

CASE REPORT

Open Access



Full-thickness macular hole associated with Valsalva retinopathy: a case report

Ja Young Oh¹, Ungsoo Samuel Kim¹, Jae Hoon Jeong¹, Seung Hyeun Lee¹, Jin-Ho Joo¹ and Joon Hyung Yeo^{1*}

Abstract

Background Full-thickness macular hole (FTMH) associated with Valsalva retinopathy has been rarely reported. In this report, we describe a case of surgically treated FTMH secondary to Valsalva retinopathy.

Case presentation A 59-year-old male complained of a sudden decrease in visual acuity of the left eye after straining on the toilet for 2 weeks. Best-corrected visual acuity (BCVA) of the left eye was counting fingers at 30 cm. Dilated fundus imaging revealed multiple preretinal hemorrhages involving the fovea. Optical coherence tomography (OCT) revealed a dome-shaped elevated lesion with a hyperreflective surface and hyporeflective area underneath. After 6 weeks of observation, the preretinal hemorrhages were almost completely absorbed, and visual acuity of the left eye improved to 0.06. However, OCT revealed an FTMH. After 12 weeks, no improvement in visual acuity was observed, and the macular hole did not close spontaneously. The patient underwent vitrectomy with indocyanine green-assisted internal limiting membrane peeling and gas tamponade. One month postoperatively, closed macular hole was confirmed using OCT, and the BCVA improved to 0.4.

Conclusions FTMH associated with Valsalva retinopathy is rare, and its underlying mechanism requires further investigation. Surgical intervention can achieve closure of the FTMH and lead to improvement in visual acuity.

Keywords Macular hole, Valsalva retinopathy, Vitrectomy

Background

Valsalva retinopathy was first described in 1972 by Duane [1], and it is known to occur because of a sudden increase in intrathoracic pressure or intra-abdominal pressure during a Valsalva maneuver, such as strenuous exercise, vomiting, coughing, nose blowing, childbirth, or sexual activity. The Valsalva maneuver leads to an elevation in intraocular venous pressure, resulting in rupture of the retinal capillaries [2–4]. Valsalva retinopathy can result in hemorrhage in any layer of the retina or vitreoretinal

space. Hemorrhages involving the macular area can lead to sudden and severe decreases in visual acuity. The prognosis of Valsalva retinopathy is generally favorable, with spontaneous resolution of hemorrhage without treatment in most cases, although it may take several weeks to months.

Valsalva retinopathy is a relatively common condition; however, full-thickness macular hole (FTMH) associated with Valsalva retinopathy has rarely been reported [5, 6]. Herein, we report a case of surgically treated FTMH secondary to Valsalva retinopathy and review the relevant literature.

*Correspondence:

Joon Hyung Yeo
yjoonh@daum.net

¹Department of Ophthalmology, College of Medicine, Chung-Ang University Gwangmyeong Hospital, Gwangmyeong, Gyeonggi-do, Korea



© The Author(s) 2025. **Open Access** This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, which permits any non-commercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if you modified the licensed material. You do not have permission under this licence to share adapted material derived from this article or parts of it. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by-nc-nd/4.0/>.

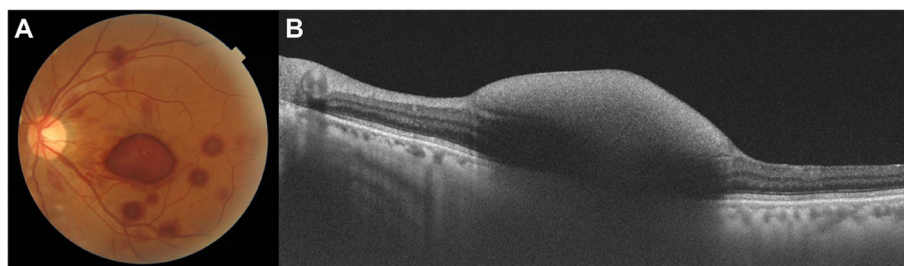


Fig. 1 Fundus photograph and optical coherence tomography (OCT) image of the left eye at the initial visit. **A** Fundus photography demonstrates multiple preretinal hemorrhages involving the fovea; **B** OCT shows a dome-shaped elevated lesion with a hyperreflective surface and hyporefective area below it

