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A new surgical approach for the treatment of a refractory foveal microaneurysm: A case report

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ABSTRACT

Purpose: To report a case of a refractory foveal microaneurysm (MA) that was successfully treated by use of a new surgical procedure.

Observations: This study involved a 79-year-old female with an active foveal MA associated with branch retinal vein occlusion in her left eye. Despite anti-vascular endothelial growth factor treatments, the MA remained active without closure, and best-corrected visual acuity (VA) gradually decreased from 20/20 to 20/200. After our new surgical procedure was explained in detail to the patient, written informed consent was obtained from the patient and the surgery was performed. Briefly, following pars plana vitrectomy, the internal limiting membrane in her left eye was peeled and the retina of the external wall of the MA was then gently incised. The exposed MA was then directly grabbed and pulled up onto the retina using 27-gauge microforceps, and photocoagulation was performed. At 3-months postoperative, closure of the MA and improvement in the retinal findings were observed, and best-corrected VA improved to 20/67.

Conclusions and importance: We report a case of a refractory foveal MA that was successfully treated with a novel surgical technique that closed the MA, avoided thermal damage to the surrounding tissue, and resulted in improved postoperative VA.

1. Introduction

Retinal microaneurysms (MAs) are reportedly caused by diabetic retinopathy, branch retinal vein occlusion (BRVO), macular telangiectasia (MacTel) type 1, and other retinal diseases. The endothelial cell junctions in MA are fragile, thus resulting in protein- and lipid-rich exudation, hemorrhage, and edema, which can ultimately lead to vision loss. For the treatment of MA, direct retinal photocoagulation performed more than 500 μm from the fovea is the 'first choice' treatment,[1,2] as it prevents decrease of visual acuity (VA) due to thermal damage.

The indications for vitrectomy for vitreoretinal diseases are increasing with the development of new surgical instruments. Although there have been reports of surgical indications for complications secondary to MA, such as removal of submacular hard exudates (HEs)[3] and cystotomy for cystoid macular edema (ME),[4] there have been no reports of a surgical procedure for successful closure of a foveal MA.

In this study, we report a case of a refractory foveal MA that was successfully treated with a novel surgical technique that closed the MA, avoided thermal damage to the surrounding tissue, and resulted in improved VA post surgery.

2. Case report

This study involved a 76-year-old female with a large foveal MA and surrounding HEs and retinal hemorrhage in her left eye diagnosed as BRVO, and no retinal disease in her right eye. Following her initial visit in July 2009, the patient underwent multiple anti-vascular endothelial growth factor (VEGF) treatments for ME in the left eye, yet closure of the MA was not achieved. HE deposition and retinal hemorrhage occurred, resulting in a decrease of best-corrected VA (BCVA) from 20/20 at initial presentation to 20/200 in July 2022 (Fig. 1A). In September 2022, after explaining the benefits and disadvantages of our novel surgical treatment for MA, written informed consent was obtained from the patient to

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undergo the surgery. Briefly, standard 27-gauge (G) pars plana vitrectomy using the CONSTELLATION® Vision System (Alcon Laboratories, Inc., Fort Worth, TX) with a wide-angle, non-contact, fundus viewing system (RESIGHT®; Carl Zeiss Meditec AG, Jena, Germany) was performed under sub-Tenon's anesthesia with approximately 5 mL of 2% lidocaine. First, internal limiting membrane peeling for 2 disk diameters was performed using 27-G microforceps, DEX™ Super Grip Forceps (Katalyst™ Surgical, Chesterfield, MO). Next, the external wall of MA was gently torn, and the exposed MA was directly grasped with 27-G microforceps and lifted into the vitreous cavity while separated from the surrounding tissue. Intraoperative focal laser photocoagulation was performed to produce a grayish-white burn of the MA (19 shots; duration: 0.15 seconds per shot; power: 100 mW) with a 27+ Flex-Tip Laser Probe (Alcon Laboratories) (Fig. 2). The MA was then returned to its original position in the retina after confirming that the MA had turned white. Finally, air exchange was performed, and the surgery was completed after confirming the closure of the wound without sutures. From the first day postoperative, no intraocular pressure increase, intraocular inflammation, or vitreous hemorrhage was observed. At 1-month postoperative, the size of the aneurysm was reduced, with improvement of retinal edema and decrease of the retinal hemorrhage and HE. At 3-months postoperative, resolution of the ME was observed, and BCVA improved to 20/67. Fundus angiography showed no obvious MA on indocyanine green angiography examination and weaker late fluorescent leakage on fluorescein angiography examination than preoperatively, suggesting a shrinkage and reduced activity of MA (Fig. 1B).

3. Discussion

The findings in this case report reveal that our novel surgical procedure for the treatment of a foveal MA secondary to BRVO resulted in a successful closure of the MA and improvement of the patient's VA.

Reportedly, an MA can arise secondary to diabetic retinopathy,[5] BRVO,[6] MacTel type 1[7], etc., and cause visual impairment when ME develops. Retinal ischemia-induced production of VEGF is thought to be involved in the development of MA secondary to BRVO, and early VEGF treatment is known to reduce the incidence of MA.[8] Treatment options for MA include *anti*-VEGF therapy and retinal photocoagulation, however, retinal photocoagulation is not indicated for the treatment of parafoveal MA because of the potential for tissue damage due to thermal injury to the surrounding tissue.

Although there are many previous reports of surgical procedures being performed for diseases of the retina, such as a preretinal hemorrhage,[9] and of the subretina, such as a subretinal hemorrhage[10] and HE deposits,[3] there are few reported of cases undergoing cystotomy[4] within the retina, especially in the macula. In the case in this current report, the use of a 27-G microforceps made it possible to directly grasp the MA with clear visibility, which greatly contributed to the success of the surgery. In such cases, evaluation of surgical invasion and more detailed preoperative evaluation are important, and it is advisable to evaluate retinal sensitivity by microperimetry and imaging by adaptive optics optical coherence tomography before and after surgery.

