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Case Report: Restitution of Retinal Pigment Epithelium Tear in Polypoidal Choroidal Vasculopathy

Xintong Yu
Hebei Provincial People's Hospital
Xi Lv
Hebei Provincial People's Hospital
Jianmin Wang
wjmykys@163.com

Hebei Provincial People's Hospital

Case Report

Keywords: Retinal Pigment Epithelial Tear, Ranibizumab、Age-related Macular Degeneration, Anti-vascular Endothelial Growth Factor

Posted Date: November 1st, 2026

DOI: https://doi.org/10.21203/rs.3.rs-11238109/v1

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Additional Declarations: No competing interests reported.

Abstract

Background

Retinal pigment epithelial tear is a severe complication of pigment epithelial detachment, particularly prevalent in age-related macular degeneration, and can result in significant and persistent visual functional impairment. Under certain pathological conditions, the torn edges of the Retinal pigment epithelial may also undergo reapproximation and reattachment.

Case Presentation:

A 56-year-old male patient was clinically diagnosed with wet Age-related Macular Degeneration complicated by Retinal pigment epithelial tear in the right eye. The patient received intravitreal ranibizumab injections under a 3 + PRN regimen. After three consecutive injections, the pre-existing pigment epithelial detachment completely resolved, and the RPE tear margins were repositioned with good apposition.

Conclusions

When pigment epithelial detachment is predominantly serous in nature and sub-RPE fibrotic traction is not conspicuous, the torn margins of the RPE may have the potential for reapproximation and reattachment.

Background

Retinal pigment epithelial (RPE) tear is a severe complication of pigment epithelial detachment (PED) and is particularly common in exudative age-related macular degeneration (AMD), potentially causing significant and persistent visual impairment. Historically, it has been regarded as a serious adverse event following intravitreal anti-vascular endothelial growth factor (VEGF) therapy, often leading to treatment discontinuation. However, recent studies suggest that continued anti-VEGF treatment after RPE tearing may still yield visual improvement, and that the torn edges may undergo reapproximation and reattachment under specific pathological conditions. Furthermore, the pathogenesis of RPE tearing and the post-treatment morphological outcomes are closely associated with the subtype of PED. Fibrovascular PED with predominantly serous content, owing to the absence of fibrotic traction, may possess a greater potential for anatomical restoration compared with fibrovascular PED. These findings provide important evidence for the formulation of individualized therapeutic strategies in clinical practice.

Case Presentation

The patient was a 56-year-old Chinese male who presented to the ophthalmology clinic with complaints of “vision distortion in right eye, vision deterioration for 2 years and aggravation for half a year”. He had a 10-year history of hypertension and denied any history of diabetes mellitus, coronary heart disease, or other systemic diseases. Ophthalmic examination revealed best-corrected visual acuity (BCVA) of 0.1 (decimal chart, equivalent to logMAR1.0), with intraocular pressure of 18 mmHg. Anterior segment examination of the right eye showed no significant abnormalities. Fundus fluorescein angiography (FFA) (Fig. 1A) demonstrated uniform weak fluorescence in the PED region in the early phase, with subtle irregular hyperfluorescence at the margins. In the late phase, mild dye pooling was observed within the PED with slightly blurred borders. Fundus examination (Fig. 1B) revealed neurosensory retinal detachment and pigment epithelial detachment in the macular region, accompanied by a retinal pigment epithelium tear. No significant abnormalities were observed in the left eye. Optical coherence tomography (OCT) of the right eye (Fig. 1C) indicated neurosensory retinal detachment and pigment epithelial detachment with an RPE tear. The maximum horizontal span of the RPE defect was 6920μm and the maximum vertical span was 1375μm. The contents under the RPE showed homogeneous and low-reflective signals, and the broken ends were slightly retracted, and no RPE flaps were seen that were obviously rolled inward. OCT and FFA confirmed that the edge of the RPE tear did not affect the central part of the macular fovea avascular area.

