

# Retinal inflammation diagnosed as an idiopathic macular hole with multiple recurrences and spontaneous closures

## A case report

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### Abstract

**Rationale:** An idiopathic macular hole that causes substantial reduction in central visual acuity is believed to involve no obvious underlying diseases; thus, it is suspected to form due to the presence of idiopathic tractional forces at the vitreoretinal interface. Importantly, it is effectively treated with pars plana vitrectomy (PPV), which removes the mechanical forces. However, while it is exceedingly rare, a macular hole can develop in eyes after PPV; fresh or postoperative macular holes can close spontaneously without surgical removal of traction. Thus, another mechanism might be involved, although it remains obscure.

**Patients concerns:** A 67-year-old woman experienced 4 episodes of distorted and/or blurred vision.

**Diagnosis:** She was diagnosed with recurrent macular hole formation.

**Interventions:** For each episode, she either underwent surgery or was placed under observation.

**Outcomes:** The macular hole was twice closed with PPV and twice without. The 2nd PPV procedure, which was performed at the time of 2nd recurrence, confirmed the absence of the epiretinal membrane and internal limiting membrane that cause tractional forces at the vitreoretinal interface in the macular area. At the time of the 3rd recurrence, fluorescein angiographies (FAs) revealed the presence of mild and diffuse inflammation throughout the peripheral retina, although there were no other findings indicative of ocular inflammation during the general eye examination conducted for every episode of macular hole formation. After the initiation of topical steroid treatment, inflammation (as recorded on FA) was reduced, and the macular hole subsequently closed. Development and resolution of perifoveal cystoid change and retinal protrusion were observed in every episode in optical coherence tomography (OCT) images. A bridging element in an OCT image was observed during the 4th closure of the macular hole.

**Lessons:** Dynamic changes in FA and OCT images unraveled the pathogenesis of a macular hole that was originally diagnosed as idiopathic; mild inflammation was involved. The FA is typically not used for the diagnosis and management of macular hole formation; however, its use in this case helped determine a new mechanism in an otherwise idiopathic disease.

**Abbreviations:** BCVA = best-corrected visual acuity, FA = fluorescein angiographies, ILM = internal limiting membrane, OCT = optical coherence tomography, PPV = pars plana vitrectomy.

**Keywords:** central visual dysfunction, idiopathic, inflammation, macular hole, retina

Editor: N/A.

IH and YO Equally contributed first authors.

The authors have no conflicts of interest to disclose.

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Medicine (2019) 98:4(e14230)

