• Letter to the Editor •

Unilateral optic disc hemorrhage with peripapillary hyperreflective ovoid mass-like structures and tilted disc in high myopia: a case report

Ying Cheng, Ting Wei, Li-Jun Cui, Shan Gao, Jing-Bo Hu, Si-Han Gu

Department of Ophthalmology, the First Affiliated Hospital of Xi'an Jiaotong University, Xi'an 710061, Shaanxi Province, China

Correspondence to: Ying Cheng. Department of Ophthalmology, the First Affiliated Hospital of Xi'an Jiaotong University, No. 277, Yanta West Road, Xi'an 710061, Shaanxi Province, China. cying514@126.com

Received: 2025-09-16 Accepted: 2026-08-03

DOI:10.18240/ijo.2026.12.23

Citation: Cheng Y, Wei T, Cui LJ, Gao S, Hu JB, Gu SH. Unilateral optic disc hemorrhage with peripapillary hyperreflective ovoid mass-like structures and tilted disc in high myopia: a case report. *Int J Ophthalmol* 2026;19(12):2509-2513

Dear Editor,

We present an intriguing case of a young myopic female with unilateral optic disc hemorrhage (ODH) accompanied by peripapillary hyperreflective ovoid mass-like structures (PHOMS) and a tilted disc. PHOMS have recently been recognized using enhanced depth imaging optical coherence tomography (OCT). PHOMS typically appear as homogeneous and ovoid hyperreflective masses located in the peripapillary region, often forming a doughnut- or torus-like shape encircling the optic disc. PHOMS are believed to arise from impaired axoplasmic flow, causing bulging or herniation of optic nerve fibers laterally into the peripapillary region.

PHOMS are associated with a variety of conditions, including optic disc drusen (ODD), papilledema, non-arteritic anterior ischemic optic neuropathy, optic neuritis, tilted or myopic optic discs, and multiple sclerosis-related optic nerve disease. Based on their underlying pathogenesis, PHOMS can be classified into 3 subtypes, including disc edema-associated PHOMS, ODD-associated PHOMS and anomalous disc-associated PHOMS. PHOMS represent a non-specific marker of pathological changes, with variable morphology, size, and prognosis depending on the underlying etiology[1]. For instance, PHOMS may regress with papilledema resolution, whereas ODD generally remains relatively stable or progresses slowly because of calcified deposits, and optical coherence tomography angiography (OCTA) typically shows an absence of blood flow signals within ODD[2]. Spontaneous ODH associated with PHOMS is rarely reported. Here, we report a rare case of unilateral ODH associated with PHOMS and a tilted disc in a young woman with high myopia and preserved visual acuity, and discuss the multimodal imaging characteristics and underlying mechanism of these clinical manifestations.

Ethical Approval Written informed consent for publication was obtained from the patient, and all personally identifiable information was removed to protect patient confidentiality.

Case Presentation A 23-year-old female presented to the ophthalmology clinic after an incidental finding of right ODH during a routine physical examination at her university. She reported no ocular symptoms and denied any history of drug allergies, systemic diseases, or ocular trauma. Ophthalmic examination revealed a best-corrected visual acuity (BCVA) of 1.0 decimal (20/20) in the right eye with refraction of -6.54 D sphere and -0.11 D cylinder at 173°, and 0.8 decimal (20/25) in the left eye with -6.54 D sphere. Intraocular pressure was 13 mm Hg in both eyes measured with a non-contact tonometer (NCT; Topcon Corporation, Tokyo, Japan). Slit-lamp examination showed no abnormality in the anterior segments, with normal direct and indirect light pupillary reflexes. The relative afferent pupillary defect was negative.