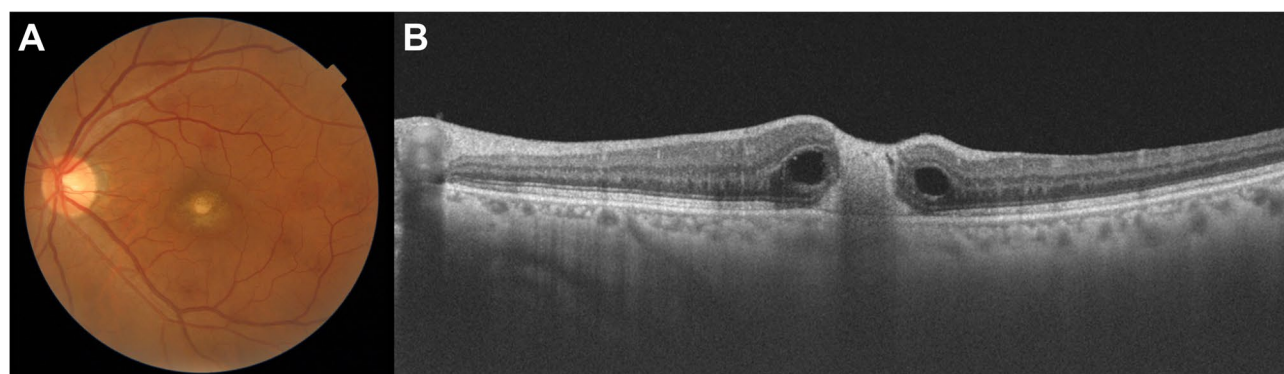


Fig. 2 Fundus photograph and OCT image 6 weeks after the initial visit. **A** After 6 weeks of observation, dilated funduscopic examination shows remarkable absorption of the hemorrhage; **B** OCT shows a full-thickness macular hole, with retinal edema on either side of the hole

Case presentation

A 59-year-old male complained of a sudden decrease in visual acuity of his left eye after straining on the toilet for 2 weeks. His medical history was unremarkable, except for well-controlled dyslipidemia. At presentation, vital signs, including blood pressure, pulse rate, and body temperature, were within normal limits, and no remarkable findings were noted on physical examination. Best corrected visual acuity (BCVA) of the right eye was 20/20 and that of the left eye was counting fingers at 30 cm. The intraocular pressure was normal in both eyes, and the findings of the anterior segment examinations were unremarkable. Dilated fundus imaging revealed multiple preretinal hemorrhages involving the fovea (Fig. 1A). Swept-source optical coherence tomography (OCT) revealed a dome-shaped elevated lesion with a hyperreflective surface and hyporefective area below it (Fig. 1B).

Fundus fluorescein angiography revealed masking due to hemorrhage; however, no other retinal vascular pathology was observed. The blood test results were normal. Valsalva retinopathy was diagnosed, and various treatment options, including observation, Nd: YAG laser membranotomy, and vitrectomy, were discussed with the patient. The patient preferred to undergo observation.

After 6 weeks of observation, the fundus examination showed significant improvement in the multiple preretinal hemorrhages, although a small amount of hemorrhage

remained in the macular area (Fig. 2A). The BCVA of the left eye improved slightly to 20/320. OCT revealed an FTMH filled with an unresolved hemorrhage in the macular area and retinal edema on either side of the hole (Fig. 2B). After an additional 4 weeks of follow-up, although complete resolution of the hemorrhage was observed, no improvement in visual acuity was observed. OCT revealed that the internal limiting membrane (ILM) on top of macular hole was still attached; however, neither an epiretinal membrane nor posterior vitreous detachment (PVD) was observed (Fig. 3A). After 8 weeks of no improvement in visual acuity, the macular hole persisted, although retinal edema on either side of the hole appeared to decrease (Fig. 3B). Subsequently, vitrectomy with ILM peeling and intraocular gas tamponade were planned.