4. Conclusion

In conclusion, we report a case of a refractory and large foveal MA that was successfully treated with a novel surgical technique that avoids thermal tissue damage caused by retinal photocoagulation of the aneurysm and result in improved VA post surgery, thus suggesting that it can safely be applied as a treatment option for foveal MA.

Patient consent

The patient orally consented to the publication of the case.

This report does not contain any personal information that could lead to the identification of the patients.

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Authorship

All authors attest that they meet the current ICMJE criteria for Authorship.

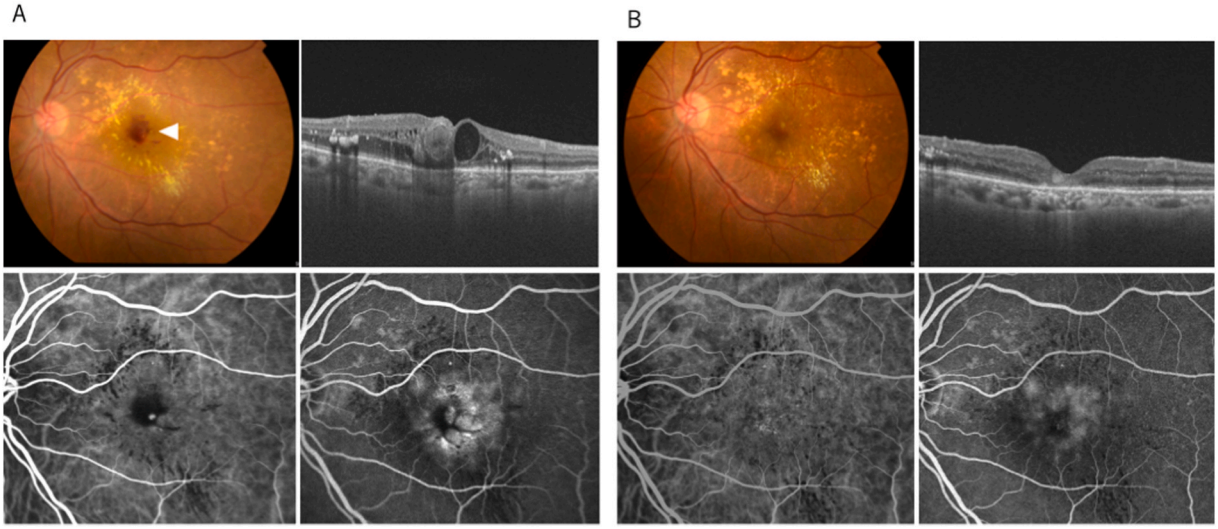

Fig. 1. A) Images of the preoperative fundus findings. Fundus color photograph showing a refractory foveal microaneurysm (MA) (arrowhead) and retinal hemorrhage in the fovea with surrounding hard exudates (HEs) (upper left), and a vertical-section optical coherence tomography (OCT) image showing high intensity MA in the fovea (upper right). Fundus angiography revealed MA in the macula on early indocyanine green angiography (ICGA) examination (lower left) and fluorescent leakage around the MA on late fluorescein angiography (FA) examination (lower right). B) Images of the fundus findings at 3-months postoperative. The findings of MA whitening with reduction of retinal hemorrhage and HEs were confirmed (upper left). The closure of the MA was confirmed by vertical-section OCT (upper right). Fundus angiography also confirmed closure of the MA in the macula on early ICGA examination (lower left), and FA examination showed decreased late fluorescence leakage around the MA (lower right).

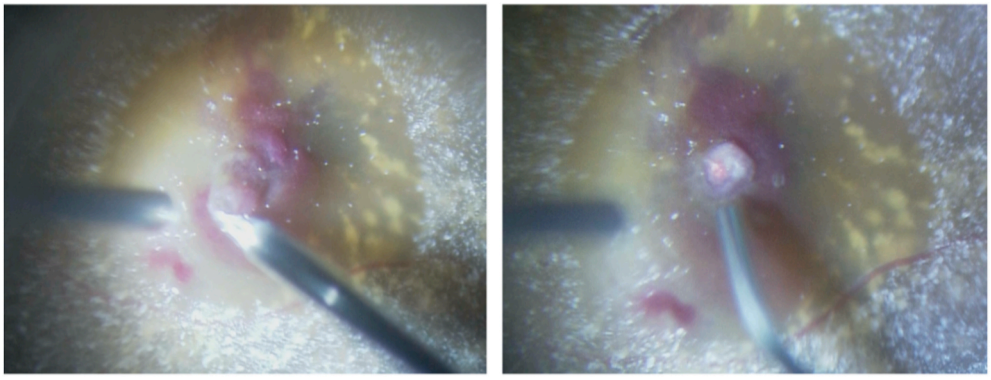

Fig. 2. Images of the intraoperative findings. After incising the inner retina, the MA was grasped with 27-gauge microforceps and dissected from the surrounding tissue (left). Intraoperative endolaser focal photocoagulation was performed laterally and all around on the MA in the vitreous cavity using a curved laser (right).

CRediT authorship contribution statement

Hiroshi Tanaka: Writing – original draft, Investigation, Data curation, Conceptualization. **Kentaro Kojima:** Writing – review & editing. **Takafumi Miyatani:** Writing – review & editing. **Natsuki Kusada:** Writing – review & editing. **Nobuhiro Terao:** Writing – review & editing. **Kenji Nagata:** Writing – review & editing. **Chie Sotozono:** Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ajoc.2024.102034.

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