Multimodal imaging was performed in both eyes. In the right eye, ultra-widefield fundus photography (Optos Inc., Marlborough, Massachusetts, United States) showed mild vitreous opacities in the posterior pole, and a nearly circumferential ODH with confluent flame-shaped hemorrhages. The optic disc was tilted and slightly rotated, with unclear margins and mild optic disc elevation. The left eye showed a tilted optic disc with relatively indistinct nasal disc margins. No obvious abnormalities were seen in the rest of her retina, and the foveal reflection could be seen in the left eye. B-scan ultrasonography (Alcon, Fort Worth, Texas, United

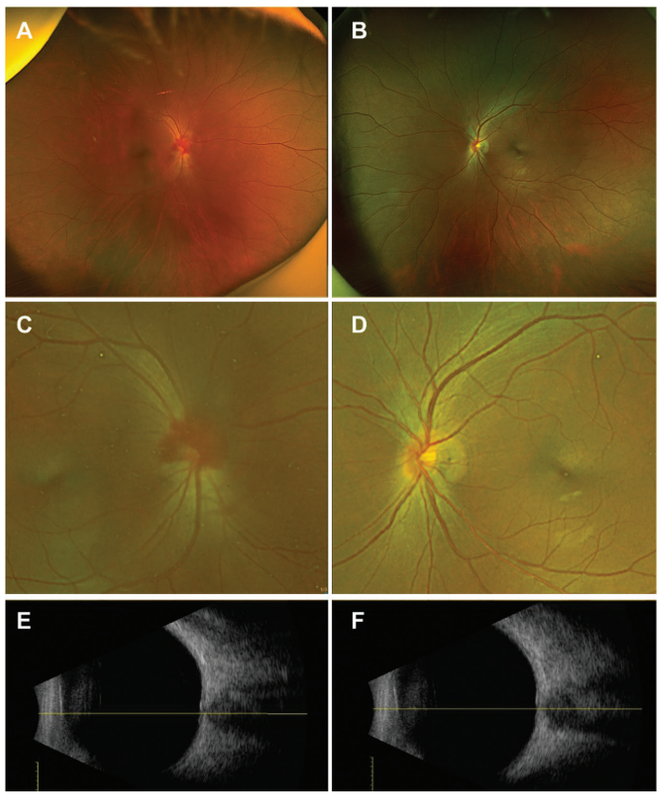


Figure 1 Fundus photography (A, OD; B, OS) and its zoom-in views (C, OD; D, OS) showed mild vitreous opacities and optic disc hemorrhage in the right eye, and bilateral tilted discs with unclear boundaries. B-scan ultrasonography revealed an elevated reflective signal on the surface of the optic disc, more prominent in the right eye (E, OD; F, OS) OD: Right eye; OS: Left eye.

States) revealed an elevated reflective signal over the optic disc surface in both eyes, which was more prominent in the right eye, without focal hyperreflective lesions or posterior acoustic shadowing inside the optic disc (Figure 1).

Cross-sectional OCT B-scan images (TowardPi Medical Technology Co., Ltd., Beijing, China) showed tilted optic discs in both eyes (right: tilt angle 15.71°; left: tilt angle 12.09°). En-face images showed relatively elevated optic discs with indistinct margins, forming a configuration resembling the "C-shaped" halo surrounding the nasal, superior, and inferior margins of the optic disc in both eyes. PHOMS was found in the nasal quadrant around the optic disc in the right eye and the circumferential quadrant in the left eye. These ovoid structures were wedged between the retinal nerve fiber layer (RNFL) and Bruch's membrane, causing anterior displacement of the inner retinal layers. The bilateral RNFL thickness was within the normal range. In the right eye, localized posterior vitreous detachment (PVD) and vitreous opacities were observed, with a focal neuroretinal detachment in the nasal peripapillary region. The optic disc exhibited a circumferential optic disc elevation secondary to ODH, predominantly involving the nasal, temporal, and superior quadrants. No calcification