A vitrectomy was performed under general anesthesia using 25-gauge, 3-port pars plana technique (Constellation; Alcon Surgical, Fort Worth, TX, USA). After inducing PVD and removing the vitreous, the ILM was stained with 0.05% indocyanine green (Diagnogreen; Daiichi Sankyo, Tokyo, Japan) above the macula, followed by lavage. The ILM was peeled off centripetally, approximately 3 disc diameters around the macular hole. This was followed by fluid-air exchange and intraocular gas tamponade using perfluoropropane (C_3F_8 , 10%). The patient was instructed to maintain a face-down position for 7 days postoperatively.

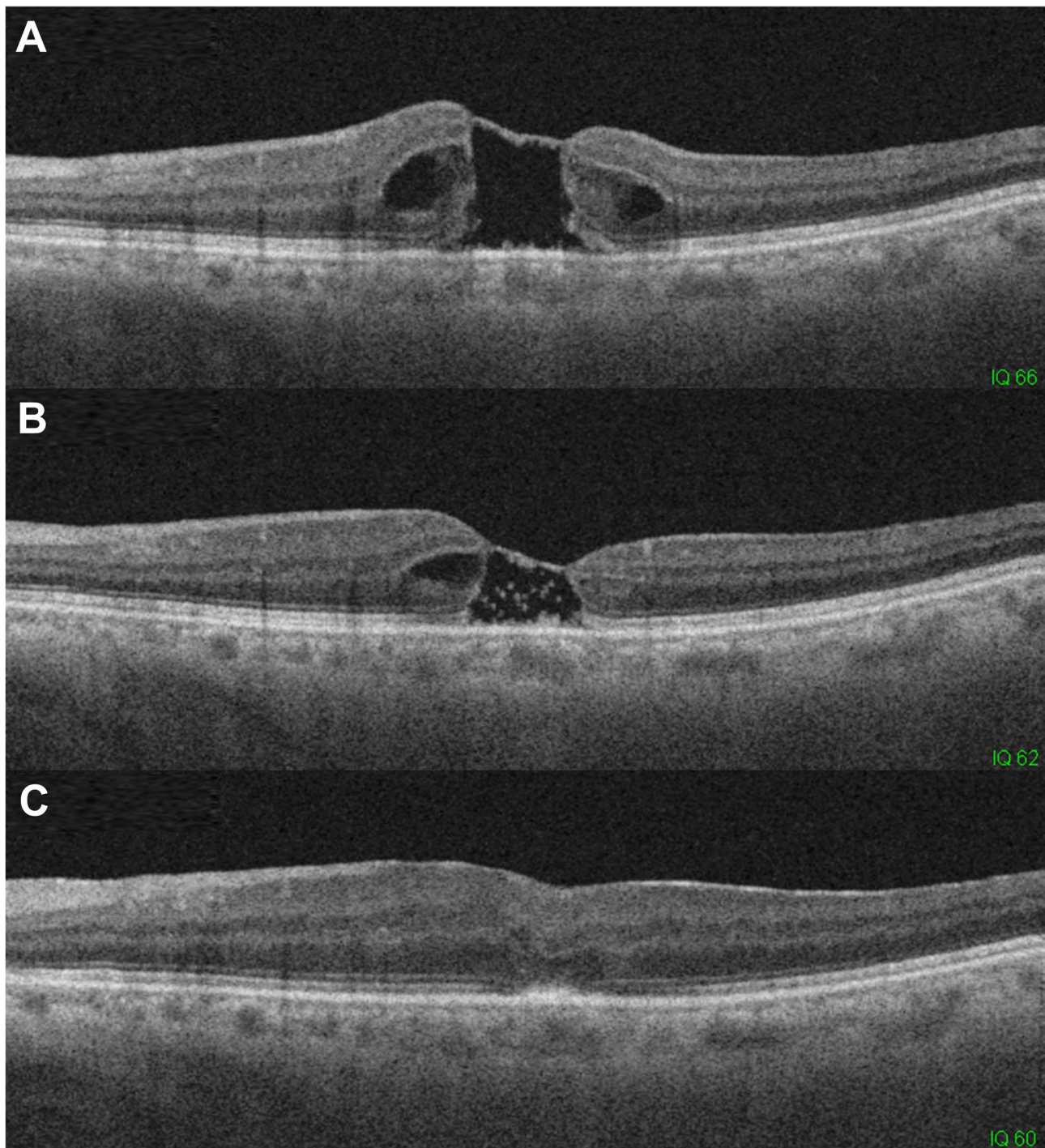


Fig. 3 Consecutive OCT images 10 weeks after the initial visit, 18 weeks after the initial visit, and postoperatively. **A** The hemorrhage is completely resolved without closure of the macular hole. OCT demonstrates that the internal limiting membrane on the top of the macular hole is still attached; **B** After 8 weeks of observation, retinal edema on either side of the hole appears to decrease. However, the macular hole persists; **C** Four weeks after vitrectomy, macular hole is closed

Four weeks after vitrectomy, the macular hole was documented to have closed, with reconstitution of the foveal architecture (Fig. 3C). The BCVA of the left eye improved to 20/50.

Discussion and conclusions

In most cases of Valsalva retinopathy, hemorrhage may be self-limiting, and conservative treatment is widely used. However, slowly resolving hemorrhages may lead to the formation of an epiretinal membrane as well as

toxic damage to the retina due to exposure to hemoglobin, iron, and hemosiderin [7–9]. In some circumstances, treatment with Nd: YAG laser or vitrectomy provides rapid visual recovery [10–12]. Although these treatment modalities are generally considered effective and safe [13], there have been some reports of the development of macular hole following procedures for Valsalva retinopathy [10, 14–16]. However, reports of FTMH associated with untreated Valsalva retinopathy are rare, and to the best of our knowledge, there have been no reports of surgical treatment for such cases.

