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# Iatrogenic Macular Tear Formation During PVD Induction in a Patient with Diabetic Retinopathy: A Case Report

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**Case Report**

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## Abstract

# Background

Epiretinal membrane (ERM) is a common vitreoretinal interface disorder for which pars plana vitrectomy (PPV) is the standard surgical treatment. Induction of posterior vitreous detachment (PVD) is a fundamental step during PPV to relieve vitreoretinal traction. However, PVD induction carries a significant risk of iatrogenic retinal breaks, potetienlly resulting in severe visual impairment.

# Case presentation

We report a case of an intraoperative macular tear that occurred during PVD induction in a patient with an epiretinal membrane and proliferative diabetic retinopathy. The tear was presumed to atrributed to abnormal vitreoretinal adhesion. The complication was successfully managed using an inverted internal limiting membrane (ILM) flap technique, combined with autologous blood and gas tamponade. Postoperatively, anatomical closure of the macular tear was achieved, and best-corrected visual acuity improved to 20/80.

# Conclusion

This case underscores the necessity for caution during PVD induction, especially in eyes with complex vitreoretinal interface pathologies. Furthermore, it provides a practical approach for this uncommon complication.

## Background

Epiretinal membrane (ERM) is a common macular disorder characterized by the formation of a fibrocellular membrane on the internal limiting membrane at the vitreoretinal interface. The tractional force often lead to visual impairment such as reduced visual acuity and metamorphopsia[1,2]. While pars plana vitrectomy (PPV) with membrane peeling is the standard intervention for symptomatic patients[3], the procedure is associated with potential intraoperative and postoperative complications, including hemorrhage, retinal tears, cataract and retinal detachment [4]. The surigcal induction of posterior vitreous detachment (PVD) is a crucial step that often required during PPV to release vitreoretinal traction and facilitate safe membrane peeling. However, PVD induction may result in iatrogenic retinal injury, such as retinal breaks caused by excessive vitreoretinal traction during posterior hyaloid separation[5].

## Case presentation

A fifty-one-year-old man visited Peking Union Medical College Hospital with a complaint of progressively worsening blurred vision in both eyes. The patient had a more than 10-year history of diabetes mellitus.

Three years prior, the patient was diagnosed with proliferative diabetic retinopathy (PDR) of both eyes and subsequently underwent PPV for vitreous hemorrhage in the left eye. Both eyes had previously received pan retinal photocoagulation (PRP).

On ophthalmic examination, the best-corrected visual acuity (BCVA) was 20/200 in the right eye and 20/100 in the left eye. Slit-lamp examination revealed a cortical cataract in the right eye. Dilated fundus examination and optical coherence tomography (OCT) demonstrated the presence of an epiretinal membrane (ERM) and edema involving the macula in his right eye, with central macular thickness (CMT) measured 360μm (Fig. 1). B-scan detected partial PVD in his right eye (Fig. 1). Based on these findings, PPV combined with phacoemulsification and intraocular lens implantation was recommended.

A 25-gauge transconjunctival sutureless PPV (performed by surgeon C.W. & JY.Y.) was carried out on September 30, 2025. Following phacoemulsification and intraocular lens implantation, core vitrectomy was initiated. A small amount of triamcinolone acetonide (TA) was then injected into the vitreous cavity to enhance visualization of the vitreous cortex. During induction of PVD, a macular retinal break accompanied by localized hemorrhage occurred, shown in Fig. 2. Peripheral vitrectomy was subsequently performed to minimize further vitreoretinal traction. After intravitreal indocyanine green staining, the ILM in the macular area was peeled. An inverted ILM flap technique combined with autologous blood technique was performed. Careful examination with scleral indentation revealed no additional retinal breaks or primary retinal holes. Finally, 12%C3F8 gas was used for tamponade in the vitreous cavity.

One day and one week postoperatively, the visual acuity stabilized at counting fingers at 30 cm, with an intraocular pressure of 13 mmHg and 15 mmHg, respectively. Adequate intraocular gas tamponade was observed. At the one-month postoperative follow-up, the patient underwent neodymium-doped yttrium aluminum garnet (Nd:YAG) laser posterior capsulotomy for posterior capsular opacification (PCO). At 80 days postoperatively, the best-corrected visual acuity in the right eye was 20/80, and both dilated fundus examination and OCT confirmed complete anatomical closure of the macular tear (Fig. 1).

