

A case of paracentral acute middle maculopathy after small incision lenticule extraction surgery

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Dear Editor,

Paracentral acute middle maculopathy (PAMM) is characterized by optical coherence tomography (OCT) finding of a hyper-reflective band spanning the inner nuclear layer (INL), which is primarily due to ischemic hypoxia caused by impaired perfusion of the deep capillary plexus of the retina. PAMM is most commonly associated with primary retinal vascular diseases, such as retinal veins or arteries occlusion, diabetic or hypertensive retinopathy. Other causes include hypercoagulable states, iatrogenic complications from ocular procedures or systemic intervention, and some rare inflammatory and congenital conditions^[1]. Herein, we report a case of PAMM that occurred after small incision lenticule extraction (SMILE) surgery.

A 27-year-old female suffered blurred vision and paracentral scotoma in superotemporal area in her right eye one week after SMILE surgery. She was referred to our clinic two more weeks later. At the first presentation, she had no blurred vision any more but still fixed scotoma. She denied other visual symptoms and her medical history was insignificant. Her best corrected visual acuity was 20/16 OD. The anterior segment examination and intraocular pressure were unremarkable. The color fundus

photography revealed a grey-white lesion in the inferotemporal area to the fovea in the right eye, corresponding to a hyper-reflective band spanning the INL on OCT. The fundus autofluorescence and fluorescein angiography examination were normal. However, the reduced retinal blood flow of the corresponding area in OCT angiography and oval patches of hyperreflectivity in a globular pattern on enface OCT were observed (Figure 1). No remarkable findings were detected in her left eye.

She was presumptively diagnosed with PAMM and initially treated with a periocular injection of triamcinolone acetonide (TA; 20 mg) along with oral intakes of Ginaton and mecobalamin. Four months later, the lesion was diminished obviously (Figure 2) and her subjective symptom of paracentral scotoma was significantly improved.

DISCUSSION

PAMM is generally believed to be caused by ischemic hypoxia of retinal middle tissue^[1]. In this case, oval patches of hyperreflectivity in the globular pattern on enface OCT are thought to represent distal ischemic events in smaller terminal retinal arterioles, precapillaries and capillaries^[2]. This patient was a young healthy individual with unremarkable medical history except the SMILE surgery one week before the acute onset. Therefore, the ischemic event might be due to anesthetic or surgical factors that have been hypothesized as potential contributors^[3-4]. The stimulus by periocular anesthesia before surgery might play a role in paracentral hypoperfusion, and the spasm or transient occlusion of the retinal vascular system might occur during invasive procedures such as creating the small incision and lenticule extractions. However, the time lag was the obstacle to establish a definitive link between PAMM and SMILE. One possible theory that might explain this phenomenon is the reperfusion injury after an ischemic event, which could cause damage due to increased levels of oxygen-derived free radicals and inflammatory cytokines over time^[2]. Another explanation is also related to the inflammatory process, similar to the transient light-sensitivity syndrome after SMILE but attacked the more distant place (*i.e.*, parafoveally middle retinal layers)^[5].

In the literature, there have been several reports about PAMM secondary to other ocular surgeries, including cataract surgery,