Kim et al. [14] reported a macular hole after vitrectomy for Valsalva retinopathy. In addition, Ulbig et al. [10] reported a macular hole identified after Nd: YAG laser treatment for Valsalva retinopathy that drained a premacular subhyaloid hemorrhage into the vitreous. However, in this case, the FTMH developed spontaneously without any invasive treatment. Initially, owing to the presence of a large amount of hemorrhage in the macular area, the FTMH could not be directly visualized on OCT. Therefore, it is unclear whether the FTMH was present from the onset or developed secondarily during the resolution of premacular hemorrhage. Although the mechanism underlying FTMH formation in Valsalva retinopathy is not fully understood, several plausible mechanisms have been proposed. First, FTMH could have been induced directly by a substantial amount of hemorrhage originating from the intraretinal or subretinal layer and breaking through the neurosensory layers. In Valsalva retinopathy, retinal hemorrhage is commonly caused by the rupture of superficial capillaries, resulting in a hemorrhage beneath the posterior hyaloid membrane or ILM. However, in a retrospective study of 58 eyes, the hemorrhage was reported to be located in the intraretinal and subretinal layers in 32.7% and 13.4% of cases, respectively [3]. Second, tangential traction of the macula may have been exerted by the partially detached ILM following the premacular hemorrhage. Tian et al. [5] reported a case of Valsalva retinopathy associated with a macular hole, in which an initial lamellar macular hole progressed to an FTMH 1 week after observation. In that report, Nd: YAG laser membranotomy was performed, and spontaneous closure of the macular hole was observed 12 weeks after treatment. Therefore, if the Nd: YAG laser had been applied early in the present case, the sub-ILM hemorrhage may have been absorbed rapidly, leading to early relief of ILM tension and potentially preventing the formation of the macular hole. Third, a large preretinal hemorrhage may have exerted considerable physical pressure on the macular area, resulting in structural damage. Moreover, the toxic effect of dissolved hemoglobin resulting from long-standing contact between the blood and retina could have caused further retinal damage. Lastly, FTMH formation might be the result of PVD caused by a Valsalva retinopathy-induced premacular hemorrhage and the associated anteroposterior traction at the vitreofoveal

interface. However, given that the intraoperative findings confirmed the absence of PVD in the present case, it is unlikely that PVD contributed to the formation of FTMH.