## Discussion and conclusion

Surgery-related retinal tears are not uncommon, and previous reports have demonstrated that PVD induction during PPV is associated with a significantly higher incidence of iatrogenic retinal tears. These tears are primarily attributed to vitreous traction during PVD induction or at the instrument insertion sites, and they predominantly occur in the peripheral retina[5]. In the present case, however, a macular tear was observed, representing an atypical location for retinal tears during PVD induction.

Idiopathic macular holes (MHs) are believed to result from abnormal anteroposterior and tangential vitreous traction on the foveal retina[6]. In our case, since standard surgical procedures were performed and no peripheral retinal tears were identified, we speculate that the macular tear during PVD induction may share a similar pathogenic mechanism to idiopathic MH formation. Previous studies have

demonstrated that diabetic retinopathy is characterized by reduced vessel density in the superficial vascular plexus, which correlates with thinning of the inner retinal layers[7]. This neurovascular compromise may render the fovea more vulnerable to tractional forces. Furthermore, non-enzymatic glycosylation of vitreous collagen in diabetic patients is thought to strengthen the adhesion between the posterior vitreous cortex and the ILM[8]. Such firm adhesion can make separation of the posterior hyaloid more difficult during PVD induction, potentially leading to inferior anatomical and functional outcomes[9,10].

Previous reports have indicated that early vitrectomy achieves higher closure rates for macular tear[11,12]. Although PPV combined with ILM peeling and gas tamponade remains a standard surgical approach for idiopathic MHs, larger holes exceeding 400μm in diameter often require adjunctive techniques, such as the inverted ILM flap technique, autologous blood patching or amniotic membrane transplantation. Particularly, the inverted ILM flap technique is believed to induce glial cell proliferation and facilitate hole closure[13–17]. In our case, the surgeon performed the ILM flap technique during the initial surgery, it provided a physical scaffold to bridge the tissue defect, which is more reliably than ILM peeling alone. Ultimately, this strategy yielded an ideal anatomical and visual outcome, shown in Fig. 1.

In conclusion, we report a case of an unexpected intraoperative macular tear occurring during PVD induction in a patient undergoing PPV. The break was successfully managed using the ILM flap technique combined with autologous blood technique. This case underscores the necessity for heightened caution during PVD induction, particularly in patients with DR where the vitreoretinal interface may be more complex. Furthermore, it demonstrates an effective rescue strategy for managing this rare intraoperative complication, providing a viable surgical option for achieving successful closure.

## Abbreviations

Epiretinal membrane (ERM)

pars plana vitrectomy (PPV)

internal limiting membrane (ILM)

proliferative diabetic retinopathy (PDR)

pan retinal photocoagulation (PRP)

best-corrected visual acuity (BCVA)

optical coherence tomography (OCT)

central macular thickness (CMT)

triamcinolone acetonide (TA)

neodymium-doped yttrium aluminum garnet (Nd:YAG)

posterior capsular opacification (PCO)

# Declarations


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### Author Contribution

Yuqi Ma collected the clinical information, conducted the literature search, and wrote the original draft of the manuscript. Chan Wu supervised the study, critically reviewed the manuscript, and contributed to shaping the discussion. Jingyuan Yang participated in the clinical management of the patient, obtained informed consent for publication, and revised the manuscript. All authors read and approved the final manuscript.


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### Availability of data and materials

No datasets were generated or analysed during the current study.

### Ethics approval and consent to participate

Ethics approval was not required for this case report in accordance with institutional policy.

### Consent for publication

Written informed consent for publication of clinical data and imaging was obtained from the patient.