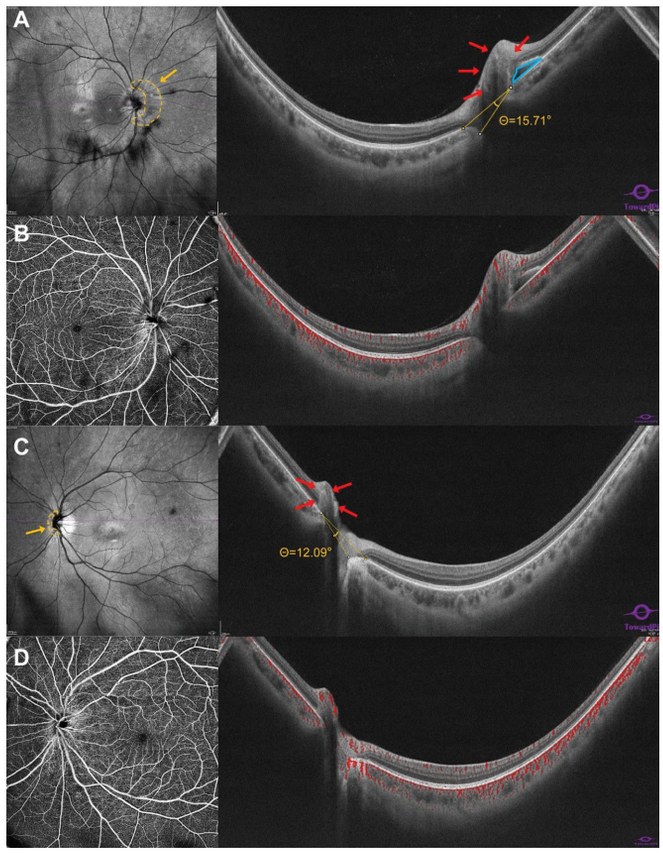


Figure 2 In the right eye, en-face images showed relatively elevated optic discs with indistinct margins, forming a configuration resembling a "C-shaped" halo (left panel, yellow arrow) surrounding the nasal margins of the optic disc OCT B-scans showed PHOMS (red arrow), tilted optic discs (right panel, yellow mark) and focal neuroretinal detachment (blue mark; A). OCTA exhibited the blood flow signals inside the PHOMS and ruled out abnormal vasculature or neovascularization (B). In the left eye, en-face and OCT B-scan images showed tilted optic discs (right panel, yellow mark) and PHOMS (red arrow) with unclear margins and a "C-shaped" halo (left panel, yellow arrow; C). OCTA did not show obvious abnormalities (D). OCT: Optical coherence tomography; OCTA: Optical coherence tomography-angiography; PHOMS: Peripapillary hyperreflective ovoid mass-like structures.

or drusen-like deposits were observed. In the left eye, PHOMS could be observed in the superior, inferior, and nasal peripapillary regions, with nasal disc margin prominence. The macular structures were normal in both eyes. Additionally, OCTA (TowardPi) confirmed detectable blood flow signals inside the PHOMS and ruled out abnormal vasculature or neovascularization (Figure 2).

Visual field examination (Carl Zeiss, Oberkochen, Germany) showed an enlarged physiological blind spot in the right eye, and normal findings in the left eye (Figure 3). The laboratory examination results showed a normal complete blood count, coagulation profile and C-reactive protein level. The patient was advised to undergo regular follow-ups with serial OCT and OCTA imaging. No medical intervention was initiated due