The right eye manifested as PED with neurosensory detachment and RPE tear; OCT demonstrated predominantly serous content beneath the RPE, and FFA showed mild late-phase leakage. Combined with the resolution of subretinal fluid and visual improvement following anti-VEGF therapy, the clinical diagnosis was neovascular AMD (type 1 macular neovascularisation (MNV)with low fibrotic burden) complicated by RPE tear.

Baseline OCT showed subretinal hyperreflective material adjacent to the fovea with definite intraretinal fluid and subretinal fluid, suggesting the presence of active choroidal neovascularization (CNV), which constitutes an anatomical basis for continued initiation of ranibizumab treatment after RPE tear. The patient received intravitreal ranibizumab injections using a 3 + PRN regimen (i.e., three consecutive monthly loading doses followed by as-needed treatment), at a dose of 0.5 mg/0.05 ml.

Follow-up results showed that one month after the first injection, the patient's visual acuity improved to 0.2(logMAR0.7), and OCT (Fig. 1D) showed partial retinal reattachment with partial absorption of subretinal fluid and a trend toward apposition of the RPE tear margins. One month after the second injection, visual acuity further improved to 0.3(logMAR0.52), and OCT (Fig. 1E) demonstrated retinal reattachment with complete absorption of subretinal fluid. One month after the third injection, visual acuity reached 0.4(logMAR0.4), and OCT (Fig. 1F) showed a stable retinal status. During the subsequent 2 years and 9 months of follow-up, additional injections were given when the patient met any of the following criteria: 1) The best-corrected visual acuity decreased by 5 letters or more compared with the previous follow-up;2)OCT suggested new or previously resolved subretinal or intraretinal fluid;3) New macular hemorrhage; 4) The original PED height increased by more than 100μm. Patients received 7 additional injections of subretinal or intraretinal fluid due to OCT indicating new or previously resolved

subretinal or intraretinal fluid, and the BCVA was maintained at 0.4(logMAR0.4).During the OCT follow-ups at 6 months (Fig. 1G), 2 years (Fig. 1H), and 3 years (Fig. 1I), no significant detachment of the RPE layer was observed.

Discussion and Conclusion

An RPE tear refers to a rupture of the RPE monolayer, which is clinically most commonly observed in vascularized PED and represents one of the more severe complications of exudative AMD [1]. RPE tear was usually regarded as a serious adverse event related to anti-VEGF treatment in the past, but the results of recent studies suggest that it is necessary to re-examine this [2]. Cunningham et al. [3], based on a pooled analysis of multiple randomized controlled trials, found no significant difference in the incidence of RPE tears between the ranibizumab-treated group and the control group. More importantly, patients who continued ranibizumab treatment after developing an RPE tear achieved better mean visual outcomes than the control group, suggesting that continued anti-VEGF therapy following an RPE tear may confer potential clinical benefit. This conclusion is consistent with the review by Sastre-Ibáñez et al. [1]. Furthermore, the case series by Rouvas et al. demonstrated that continued anti-VEGF therapy after RPE tear occurrence is clearly feasible and may maintain or even improve patients' visual function [4].

The pathogenesis of RPE tears is distinctly multifactorial and is closely associated with the pathological type of PED. In fibrovascular PED—the most common type of PED in exudative AMD—RPE tears primarily arise from mechanical traction: type 1 occult choroidal neovascularization (type 1 MNV) beneath the RPE, along with its accompanying fibrovascular tissue, progressively develops contractile forces during growth and maturation. These forces continuously act on the overlying RPE layer, generating tangential traction. When the tractional stress accumulates locally at the PED margin and exceeds the tissue tolerance threshold, an RPE tear can be triggered [1,5]. However, RPE tears are not exclusively observed in fibrovascular PED. In the course of exudative AMD, some patients may present with predominantly serous PED, or fibrovascular PED may convert to a predominantly serous form following anti-VEGF therapy. In such cases, hemodynamic changes become a more prominent pathogenic mechanism. The maintenance of serous PED depends on a relatively balanced hydrostatic pressure within the sub-RPE space. When CNV leakage suddenly decreases (e.g., after anti-VEGF therapy) or intraocular pressure fluctuates, the internal pressure of the PED can undergo rapid changes, leading to sudden collapse or elevation of the RPE layer. This short-term morphological remodeling can generate additional tearing forces at the fragile attachment margins, thereby inducing RPE rupture [1,5].The PED in the present case exhibited characteristics consistent with type 1 occult choroidal neovascularization (type 1 MNV) with low fibrotic burden, highly consistent with the findings of Rouvas et al. After three ranibizumab injections, the patient's visual acuity improved from 0.1 (logMAR 1.0) to 0.4 (logMAR 0.4), with OCT demonstrating retinal reattachment and satisfactory apposition of the RPE tear margins. This outcome suggests that anti-VEGF agents do not necessarily exacerbate RPE tears; rather, they may improve the repositioning and apposition of the RPE tear margins by reducing exudation and promoting fluid absorption, thereby leading to better anatomical and functional outcomes. In light of previous observations that "eyes without foveal involvement have a better prognosis," the fact that the RPE tear in this case did not involve

