• Letter to the Editor •

Pars plana vitrectomy with internal limiting membrane plugging assisted by autologous blood for optic disc pit associated with vitreomacular traction

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Dear Editor,

We report a case of optic disc pit (ODP) associated with vitreomacular traction which has been successfully treated by a combined technique. We have obtained the written informed consent from the patient, and this case study is in accordance with the tenets of the Declaration of Helsinki.

ODP, with an estimated incidence rate of approximately 1 in 10 000, is a rare congenital anomaly[1]. Currently, vitrectomy is mostly used method to address ODP associated with macular lesions, other surgery-based methods exist.

CASE REPORT

A 10-year-old girl presented with vision loss in her left eye during a routine physical examination. She was referred to our institution for treatment in November 2021. The patient denied any medical history involving systemic, ophthalmologic, or hereditary diseases. Her unaided visual acuity was 10/20 in the right eye and 5/20 in the left eye. The best corrected visual acuity (BCVA) was 20/20 in the right eye and 5/20 in the left eye with mild myopic and astigmatism. A slit-lamp examination revealed a clear cornea and lens, with active pupillary responses. However, a fundus examination revealed a discrete, oval-shaped, grey-yellow depression in the inferotemporal segment of the optic disc, as well as abnormal tongue-shaped reflections in the nasal macular region. Fundus fluorescein angiography (FFA) showed a mild distortion of the vessels between the optic disc and macula, but no vascular leakage or hyper-fluorescence were detected (Figure 1A). Optical coherence tomography (OCT) confirmed the presence of an ODP, curved hyper-reflection above the macula and optic disc, macular traction, and partial neuroepithelium detachment (Figure 1B-1E). The ophthalmic examination results of right eye were all within the normal range. The patient was diagnosed with ODP associated with vitreomacular traction in her left eye (Figure 1).

A three-port 23-gauge pars plana vitrectomy (PPV) was performed in which vitreous detachment was induced with the assistance of indocyanine green staining and foveal-sparing internal limiting membrane (ILM) peeling. Following this, the ODP was plugged in with an inverted ILM flap. After air-fluid exchange, autologous blood extracted from a peripheral vein was immediately applied to the pit, with excess blood carefully removed using a flute needle. There were no significant complications during the surgical procedure.

Postoperatively, follow-up visits were conducted one week, six months, and one year after the procedure. Throughout the period, slit-lamp examinations of the anterior chamber remained normal and the lens remained crystalline. At one week postoperatively, little surgical inflammation was observed. At the six-month and one-year follow-up examinations, the ILM remained stable and intact over the ODP and showed no abnormal traction or glial proliferation. Additionally, significant improvements were identified in the macular morphology, based on review of the OCT images, and there appeared relatively normal with no observable damage to the optic nerve fiber layer (RNFL) thickness (Figure 2). The unaided visual acuity improved and kept at 6/20.

DISCUSSION

OPD was first reported by Wiethe[2] and since then there have been many studies focus on the pathophysiology, mechanism and complications. OPDs are often asymptomatic unless

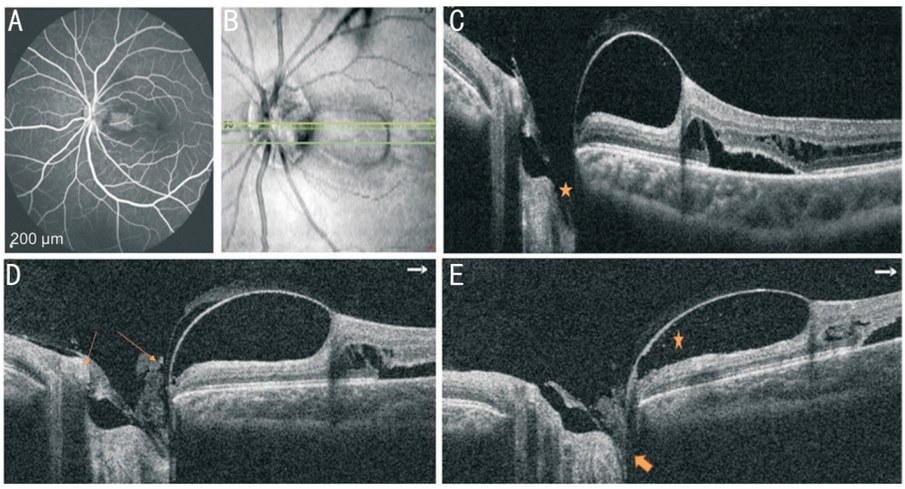

Figure 1 Preoperative multi-images of the patient with optic disc pit (ODP) A: Fundus fluorescein angiography (FFA) showed a mild distortion of the vessels between the optic disc and macula without vascular leakage or hyper-fluorescence. B: Three scan layers (green lines) and the images in optical coherence tomography as C, D, E. C: ODP (yellow star) located in the inferotemporal segment of the optic disc and there was curved hyper-reflection above the macula and optic disc, macular traction, and partial neuroepithelium detachment. D: The ODP overlayed by tissue-like substances. There existed V-shaped strands (yellow arrow) below and a pocket-like structure between the retina and the strands. E: There may be a pathway (yellow arrow) connected the ODP and the "pocket", with hyper-reflective spots in it (yellow star).