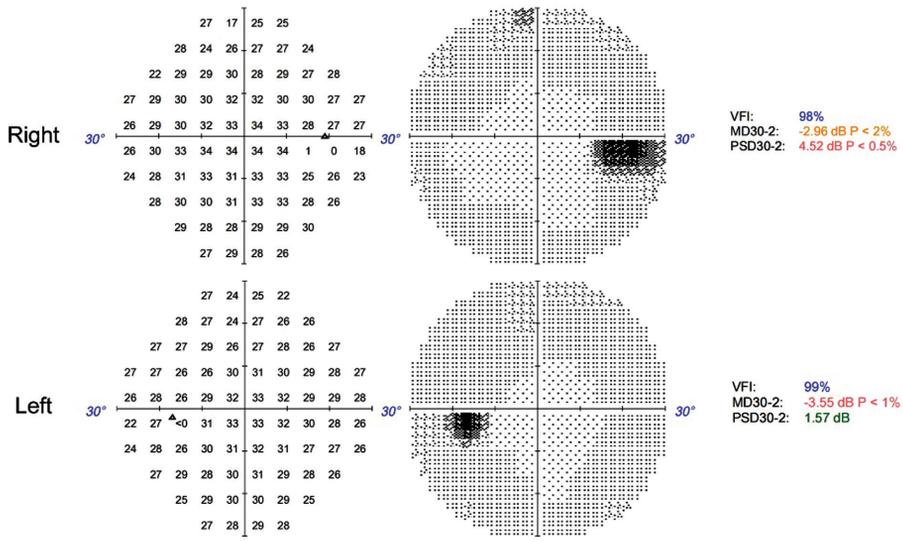


Figure 3 Visual field examination showed an enlarged physiological blind spot in the right eye, and no abnormalities in the left eye VFI: Visual field index; MD: Mean deviation; PSD: Pattern standard deviation.

to stable vision and the absence of systemic or inflammatory signs.

DISCUSSION

ODH is a clinical finding characterized by bleeding at or near the optic nerve head. Although its pathogenesis is not fully elucidated, it is generally considered to involve both mechanical and ischemic vascular factors. In the current case, this patient presented with unilateral ODH without any visual symptoms, and multimodal imaging confirmed the presence of bilateral tilted optic discs and PHOMS. Although the BCVA was slightly lower in the left eye, we consider that it may be caused by a minor uncorrected astigmatic error during refraction or a pre-existing mild amblyopia from childhood, and this small discrepancy does not influence the interpretation of the primary imaging findings. Tilted discs are congenital anomalies characterized by an oblique insertion of the optic nerve head. They are often associated with myopia and peripapillary atrophy, which is consistent with the findings in our patient. Previous studies have confirmed that myopic refractive error and optic disc tilt angle were positively correlated with PHOMS, and a larger tilt angle has a higher susceptibility to ODH[3-5]. This finding is in line with our present case that the tilt angle is 15.71° in the right eye (with ODH) and 12.09° in the left eye. The mechanical and vascular mechanisms may play key roles in this phenomenon. We speculate that the mechanical stress from the tilted anatomy and associated deformation of the lamina cribrosa and peripapillary tissues could obstruct axoplasmic flow and contribute to the formation of PHOMS. Moreover, the myopia-related scleral structure changes further exacerbate the tractional effects[6]. Furthermore, PHOMS may compress the radial peripapillary capillary layer and lead to localized reductions in blood flow density shown by OCTA[7], resulting in endothelial damage and vascular fragility, thus predisposing to hemorrhage.

PHOMS cause anterior displacement of surrounding retinal layers, appearing as a ski slope or boot-like shape on OCT scans. The term “PHOMS” well reflects the key morphological features observed in OCT imaging[8]. “Peripapillary (P)” refers to their typical anatomical location around the optic disc, specifically situated above Bruch’s membrane and at the outer edge of the optic nerve head. “Hyperreflective (H)” describes the strong OCT signal with dense internal structure and heterogeneous optical properties. “Ovoid (O)” captures their oval shape on cross-sectional OCT images, revealing a partial annular mass instead of discrete lesions like ODD. “Mass-like structures (MS)” indicate a solid appearance and biomechanical impact on adjacent tissues. PHOMS usually coexist with tilted discs, and the latter are strongly associated with myopia, affecting more than 20% of individuals with high myopia greater than 5 diopters[9]. To date, the direct causation between PHOMS and ODH is not fully established. Generally, PHOMS does not cause obvious RNFL thinning, helping distinguish them from glaucoma-related ODH. OCTA data have demonstrated that larger PHOMS are associated with decreased retinal vessel density[10]. It is hypothesized that the space-occupying nature of PHOMS may compress optic nerve head tissues, leading to local vascular congestion and impaired microcirculation, thereby increasing the hemorrhage predisposition. In addition, OCT B-scan images of the current case showed a localized posterior vitreous detachment in the right eye; we presume that the vitreoretinal tractional forces induced by PVD may partly contribute to the ODH development.

