

Case Report: Paracentral Acute Middle Maculopathy Following COVID-19 Vaccination

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ABSTRACT

We report a case of paracentral acute middle maculopathy (PAMM) in association with coronavirus disease 2019 (COVID-19) vaccination. A 67-year-old male patient presented with a complaint of decreased vision in his right eye (OD) three days after receiving the Pfizer-BioNTech COVID-19 vaccine. Dilated fundus examination showed a white retinal lesion in the superior parafoveal region and optic disc edema in OD, and fundus autofluorescence (FAF) revealed hypoautofluorescence at the corresponding area. Spectral domain optical coherence tomography (SD-OCT) demonstrated the presence of a hyperreflective band along the inner nuclear layers (INL) and extending from the outer plexiform layer (OPL) to inner plexiform layer (IPL) in OD, SD-OCT was normal in his left eye (OS). Fundus fluorescein angiography (FA) showed hypofluorescence in the superior parafoveal area with late disc leakage in OD and FA was normal in OS. Current case highlights the recent severe acute respiratory syndrome coronavirus - 2 (SARS-CoV-2) vaccine as a possible cause for PAMM as a form of a rare adverse effect. However, further studies should be done to describe any association between COVID-19 vaccination and post-vaccination related retinopathies.

Keywords: Paracentral acute middle maculopathy, COVID-19, COVID-19 vaccine.

INTRODUCTION

Paracentral acute middle maculopathy (PAMM) was defined by the presence of a hyper-reflective band covering the inner nuclear layer (INL), followed by the development of INL atrophy, on optical coherence tomography (OCT).¹ PAMM is thought to result from retinal ischemia via the intermediate capillary plexus and/or the deep capillary plexus.^{2,3} Various vasculopathic risk factors and systemic diseases have been associated with PAMM.^{3,4}

PAMM, has been reported with SARS-CoV-2 infection and possibly represent post-infectious complications.⁵⁻⁷ Although, the exact mechanisms of these complications are unclear, SARS-CoV-2 infection can cause an inflammatory and procoagulatory state by affecting endothelial cells, which can lead to vascular thromboembolic complications.^{8,9}

PAMM is one of the potential retinal adverse events after previously reported COVID-19 vaccines.^{7,10,11} We report a case of PAMM following the COVID-19 vaccination.

Case Report

A case of 67-year-old male presented with decreased visual acuity in the right eye (OD) a few days after receiving his dosage of Pfizer-BioNTech COVID-19 vaccine. The patient stated that three days after receiving his dose of the vaccine, he developed a sudden vision loss in OD. His medical history was significant for acromegaly, diabetes mellitus, hypertension, and hypothyroidism. Best corrected visual acuity (BCVA) was 20/60 in OD and 20/20 in the left eye (OS). Intraocular pressure (IOP) was normal. Dilated fundus examination revealed a white retinal lesion in the superior parafoveal area and optic disc edema in his OD (figure 1A). Fundus autofluorescence (FAF) showed hypo-autofluorescence in the area responding to the retinal lesion and optic disc (figure 1B) in his OD and FAF was normal in his OS. Fundus fluorescein angiography (FA) showed hypofluorescence in the superior parafoveal area with late disc leakage in OD and FA was normal in OS (figure 1C and 1D).