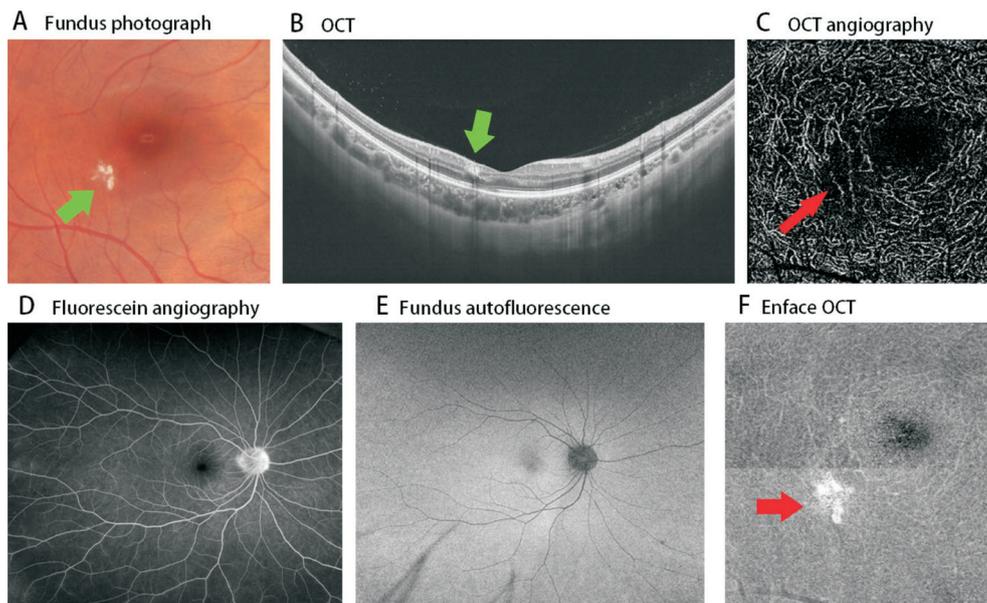


Figure 1 Images at initial visit A: Color fundus photography demonstrated a white-greyish lesion (arrow); B: OCT revealed a hyper-reflective band spanning the INL (arrow); C: Reduced retinal blood flow (arrow) were detected by OCT angiography; D, E: Fundus autofluorescence and fluorescein angiography did not show abnormal signs; F: Oval patches of hyperreflectivity in a globular pattern (arrow) on enface OCT.

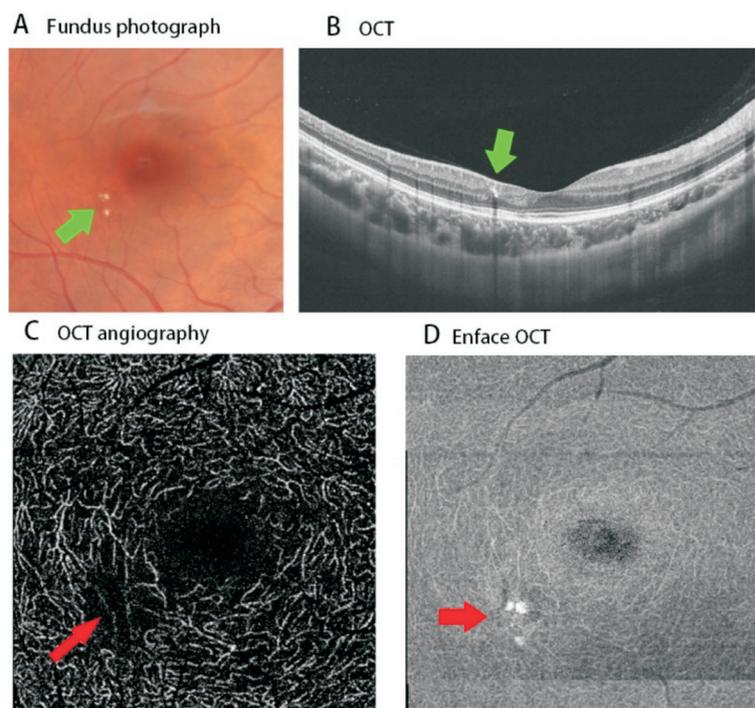


Figure 2 Images at 4-month follow-up A: The white-greyish lesion (arrow) was diminished obviously; B: Gradual resolution of the hyper-reflective band spanning on the INL (arrow); C: Reduced blood flow was not restored on OCT angiographic image (arrow); D: Oval patches of hyperreflectivity in a globular pattern on enface OCT were diminished obviously (arrow).