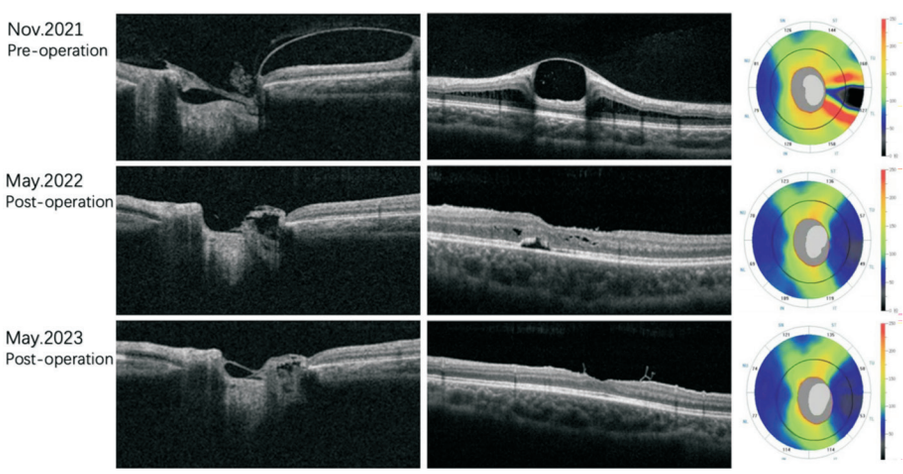

Figure 2 The optical coherence tomography (OCT) images presented the retinal morphology of pre-operation (Nov. 2021) and post-operation (May, 2022 and May, 2023) During the follow-up period, the ILM remained stable and intact over the optic disc pit (ODP). Significant improvements were identified in the macular morphology and there appeared relatively normal with no observable damage to the optic nerve fiber layer (RNFL) thickness. ILM: Internal limiting membrane.

complicated by maculopathy associated with other diseases[3].

In this case, OCT images revealed that the ODP was located in the inferotemporal segment of the optic disc and was overlayed by substances which may be arterial remnants or rudimentary retinal tissues[4]. Below that, there existed V-shaped strands, which might present vitreous cortex fibroplasia, extended to the nasal side, adhering to the margin of the disc (Figure 1D). The temporal part of this strands extended and sticked to the surface of macular fovea, formed a pocket-like structure between the retina and the strands. The OCT results indicated that there may be a pathway connected the ODP and the "pocket". Moreover, hyper-reflective spots were observed in the "pocket", a possible sign of vitreous (Figure 1E). Based on that, we hypothesized that the V-shaped traction acted as a unidirectional valve. This traction, combined with respiratory or retinal surface vascular pulsations, may have pumped the liquefied vitreous through the pathway into the "pocket". Over time, the liquefied vitreous may accumulate while the traction force gradually increased, affecting the macular and leading to retinoschisis and neuroepithelium detachment. If traction force had continued to develop, it may progress into a tear or hole to form, allowing the liquefied vitreous to spread under or into the retina[5].

While no consensus yet exists on the most effective method, PPV remains the most widely used[6]. In our case, we employed a combined technique to optimize the chances of achieving a

successful clinical outcome. First, complete posterior vitreous detachment was induced with peeling away substances traversing the pit. As 25%-75% of OPD may deteriorate[7], the ODP was plugged in with an inverted ILM flap to reduce the potential odds. The use of ILM flap could yield favorable anatomical improvement[8]. It is supposed that the incorporation of the ILM plug may reconfigure the larger-diameter ODP into a porous structure, greatly preventing the communication of liquid. Meanwhile, the foveal ILM had been preserved to decrease the potential risks of full-thickness macular hole formation[9]. Furthermore, autologous blood was incorporated along the inverted ILM's surface, which was commonly and effectively employed in refractory macular hole surgeries[10]. It had the benefit of perfect biological compatibility and adhesion with human fibrinogen, coagulation factors, and thrombin[11]. It could seal invisible protein pores and fusion with the inverted ILM to become a nearly permanent barrier[12]. Additionally, it eliminates the need for centrifugation, simplifying procedure and minimizing potential contamination risks with little intraocular inflammation.

This combined technique had provided advantages for recovery. However, there are some limitations. First, the use of combined surgical techniques may increase the complexity of the procedure, potentially creating additional risks. Additionally, the complications and success rate in large sample remains unknown.

In the case, the modified treatment approach, combined PPV with fovea-sparing ILM peeling and an inverted ILM plugging sealed with autologous blood, appears to contribute to the resolution of ODP associated with vitreomacular traction. Further studies and clinical trials will be necessary to fully assess the comprehensive benefits.

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