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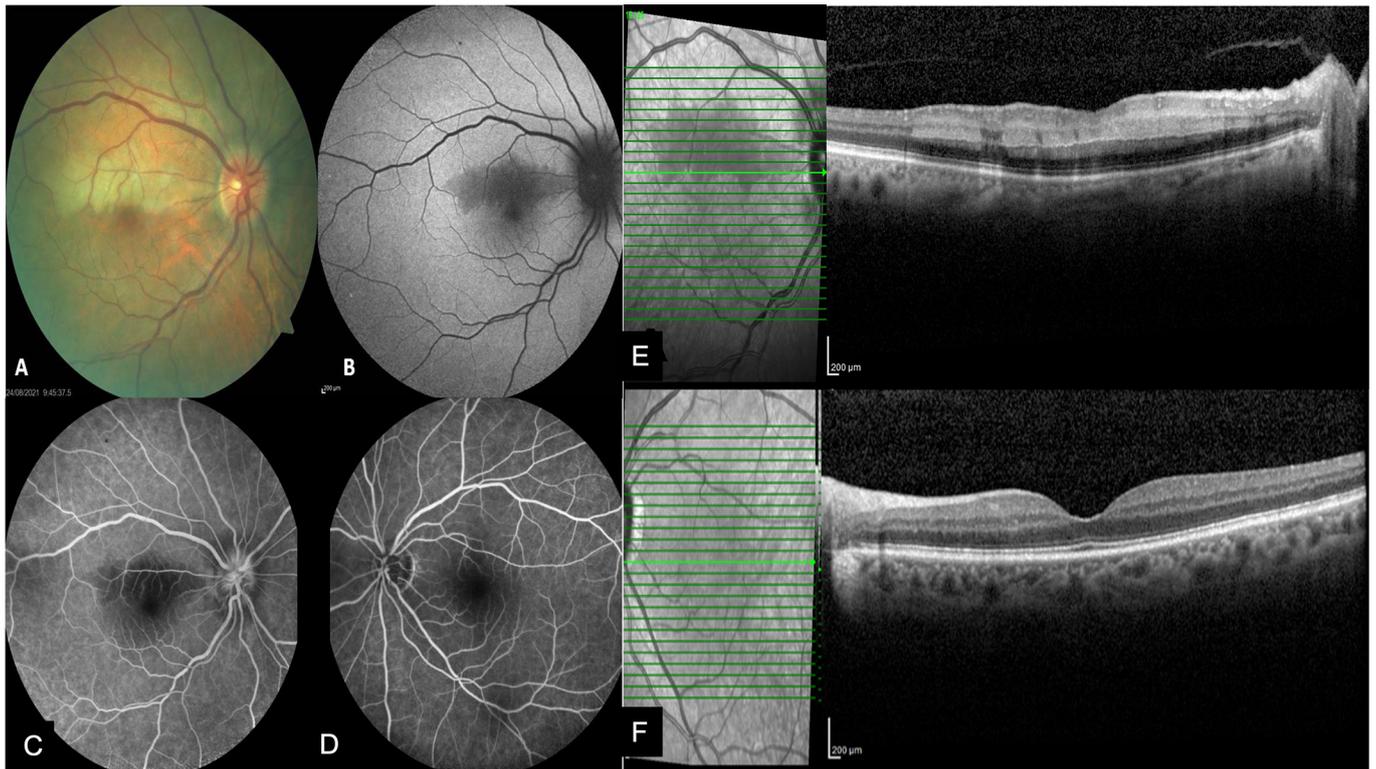


Figure 1: A. Color fundus photograph of right eye showing whitish retinal lesion on superior parafoveal area. retinal and disc edema. B. Fundus autofluorescence (FAF) showing hypo-autofluorescence in the superior parafoveal area and peripapillary area in right eye. C. Fundus Fluorescein Angiography (FA) of right eye showing hypofluorescence in superior perifoveal area and late disc leakage. D. Normal FA of left eye E. Spectral domain optical coherence tomography (SD-OCT) of right eye showing a hyperreflective band in the inner nuclear layer and it extends from the outer to inner plexiform layers. F. No significant findings on SD-OCT of left eye.

Spectral domain optical coherence tomography (SD-OCT) demonstrated the presence a hyperreflective band like lesion along the INL and extending from the OPL to IPL in OD (figure 1E), while OCT was normal in OS (figure 1F). The patient was diagnosed with PAMM in OD. The patient was seen after 6 weeks, BCVA of OD did not improve and follow-up SD-OCT showed atrophy and thinning in the middle retinal layers (figure 2).

DISCUSSION

The Pfizer-BioNTech COVID-19 is a lipid nanoparticle-formulated, nucleoside-modified ribonucleic acid (RNA) vaccine encoding a prefusion-stabilized, membrane-anchored severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) full-length spike protein. It is highly efficacious against COVID-19 and is currently approved, conditionally approved, or authorized for emergency use worldwide.¹²