Received: 21 September 2018 / Received in final form: 24 December 2018 /

Accepted: 1 January 2019

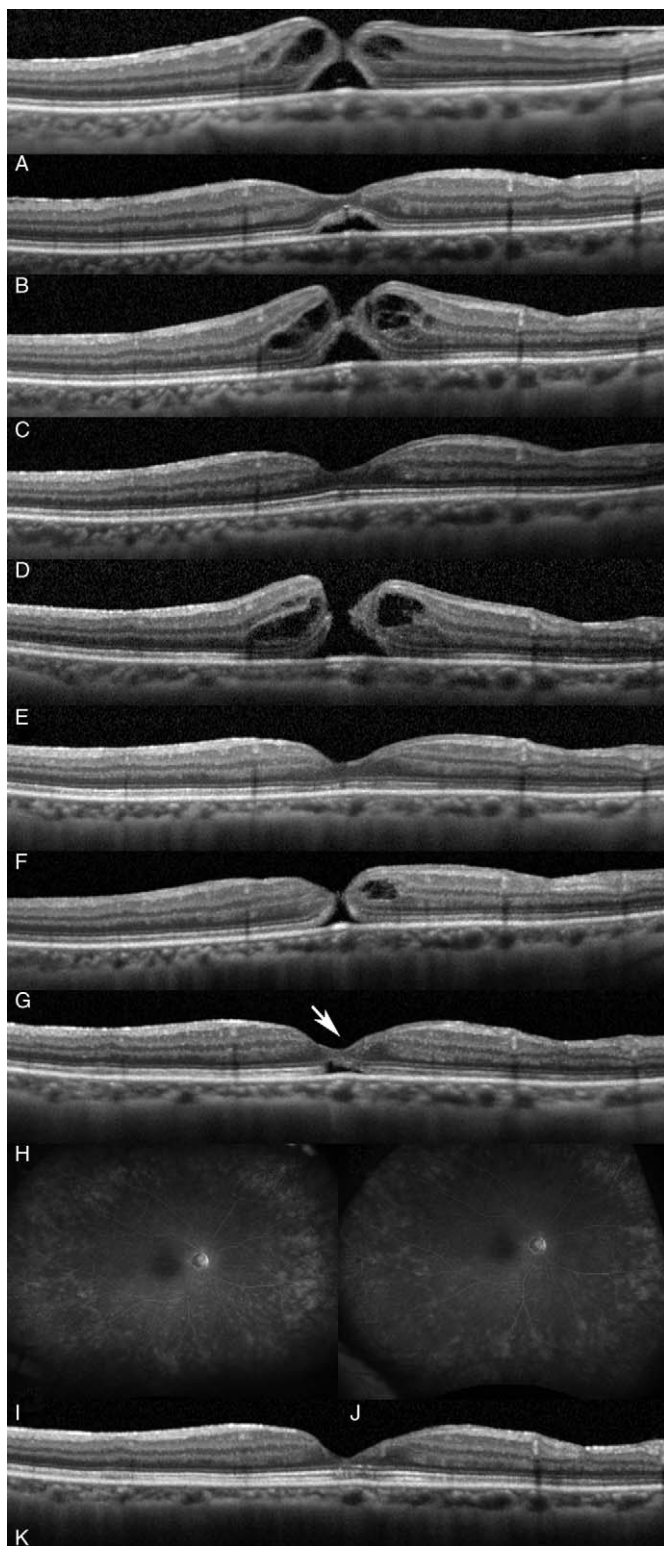
<http://dx.doi.org/10.1097/MD.0000000000014230>

## 1. Introduction

An idiopathic macular hole is effectively treated by removing the tractional forces at the vitreoretinal interface with pars plana vitrectomy (PPV). Thus, it is well-accepted that the macular hole is caused by mechanical tractional force. However, while it is rare, such holes can close spontaneously,<sup>[1]</sup> suggesting the presence of mechanisms other than traction in macular hole formation. Here, we describe a patient with 4 episodes of macular hole formation, twice closed with PPV and twice without, showing an inflammatory finding in the fundus fluorescein angiographies (FAs).

## 2. Case report

In March 2013, a 67-year-old Japanese woman presented with distorted vision in her right eye and was diagnosed with an “idiopathic” macular hole confirmed by an optical coherence tomography (OCT) image (Fig. 1A), and cataract at the Vitreo-Retina Division Clinic of the Department of Ophthalmology,



**Figure 1.** Optical coherence tomography (OCT) and fluorescein angiography (FA) images of the eye with recurrent macular holes with spontaneous closures over time. Vertical OCT images (A–H) at the time of 4 episodes of macular hole formation (A, C, E, G), and of closure and inclosing (B, D, F, H). Perifoveal cystoid change and retinal protrusion were observed at every episode of macular hole formation (A, C, E, G). The bridging element was obvious in the last episode (H, arrow). The macular hole was closed with (B and F) or without (D and H) pars plana vitrectomy. The FA images (I and J) showed diffuse inflammation in the whole retina. Compared with the FA image recorded on the same day as the OCT image (H) (I), inflammation was partially reduced by topical steroid administration after 3 months (J). A recent vertical OCT image

