervous system. Similarly, vaccination against SARS-CoV-2 has been linked to retinal complications in the literature; however, cotton wool-like lesions have not yet been reported. There are many questions yet to be answered about the implications of COVID-19 infection and its vaccines.

Keywords

Choroidal/Retinal inflammation<UVEA, posterior uveitis<UVEITIS, retinal pathology / research<RETINA, CME<RETINA, retina – medical therapies<RETINA

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Introduction

The coronavirus SARS-CoV-2 pandemic outbreak has been associated with a varied spectrum of systemic involvement.¹ There are reports regarding eye disorders. Conjunctivitis was the most common finding in patients with COVID-19 who presented with ocular involvement.² However, reports of retinal microvascular alterations have been identified.³ In this case study, we describe bilateral

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cotton wool-like retinal lesions associated with macular edema in a patient with COVID-19 who was vaccinated with a single dose of AstraZeneca one month earlier.

Case report

The patient was a 22-year-old white female with no previous history of morbidity, complaining of blurred vision in both eyes seven days after testing positive for SARS-CoV-2 by PCR (using nasal and oral swab), and confirmed through ELISA blood test (IgM positive). There was no ancillary test revealing diabetes mellitus.

The patient underwent ophthalmological examination, which showed visual acuity (VA) of 20/40 in both eyes. Slit lamp biomicroscopy demonstrated no signs of anterior segment inflammation in both eyes. The patient had no vitritis. The intraocular pressure was 12 mmHg in the right eye and 13 mmHg in the left eye, and the pupillary reflexes were normal. Both eyes had scattered whitish cotton wool-like lesions and a few hemorrhages in the posterior pole on fundus examination (Figure 1(a) and (b)). On spectral domain optical coherence tomography (SD-OCT) – DRI-OCT Triton Swept Source (Topcon, Tokyo, Japan), there were hyperreflective lesions in the nerve fiber layer, ganglion cell layer, inner nuclear layer, and inner and outer plexiform layers at the site corresponding to the whitish cotton wool like lesions in the posterior fundus photos (Figure 1(a) and (b) during acute phase and C and D after acute phase with reduction signs). Moreover, the macula of both eyes had intraretinal and subretinal fluid.

Further workup for viral hepatitis (B, C, D), human immunodeficiency (HIV), cytomegalovirus (CMV), herpes, venereal disease research laboratory (VDRL), and tuberculosis was negative. Furthermore, the results of other blood tests such as, glycated hemoglobin (4.8%), high erythrocyte sedimentation rate (7 mm/h), white blood cell count (6200 cells/mm³), red blood cell count (4 million/mm³), urea (20 mg/dL), creatinine (0.05 mg/dL), C-reactive protein (<0.80), and platelet count (142,000) were unremarkable. The patient also underwent rheumatological tests, CSF assessment, and chest computed tomography, all of which were normal.

The patient also exhibited muscle weakness of the lower limbs, which led to her being admitted to the hospital. She was then also diagnosed with idiopathic myopathy, where she was submitted to methylprednisolone pulse therapy and anticoagulant for 20 days.

After 3 months of follow-up, VA improved to 20/20 in both eyes and the number of cotton wool-like lesions in the posterior fundus decreased, and the macular edema disappeared (Figure 1(c) and (d)). However, fluorescein angiography showed some scattered microaneurysms with minimal or no leakage and some areas of retinal nonperfusion in both eyes (Figure 2(a) to (f)). The patient continues to be treated with 20 mg prednisone 1 pill a day, after

undergoing a gradual reduction of the medication. This treatment was maintained due to the idiopathic myopathy.

Discussion

From March 2020 to June 2021, the Marcílio Dias Navy Hospital had 5069 patients who tested positive for COVID-19. Among these patients, 1035 patients (20.4%) were admitted to this hospital and only one patient (0.019%) showed decreased VA. Lima and coworkers² searched for patients with ocular involvement at the beginning of the COVID-19 infection. In their study, 108 of 1740 patients had ocular findings. Moreover, these authors did not find any patients with retinal complications or diminished VA.² These outcomes reveal how uncommon retinal lesions are due to COVID-19 infection.