pterygium surgery, and vitrectomy^[3-4,6-9]. However, to the best of our knowledge, this is the first report about PAMM after SMILE. The specific mechanisms remained unknown but the hypo-perfusion of the retinal vasculature due to the systemic, anesthetic or surgical factors has been recognized. Creese *et al*^[3] reported 10 cases with PAMM after cataract surgery, predominantly in eyes with preexisting low perfusion of the

retinal circulation. Nakashima *et al*^[4] retrospectively studied PAMM following vitrectomy for patients with proliferative diabetic retinopathy, suggesting that severe preexisting microvascular insufficiency led to tissue hypoxia and the development of PAMM. Both case series indicated that underlying vasculopathy might make patients vulnerable to ischemic insult as a result of surgical invasion. Another two

case reports about vitrectomy for vitreous hemorrhage and epiretinal membrane removal also reflected this opinion^[7,9]. However, PAMM could occur in the absence of cardiovascular risk factors, and even in the young healthy adults, just like our patient^[6,8]. This suggested that other possible mechanisms existed, such as local anesthetic induced arterial vasospasm and surgically induced intraocular pressure elevation. While the recurrence of PAMM might be more related to the systemic condition and primary etiology. Despite Creese *et al*^[3] and Nakashima *et al*^[4] tried to identify the risk factors of PAMM occurrence after ocular surgery, we still could not draw a conclusion about high-risk patients due to the rarity of this disorder. More researches were needed to reveal the pathogenesis about the occurrence and recurrence of PAMM after ocular surgery. Nonetheless, as more is discovered about PAMM, we need to learn that careful fundus examination should be attached great importance after the ocular surgery. There is currently no treatment guideline for PAMM. To prevent the damage of inflammatory cytokines to the retina and subsequent severe vision loss and lesion progression, we started the treatment with periocular injection of TA. Encouragingly, the prognosis is satisfactory. Despite the corticosteroid seemed to be suitable for her situation, we still wondered whether the patient's condition would get worse or recover more quickly without invasive TA injection. This unique case highlights the importance of early fundus examination after ocular surgery, which may help elucidate the mechanism of PAMM after surgical interventions. Meanwhile, standard treatment strategies for PAMM still need more active investigations.

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REFERENCES

- 1 Scharf J, Freund KB, Sadda S, Sarraf D. Paracentral acute middle maculopathy and the organization of the retinal capillary plexuses. *Prog Retin Eye Res* 2021;81:100884.
- 2 Sridhar J, Shahladee A, Rahimy E, Hong BK, Khan MA, Maguire JJ, Dunn JP, Mehta S, Ho AC. Optical coherence tomography angiography and en face optical coherence tomography features of paracentral acute middle maculopathy. *Am J Ophthalmol* 2015;160(6):1259-1268.e2.
- 3 Creese K, Ong D, Sandhu SS, Ware D, Alex Harper C, Al-Qureshi SH, Wickremasinghe SS. Paracentral acute middle maculopathy as a finding in patients with severe vision loss following phacoemulsification cataract surgery. *Clin Exp Ophthalmol* 2017;45(6):598-605.
- 4 Nakashima H, Iwama Y, Tanioka K, Emi K. Paracentral acute middle maculopathy following vitrectomy for proliferative diabetic retinopathy: incidence, risk factors, and clinical characteristics. *Ophthalmology* 2018;125(12):1929-1936.
- 5 Desautels JD, Moshirfar M, Quist TS, Skanchy DF, Hoopes PC. Case of presumed transient light-sensitivity syndrome after small-incision lenticule extraction. *Cornea* 2017;36(9):1139-1140.
- 6 O'Day R, Harper CA, Wickremasinghe SS. Central retinal artery occlusion showing features of paracentral acute middle maculopathy following uncomplicated pterygium surgery. *Clin Exp Ophthalmol* 2019;47(1):141-143.
- 7 Hooshmand J, Moore P, McKay D, Vote BJ. Paracentral acute middle maculopathy associated with severe vision loss following vitrectomy for vitreous haemorrhage. *Clin Exp Ophthalmol* 2018;46(6):706-708.
- 8 Pham C, Boo A, Chew SKH, Okada M. Paracentral acute middle maculopathy in a young patient following routine phacoemulsification surgery. *Clin Exp Ophthalmol* 2019;47(9):1206-1209.
- 9 Ang MJ, Chen JJ, McDonald HR. Paracentral acute middle maculopathy after epiretinal membrane removal. *Retin Cases Brief Rep* 2021;15(6):647-650.