the fovea may be an important contributor to the visual improvement [4]. Furthermore, the PED type in this case may also be a critical determinant of prognosis. Unlike fibrovascular PED, the RPE tear margins in predominantly serous fibrovascular PED typically do not exhibit significant fibrotic rolling, and therefore possess an anatomical basis for reattachment. Under the effect of anti-VEGF therapy, as CNV leakage decreases and subretinal fluid is gradually absorbed, the fluid pressure within the PED declines, allowing the RPE tear margins to gradually reattach and appose in the absence of fibrotic traction. The description of RPE tear classification and morphological characteristics by Ersoz et al. also supports this explanation, suggesting that RPE tears occurring on a predominantly serous fibrovascular PED do not necessarily signify irreversible structural damage but may retain a certain degree of anatomical recovery potential [5]. Nevertheless, at the cellular biological level, whether this case involves complete reconstruction of barrier function and restoration of the photoreceptor-RPE outer segment interdigitation requires careful evaluation using multimodal functional imaging.

The causal relationship between RPE tears and anti-VEGF agents remains incompletely understood. RPE tears may occur spontaneously or following thermal laser photocoagulation, photodynamic therapy, or anti-VEGF therapy; therefore, their occurrence should be regarded as the result of multiple interacting factors [1,5]. Based on available evidence, the development of an RPE tear should not serve as a basis for discontinuing anti-VEGF therapy. Clinical decision-making should incorporate comprehensive assessment of the patient's PED type, foveal involvement, and overall visual function status to achieve individualized treatment. This case also suggests that for RPE tears occurring on a predominantly serous fibrovascular PED, the RPE tear margins can achieve reattachment and apposition with the continued absorption of subretinal fluid and associated exudative fluid.

Abbreviations

RPE Retinal pigment epithelial

PED Pigment epithelial detachment

AMD Age-related macular degeneration

VEGF Vascular endothelial growth factor

BCVA Best-corrected visual acuity

FFA Fundus fluorescein angiography

OCT Optical coherence tomography

MNV macular neovascularisation

CNV choroidal neovascularization

Declarations

Ethics approval

This study adhered to the tenets of the Declaration of Helsinki and approved by the Medical Ethics Committee of Hebei genernal Hospital.

Consent for publication

The patient provided written informed consent for the publication of this case. The consent form is available for review by the Editor of this journal.

Competing interests

The authors declare that they have no competing interests.

Funding

This work was supported by 2027 Hebei Province Medical Science Research Project Plan (Project number: 20270002)

Author Contribution

X.T. Yu and X. Lv wrote the main manuscript text.J.M. Wang participated in the diagnosis, treatment and review of the patient.All authors reviewed the manuscript.

Acknowledgement

We thank the patient who participated in this study.We appreciate the support and assistance from Roche Pharma China and the Roche Ophthalmology Academy.

Availability of data and materials

All the data were included in the manuscript.