Xie et al. [6] reported a case of FTMH associated with Valsalva retinopathy. In their report, the macular hole was detected using OCT 3 months after the onset, and on OCT, the ILM appeared to remain attached over the macular hole, similar to the findings in our case. However, in contrast to this case, the visual acuity improved from counting fingers to 20/160 after 3 months of observation and reached 20/25 by 9 months after onset. With no complaints of metamorphopsia, the macular hole was observed without treatment 17 months after onset. The authors suggested the possibility of paracentral eccentric fixation near the fovea as a potential explanation for the improvement in visual acuity despite the persistence of the macular hole. They also proposed that the macular hole in their case represented an outer retinal lamellar macular hole rather than an FTMH. However, according to the International Vitreomacular Traction Study Group classification, lamellar macular hole can be distinguished from FTMH on OCT by the presence of intact photoreceptors at the base [17]. Therefore, the OCT findings in their case were consistent with those of an FTMH.

Although Nd: YAG laser membranotomy or vitrectomy has the advantage of achieving rapid visual recovery, it has potential risks of complications, such as macular holes, epiretinal membranes, and retinal detachment [3, 18, 19]. Accordingly, Rohowetz et al. [3] suggested that observation is appropriate for most patients with Valsalva retinopathy, whereas vitrectomy may be indicated for cases that require prompt resolution of the hemorrhage. However, in cases of FTMH associated with Valsalva retinopathy and limited visual recovery, early intervention, such as Nd: YAG laser membranotomy or vitrectomy, is crucial for preventing irreversible retinal damage. Furthermore, given the potential risk of FTMH development in Valsalva retinopathy, close monitoring is essential for the timely detection of its occurrence. If there is no improvement in visual acuity or spontaneous anatomical closure, early consideration of the appropriate treatment is warranted.

In summary, this is the first report on the surgical treatment of FTMH associated with Valsalva retinopathy. Careful evaluation with OCT is essential not only at the time of diagnosis of Valsalva retinopathy but also during the absorption of preretinal hemorrhage to detect any associated macular hole. Surgical treatment can achieve closure of the macular hole along with improvement in visual acuity. However, further studies are required to determine the optimal timing of surgery.

Abbreviations

FTMH	Full-thickness macular hole
BCVA	Best corrected visual acuity
OCT	Optical coherence tomography

ILM Internal limiting membrane
PVD Posterior vitreous detachment

Acknowledgements

Not applicable.

Authors' contributions

J.Y.O. contributed to collecting the clinical information of the patient and literature search and was a major contributor in writing the manuscript. U.S.K. prepared the figures. J.H.J., S.H.L., and J.J. reviewed the manuscript and played significant roles in shaping the discussion. J.H.Y. contributed to the clinical management of the patient, obtained consent from the patient, and revised the manuscript. All authors have read and approved the final manuscript.

Funding

Not applicable.

Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

This study was approved by the Institutional Review Board of Chung-Ang University Gwangmyeong Hospital (Gwangmyeong, Korea; IRB No. 2407-172-086).

Consent for publication

Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

Competing interests

The authors declare no competing interests.