Keio University Hospital, Tokyo, Japan. Her best-corrected visual acuity (BCVA) had decreased to 0.3 in decimal (0.52 in logMAR). She underwent PPV with internal limiting membrane (ILM) peeling to remove tractional forces at the vitreoretinal interface and SF<sub>6</sub> gas tamponade, following cataract surgery with intraocular lens implantation as usual in June 2013; practical closure of the macular hole and recovery of BCVA were achieved (Fig. 1B). No complications were observed. In August 2015, she presented with a recurrent macular hole (Fig. 1C). The PPV was planned; however, it was cancelled because spontaneous closure was achieved by September 2015 (Fig. 1D). In February 2017, she presented with the 2nd recurrent macular hole (Fig. 1E) and underwent a 2nd PPV procedure; no residual ILM was found in the macula, despite the use of staining; tamponade was performed with C<sub>3</sub>F<sub>8</sub> gas to obtain an extended effect. The macular hole was closed by April 2017 (Fig. 1F). However, in July, she noticed blurred vision after self-cessation of postoperative topical steroid administration. Subsequently, she was diagnosed with the 3rd recurrent macular hole (Fig. 1G), which was closing spontaneously (Fig. 1H). However, her complaint continued. Thus, to explore pathogenesis that does not appear in morphological changes recorded by OCT, FA—not generally used for macular hole cases—was recorded to evaluate the retinal condition. The FA showed microvascular inflammation in the peripheral retina in her right eye in August 2017 (Fig. 1I). No intraocular inflammatory cells were found by general eye examinations. Topical steroid administration was restarted and the inflammation was partially resolved in November 2017 (Fig. 1J). The symptom had disappeared, and the macular hole remained closed at the time of her last visit (Fig. 1K). Perifoveal cystoid changes surrounding the macular hole that were recorded by OCT images in every macular hole recurrence (Fig. 1A, C, E, G), were subsequently resolved at the time of closure during 5 years and 5 months of follow up period (Fig. 1B, D, F, H). Retinal protrusion at the edge of the hole was also observed in every recurrence. During the 4th closure, a bridging element was observed (Fig. 1H arrow).

This study followed the tenets of the Declaration of Helsinki and was approved by the Ethics Committee of the Keio University School of Medicine (Approval number: 20100003).

### 3. Discussion

No residual membrane including ILM in the macula was found during the 2nd PPV. The 3rd recurrence corresponded to discontinuation of steroid administration; inflammation was recorded on FA, and the macular hole closed after restarting steroid treatment, which suppressed inflammation recorded on FA. These phenomena suggested the involvement of retinal inflammation in the pathogenesis of macular hole formation. A previous report showed that most post-PPV recurrent macular holes occurred after additional cataract surgery,<sup>[2]</sup> supporting the idea.

Perifoveal cystoid changes surrounding the macular hole recorded by OCT images in every macular hole recurrence in the current patient were noted in eyes with a macular hole that closed spontaneously. Some reports state the finding as an edema,

shows complete closure of the macular hole (K). Best-corrected visual acuity in decimal (logMAR) at each time point was (A) 0.3 (0.52 in logMAR) in March 2013, (B) 1.2 (−0.079) in June 2013, (C) 1.0 (0.0) in August 2015, (D) 1.2 (−0.079) in September 2015, (E) 0.7 (0.15) in February 2017, (F–H) 1.0 (0.0) in April, July, and August, 2017, respectively, (I) the same day as (H), and August 2017, (J) 1.0 (0.0) in November 2017, and (K) 1.2 (−0.079) in July 2018.

although no information regarding inflammation is provided in those reports,<sup>[3,4]</sup> while another report describes it as degeneration,<sup>[5]</sup> which is unlikely because BCVA recovered after closure.

Retinal protrusion at the edge of the hole in every recurrence, as well as a bridging element during the 4th closure (Fig. 1H arrow), suggested that macular hole formation and closure could be related to outward and inward migration of retinal neural tissue from the fovea; this was potentially related to the inflammatory reaction, rather than tightening and loosening of traction. The initial OCT image revealed both perifoveal cystoid change and protrusion, suggesting involvement of retinal inflammation from the 1st episode.

Most macular hole surgeries are successfully performed; however, some cases may present with inflammation requiring separate treatment. Perifoveal cystoid change, protrusion, and a bridging element may be inflammation-related biomarkers. Control of postoperative inflammation may also be valuable in preventing recurrences, although further study is required.

The current case illustrates that unconventional examination may help unravel the mechanisms of “idiopathic” disease in any fields.

### Acknowledgment

The authors thank all the clinical staff members of the Vitreo-Retina Division Clinic of the Department of Ophthalmology,

Keio University Hospital. The patient has provided informed consent for publication of the case.

### Author contributions

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