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Figures

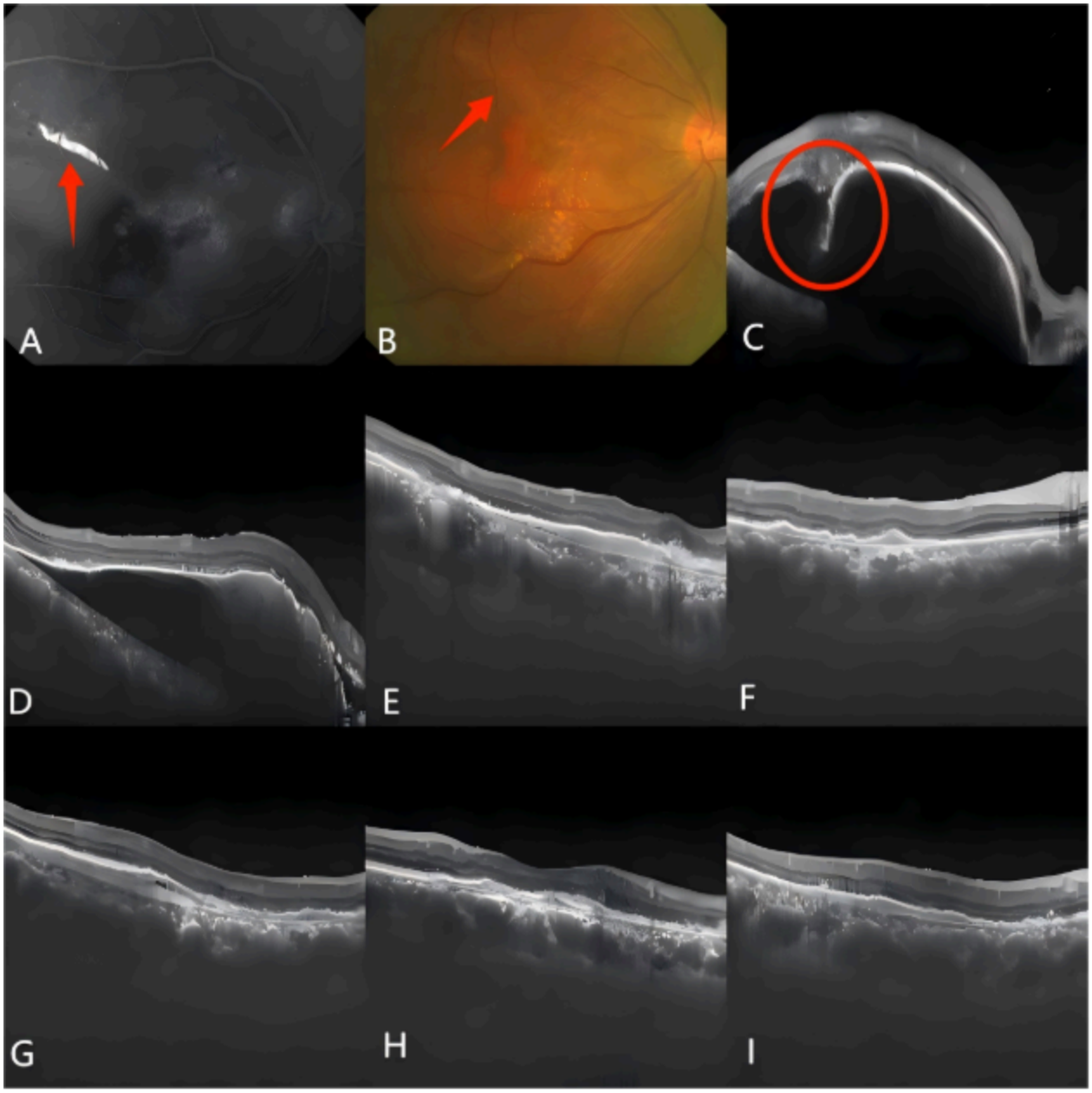


Figure 1

A: Right eye FFA showing the area of RPE tear (red arrow), B: Right eye fundus photograph showing the area of RPE tear (red arrow), C: Right eye OCT showing retinal detachment with RPE tear (red circle), D: Right eye OCT (1-month follow-up), E: Right eye OCT (2-month follow-up), F: Right eye OCT (3-month follow-up), G: Right eye OCT (6-month follow-up), H: Right eye OCT (2-year follow-up), I: Right eye OCT (3-year follow-up)