Received: 30 April 2025 / Accepted: 6 October 2025

Published online: 10 November 2025

References

- Duane TD. Valsalva hemorrhagic retinopathy. *Trans Am Ophthalmol Soc.* 1972;70:298–313.
- Kim JY, Lee DH, Lee JH, Yoon le N. Valsalva retinopathy associated with an oratorical contest. *Korean J Ophthalmol.* 2009;23:318–20.
- Rohowetz LJ, Patel V, Sridhar J, Yannuzzi NA. Valsalva retinopathy: clinical features and treatment outcomes. *Retina.* 2023;43:1317–20.
- Celik Dulger S, Ozdal PC, Teke MY. Valsalva retinopathy: long-term results and management strategies. *Eur J Ophthalmol.* 2021;31:1953–60.
- Tian Z, Li H, Zhu Y, Jin X, Li Y, Li X, et al. Spontaneous closure of a macular hole after ND:YAG laser treatment for Valsalva retinopathy in pregnancy. *JAMA Ophthalmol.* 2021;139:807–9.
- Xie ZG, Yu SQ, Chen X, Zhu J, Chen F. Macular hole secondary to Valsalva retinopathy after doing push-up exercise. *BMC Ophthalmol.* 2014;14:98.
- O'Hanley GP, Canny CL. Diabetic dense premacular hemorrhage. A possible indication for prompt vitrectomy. *Ophthalmology.* 1985;92:507–11.
- Ramsay RC, Knobloch WH, Cantrill HL. Timing of vitrectomy for active proliferative diabetic retinopathy. *Ophthalmology.* 1986;93:283–9.
- Meier P, Schmitz F, Wiedemann P. Vitrectomy for pre-macular hemorrhagic cyst in children and young adults. *Graefes Arch Clin Exp Ophthalmol.* 2005;243:824–8.
- Ulbig MW, Mangouritis G, Rothbacher HH, Hamilton AM, McHugh JD. Long-term results after drainage of premacular subhyaloid hemorrhage into the vitreous with a pulsed nd:yag laser. *Arch Ophthalmol.* 1998;116:1465–9.
- Raymond LA. Neodymium:YAG laser treatment for hemorrhages under the internal limiting membrane and posterior hyaloid face in the macula. *Ophthalmology.* 1995;102:406–11.
- De Maeyer K, Van Ginderdeuren R, Postelmans L, Stalmans P, Van Calster J. Sub-inner limiting membrane haemorrhage: causes and treatment with vitrectomy. *Br J Ophthalmol.* 2007;91:869–72.
- Durukan AH, Kerimoglu H, Erdurman C, Demirel A, Karagul S. Long-term results of nd:yag laser treatment for premacular subhyaloid haemorrhage owing to Valsalva retinopathy. *Eye (Lond).* 2008;22:214–8.
- Kim KY, Yu SY, Kim M, Kwak HW. Macular hole formation after Pars plana vitrectomy for the treatment of Valsalva retinopathy: a case report. *Korean J Ophthalmol.* 2014;28:91–5.
- Gaur S, Singh DV, Sharma A. Spontaneous resolution of parafoveal macular hole post YAG hyaloidotomy in a case of Valsalva retinopathy. *Eur J Ophthalmol.* 2023;33:Np113–7.
- Bypareddy R, Chawla R, Azad SV, Takkar B. Iatrogenic parafoveal macular hole following Nd-YAG posterior hyaloidotomy for premacular haemorrhage. *BMJ Case Rep.* 2016;2016.
- Duker JS, Kaiser PK, Binder S, de Smet MD, Gaudric A, Reichel E, et al. The international vitreomacular traction study group classification of vitreomacular adhesion, traction, and macular hole. *Ophthalmology.* 2013;120:2611–9.
- Khadka D, Bhandari S, Bajimaya S, Thapa R, Paudyal G, Pradhan E. Nd:YAG laser hyaloidotomy in the management of premacular subhyaloid hemorrhage. *BMC Ophthalmol.* 2016;16:41.
- Kwok AK, Lai TY, Chan NR. Epiretinal membrane formation with internal limiting membrane wrinkling after nd:yag laser membranotomy in Valsalva retinopathy. *Am J Ophthalmol.* 2003;136:763–6.

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.