The imaging features of optic disc elevation with indistinct margins might be misdiagnosed as papilledema, which is caused by increased intracranial pressure and usually occurs bilaterally. In papilledema, the optic disc is elevated with blurred margins caused by tissue edema, which also obscures blood vessels at the disc margin. The presence of hemorrhages and exudates could be observed around the disc, and the surrounding veins are dilated[11]. Cotton wool spots may also be present, indicating axoplasmic stasis. However, in the present case, the retinal vessels at the optic disc margin remained clearly visible, and multimodal imaging indicated that the hemorrhage was confined to the superficial retinal tissues. More importantly, the Bruch's membrane and retinal pigment epithelium extension line angulated outward on OCT, which is different from papilledema showing angulation toward the vitreous cavity. This characteristic imaging feature strongly supported the diagnosis of pseudopapilledema.

Multimodal ophthalmological imaging provides valuable evidence to differentiate PHOMS from other physiological and pathological conditions, such as blood vessels, ODD, and intrapapillary hemorrhage with adjacent peripapillary subretinal hemorrhage (IHAPSH). On OCT B-scan images, large peripapillary blood vessels have curvilinear hyperreflective anterior and posterior boundaries accompanied by a signal shadow. As for ODD, it presents as hyperreflective margins with hyporeflective interiors in OCT scans, while PHOMS appear as homogeneous ovoid structures lacking hyperreflective margins. ODD could further exhibit intrinsic autofluorescence and strong echogenicity on B-scan ultrasonography, especially if there is calcification. Furthermore, OCTA shows intrinsic flow within PHOMS, whereas ODD is an avascular entity composed of acellular calcium phosphate material[12]. In this case, we also need to consider the possible diagnosis of IHAPSH. It is a benign, self-limited hemorrhagic condition sharing similar mechanisms and risk factors such as myopia, tilted discs and PHOMS. Except for the intrapapillary hemorrhage, IHAPSH also exhibits peripapillary subretinal hemorrhage along the optic disc margins. Here, we did not observe the obvious peripapillary subretinal hemorrhage, but her fundus photography showed a small patch of hemorrhage inferonasal to the optic disc in the right eye, accompanied by a focal neuroretinal detachment at the nasal peripapillary region. Therefore, we hypothesize that a previous episode of subretinal hemorrhage may have occurred, resulting in hemorrhagic neurosensory retinal detachment. However, since this patient's visual acuity was stable, by the time of examination, the subretinal hemorrhage had already been absorbed. Further follow-up is required to clarify this possibility.

Although the prognosis of PHOMS is generally favorable, it mainly depends on the underlying ocular conditions rather than on PHOMS itself, such as papilledema, optic neuritis, optic disc drusen, myopia, or ischemic optic neuropathy. PHOMS may stay stable, develop, regress, or even disappear in parallel with changes in the associated pathologies, and they are not considered a direct cause of retinal ganglion cell loss or visual impairment. Therefore, PHOMS should be regarded as a structural imaging biomarker that facilitates the evaluation and monitoring of optic nerve disorders, whereas visual outcomes are largely driven by the course and severity of the underlying diseases rather than PHOMS alone.