### Competing interests

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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# Figures

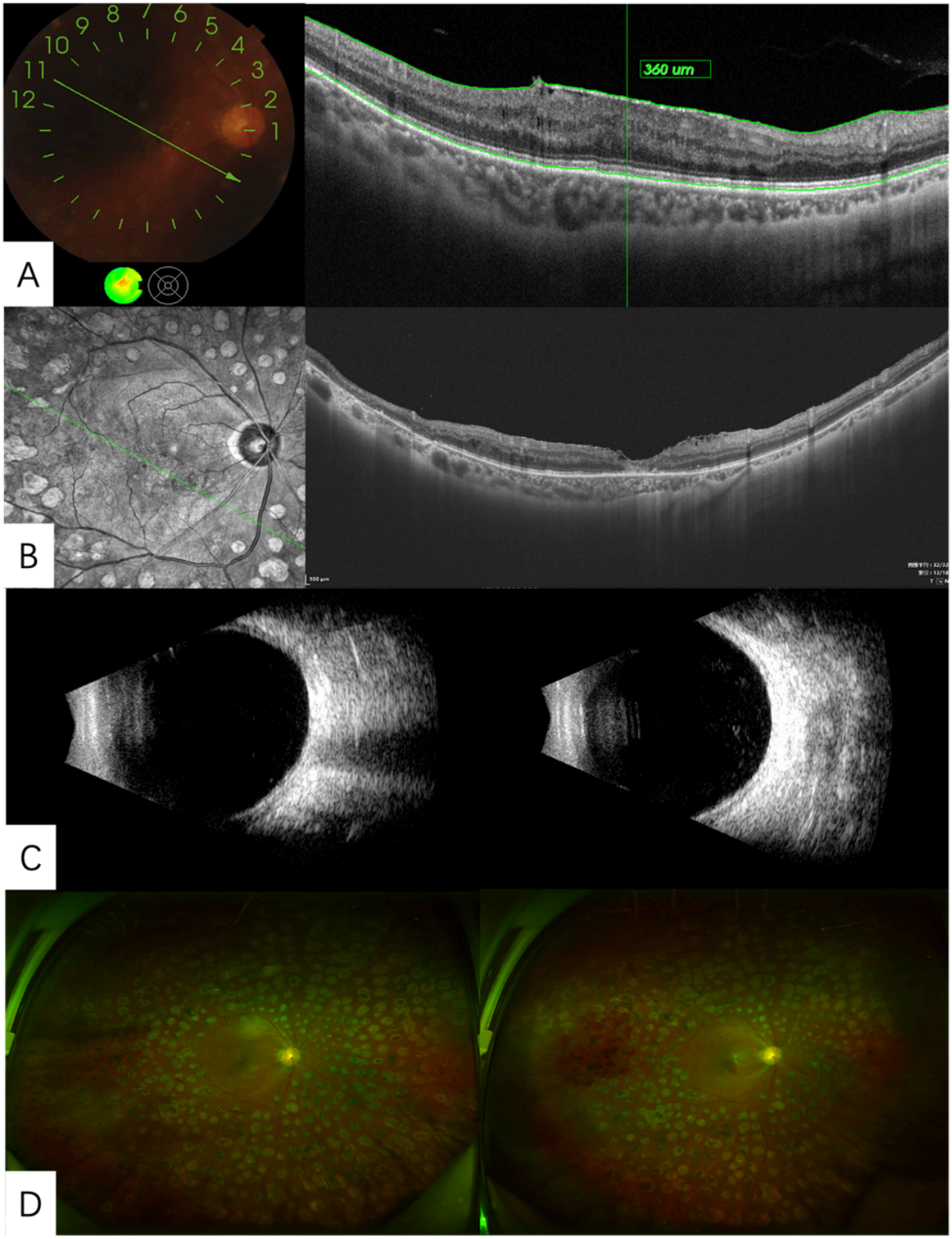



**Figure 1**

**Preoperative and postoperative imaging.**

(A) Preoperative OCT of the right eye showing an epiretinal membrane and macular edema. (B) OCT at 80 days after PPV demonstrating anatomical closure of the macular tear and restored ELM continuity.

(C) Preoperative B-scan ultrasonography showing partial posterior vitreous detachment in the right eye.
(D) Preoperative color fundus photographs of both eyes.