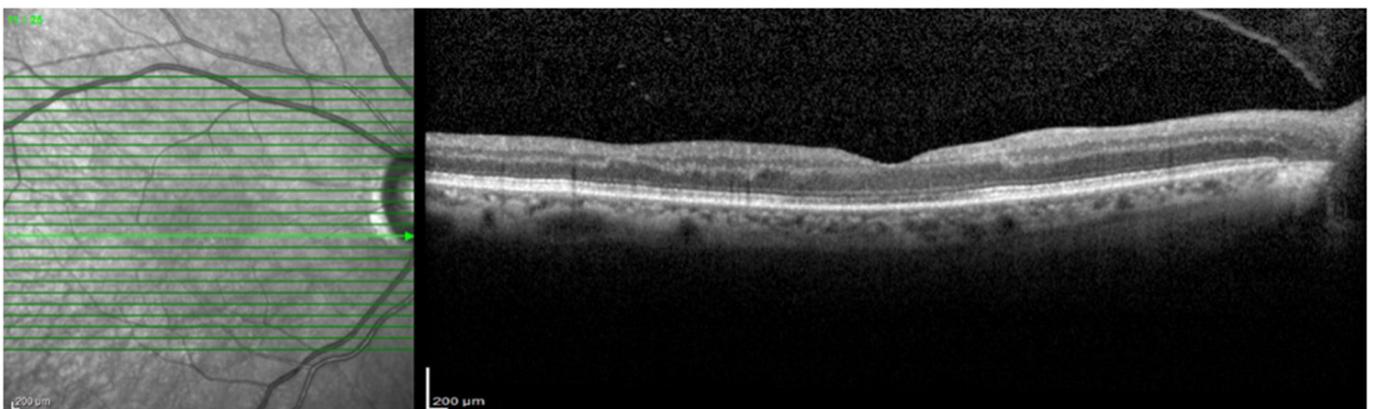


Figure 2: Follow-up OCT after 6 weeks showing atrophy and thinning of the middle retinal layers in right eye.

PAMM cases have been reported following the SARS-CoV-2 infection in the literature. The manifestations are due to abnormal vascular, inflammatory, and neuronal changes by the viral infection.^{5, 13, 14} And now in the era of covid vaccination, various case reports are surfacing showing variable ocular adverse effects and their possible relation to COVID-19 vaccination.^{7, 10, 15} Valenzuela et al. reported a case of 20-year-old female presented for photopsia and scotomata in both eyes 48 hours after receiving her second dose of the Pfizer-BioNTech COVID-19 vaccine, and she was diagnosed as AMN based on OCT findings.¹⁵ And in our patient, the symptoms developed within three days after the administration of the vaccine. Vinzamuri et al. reported a 34-year-old male presented with blurring of vision, black spots in vision, and reduced brightness of vision in his eyes for 4 weeks after receiving the first dose of SARS-CoV-2 vaccination. The patient was diagnosed with bilateral PAMM and AMN based on the OCT.⁷ The patient was reassessed after 3 weeks. Symptomatically, he reported slight improvement of brightness sensitivity, but still complained of black spots in his central field of vision. His visual acuity was 20/20 in both eyes. In our patient, there was decrease in visual acuity and did not improve during follow up suggesting a more severe course of presentation. Dehghani et al. reported a case of 38-year-old man who presented with the complaint of sudden onset of visual loss in his right eye, 2 weeks after his COVID-19 vaccination by the inactivated virus vaccine, that lasted for about an hour then developed tiny dark spots in his visual field and flashing lights. BCVA was 20/20 in both eyes and the OCT showed parafoveal hyper-reflective band involving OPL, INL, and IPL of the right eye thus diagnosed as PAMM.¹⁶ In our patient the onset of symptoms was earlier within three days, and he developed a vision loss in OD that did not resolve, and his OCT findings were similar.

In our case report, visual symptoms developed just three days after COVID-19 vaccine. His main symptom was an unresolved decrease in visual acuity, while in the other case reports, BCVA was not affected, and the symptoms were mainly photopsia and scotoma. Our patient had a more severe clinical course possibly related to his general health conditions associated systemic conditions including diabetes mellitus and hypertension, making the retina more liable to ischemic damage possibly related to COVID-19 vaccination. Therefore, even though our patient harbored several risk factors for PAMM due to his history, the temporal association of his symptoms with the vaccination points toward an association, but with a more severe course.

In conclusion, we report a presentation of PAMM following

the SARS-CoV-2 vaccination. Many case reports are now emerging in the literature that are showing various ocular adverse effects post COVID-19 vaccination. There is a need for more studies to describe the association between Covid vaccination and immunological sequela. The aim of this case report is not to discourage against vaccination, as the vaccination is proven to be safe by many studies, but to add to the knowledge of immunologic sequelae after COVID-19 vaccination.

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