According to the available literature, SARS-Cov-2 has the potential to cause vascular dysfunction.³ In a case series study, Marinho et al. also described the cotton wool spots and microhemorrhages, but the lesions were smaller and located at the level of ganglion cell and inner plexiform layers, with no sign of macular edema.⁴ SARS-CoV-2 targets angiotensin-converting enzyme 2 (ACE2) receptors which are highly expressed in vascular pericytes.⁵ Thus, it may lead to complement-mediated endothelial cell dysfunction, microvascular disturbances, and ocular circulation involvement.⁶ Ackermann et al., in evaluating pulmonary vascularization, found severe vascular abnormalities such as disseminated thrombosis and microangiopathy.⁷ Moreover, animal models have suggested that retinitis and optic neuritis could occur due to SARS-CoV-2 infection.⁸

In a review study, Haseeb et al.⁹ investigated eye complications after SARS-CoV-2 vaccination. They found 87 of 94 patients with information about their vaccinations. Ocular complications were observed after the first dose of COVID-19 vaccine in 55.6% of cases, where AstraZeneca vaccine was used in 22.9% of times, and the mean time from vaccination to the onset of the eye symptoms was 3.1 ± 2.4 days. Among 14 patients with retinal complications, cotton wool-like lesions were not reported by these authors.

Marinho et al. and Pereira et al. detected cotton wool lesions and retinal hemorrhages in patients with COVID-19, although they did not detect eye symptoms.^{4,10} Hard exudates, hemorrhages, and macular hyperpigmented lesions were identified in some patients with severe COVID-19 in the study by Pereira et al. that included patients who required invasive mechanical ventilation or vasoactive pharmacological support.¹⁰ Moreover, fever and dyspnea were present in all patients in the study by Marinho et al., whereas in the current study, the patient had idiopathic myopathy, no fever and no pulmonary symptoms. Finally, in a review study, Zhang et al. reported that posterior segment involvement by SARS-CoV-2 is