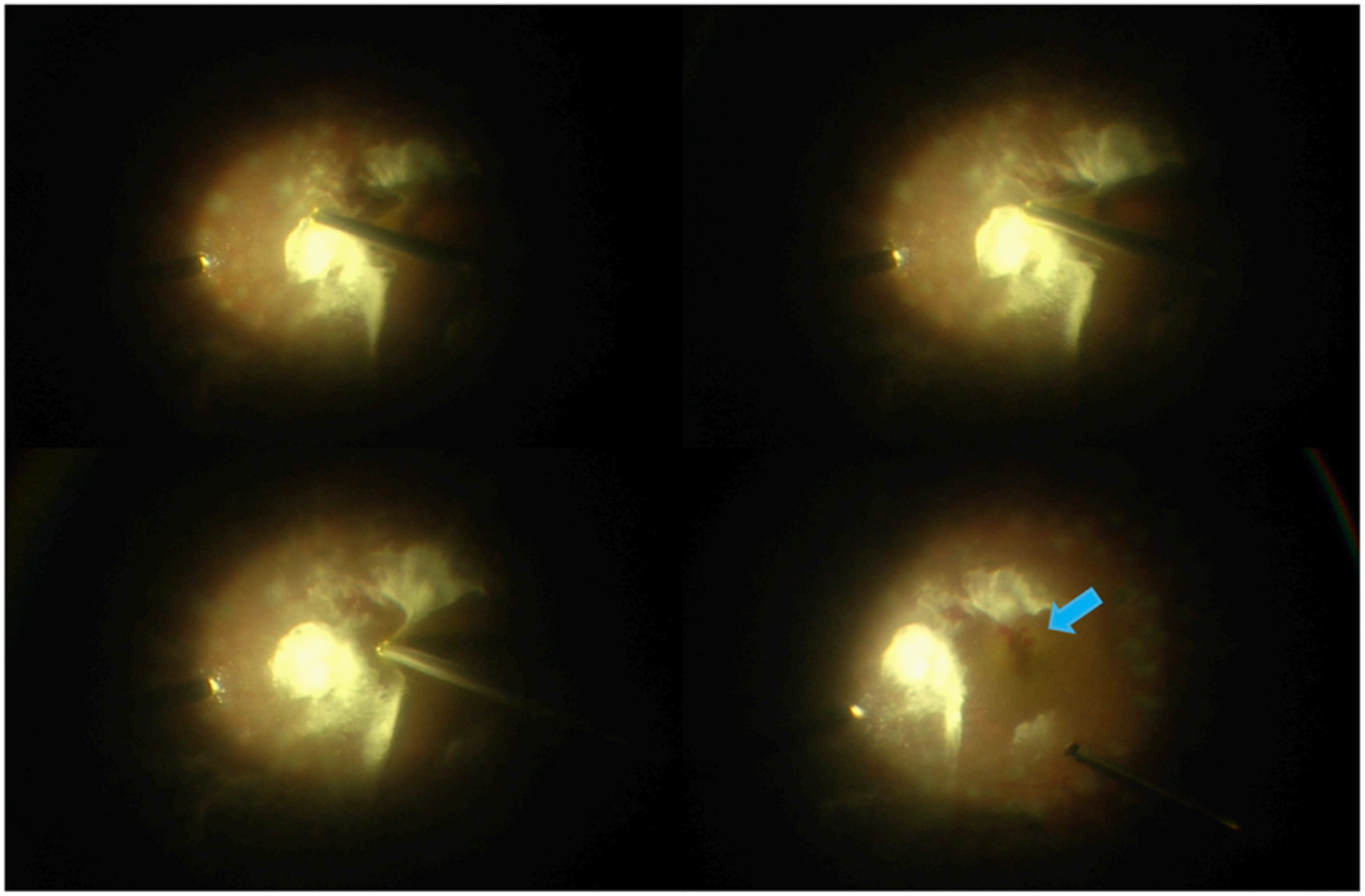


**Figure 2**

**Intraoperative iatrogenic macular tear.**

Intraoperative photograph showing a macular tear (blue arrow) that occurred during triamcinolone acetonide (TA)-assisted posterior vitreous detachment induction.