Collectively, spontaneous hemorrhage of the optic disc in PHOMS is rare. Tilted optic discs, PVD, and high myopia may act as predisposing factors by increasing mechanical traction and compromising the peripapillary microvasculature. Multimodal ophthalmological imaging could provide comprehensive structural and vascular information about the optic nerve head, thus differentiating the diagnosis of multiple optic disc anomalies and improving our understanding of its potential relationship with optic disc hemorrhage in highly myopic eyes.

ACKNOWLEDGEMENTS

Authors' Contributions: Cheng Y admitted the patient, analyzed examinations and drafted the manuscript. Wei T offered guidance on the conceptual framework for writing and analyzing examinations. Cui LJ performed critical revision of the manuscript. Gao S participated in manuscript revision and language refinement. Hu JB conducted the clinical imaging collection. Gu SH conducted the data collection and sorting.

Data Availability Statement: Relevant data are available from the corresponding author upon reasonable request.

AI-Generated Content Disclosure: No AI-generated content was used in the preparation of this manuscript.

Foundation: Supported by the Clinical Research Award of the First Affiliated Hospital of Xi'an Jiaotong University, China (No.XJTU1AF-CRF-2024-005).

Conflicts of Interest: Cheng Y, None; **Wei T,** None; **Cui LJ,** None; **Gao S,** None; **Hu JB,** None; **Gu SH,** None.

REFERENCES

1 Heath Jeffery RC, Chen FK. Peripapillary hyperreflective ovoid mass-like structures: multimodal imaging-a review. *Clin Exp Ophthalmol* 2023;51(1):67-80.

2 Xiao D, Lhamo T, Meng Y, *et al*. Peripapillary hyperreflective ovoid mass-like structures: multimodal imaging and associated diseases. *Front Neurol* 2024;15:1379801.

3 Takahashi S, Kawashima R, Morimoto T, *et al*. Analysis of optic disc tilt angle in intrapapillary hemorrhage adjacent to peripapillary subretinal hemorrhage using swept-source optical coherence tomography. *Am J Ophthalmol Case Rep* 2022;27:101598.

4 Zhang L, Yi ZHZ, Jiang X, *et al*. Clinical characteristics of peripapillary hyperreflective ovoid mass-like structures in myopic children. *Int J*

Ophthalmol 2024;17(7):1292-1299.

5 Lyu IJ, Park KA, Oh SY. Association between myopia and peripapillary hyperreflective ovoid mass-like structures in children. *Sci Rep* 2020;10(1):2238.

6 Fraser JA, Sibony PA, Petzold A, *et al*. Peripapillary hyper-reflective ovoid mass-like structure (PHOMS): an optical coherence tomography marker of axoplasmic stasis in the optic nerve head. *J Neuro Ophthalmol* 2021;41(4):431-441.

7 Xiao D, Lhamo T, Meng Y, *et al*. Peripapillary hyperreflective ovoid mass-like structures: multimodal imaging and associated diseases. *Front Neurol* 2024;15:1379801.

8 Petzold A, Biousse V, Bursztyn L, *et al*. Multirater validation of peripapillary hyperreflective ovoid mass-like structures (PHOMS). *Neuroophthalmology* 2020;44(6):413-414.

9 Daniel E, Addis V, Maguire MG, *et al*. Prevalence and factors associated with optic disc tilt in the primary open-angle African American glaucoma genetics study. *Ophthalmol Glaucoma* 2022;5(5):544-553.

10 Wang FB. Spontaneous focal hemorrhage of optic disc in peripapillary hyperreflective ovoid mass-like structures. *Int Med Case Rep J* 2024;17:843-847.

11 Xie JS, Donaldson L, Margolin E. Papilledema: a review of etiology, pathophysiology, diagnosis, and management. *Surv Ophthalmol* 2022;67(4):1135-1159.

12 Xie X, Liu TT, Wang WQ, *et al*. Clinical and multi-mode imaging features of eyes with peripapillary hyperreflective ovoid mass-like structures. *Front Med (Lausanne)* 2022;9:796667.