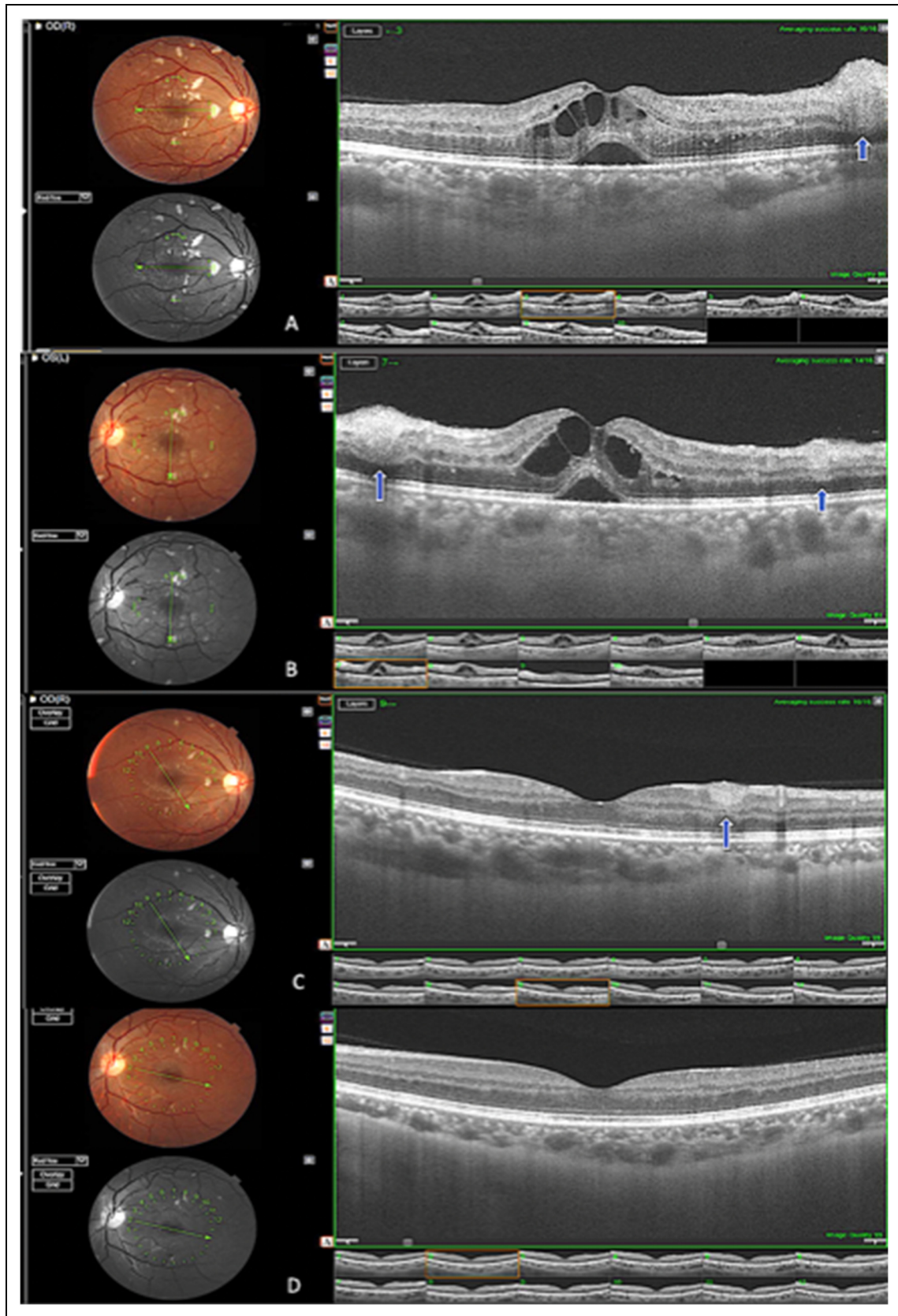


Figure 1. Eye fundus and SD OCT—right and left eye with cystoid macular edema, and cotton wool-like lesions (arrows). (a and b) Acute phase. (c and d) Late phase with CME resolution.

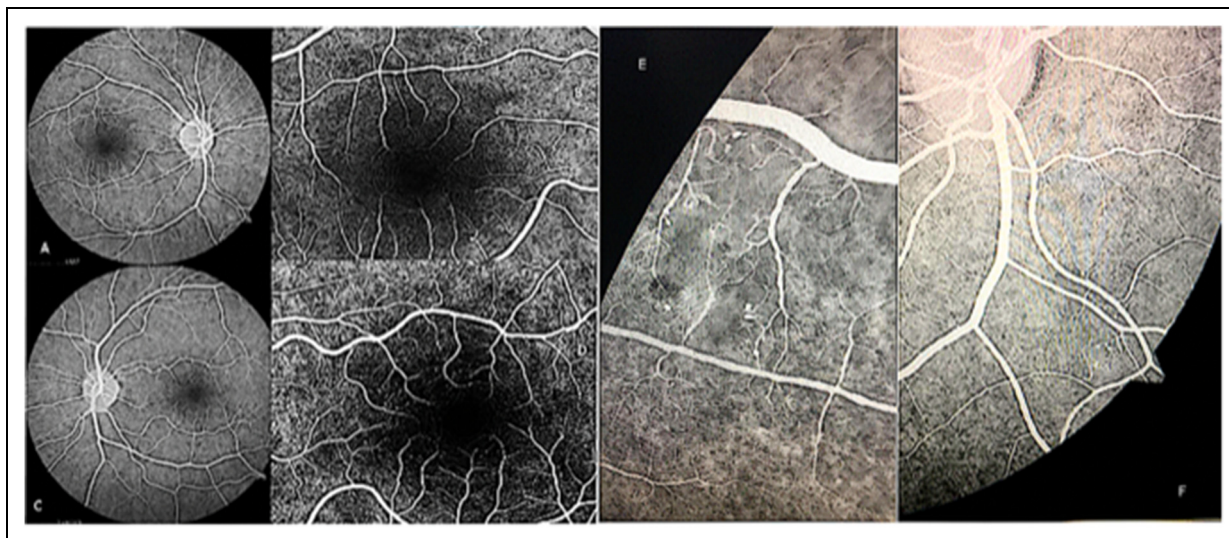


Figure 2. Fluorescein angiography—right and left eye in late phase. (a and b) Macular detail with scattered microaneurysms. (c and d) Detail of vascular abnormalities. (e and f).

uncommon and has mostly been found in patients with severe acute respiratory syndrome.¹¹

COVID-19 has been associated with capillary disorders at different target sites such as retina, lungs, and central nervous system, and therefore, the variety of these findings, their persistence, and their clinical implications remain to be elucidated.^{12–14}

In fact, we describe here a peculiar case of a patient who did not present with pulmonary or systemic cardiovascular COVID-19 complications as in other papers that also described cotton wool lesions, retinal microvascular alterations, and retinal hemorrhages. Our patient had blurred vision and intraretinal and subretinal fluid. The other papers that described these lesions reported that their patients did not have ocular symptoms. Our patient had no hard exudates or pigmentation in the macula. In our case report, the patient was vaccinated with AstraZeneca 1 month before the onset of the ocular symptoms. We did not find any paper in the literature reporting this type of lesions after vaccine against COVID-19. There are many questions yet to be resolved about the implications of COVID-19 and its vaccines.

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