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Case Report

Macular Hole Self Closure While Awaiting Pre-Operative Clearance

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Abstract

Purpose: To describe an atypical presentation of a patient with a Stage 2 full-thickness macular hole (FTMH) who exhibited spontaneous resolution while awaiting pre-operative clearance.

Methods: Complete ophthalmic examination including dilated fundus examination and spectral domain optical coherence tomography (SD-OCT).

Results: A 69-year-old Caucasian female with a history of vitreomacular traction (VMT) presented with a two-week history of visual loss in the right eye. Visual acuity, with correction, measured 20/200 in the right eye. Examination revealed a partial posterior vitreous detachment and a Stage 2 FTMH. SD-OCT testing confirmed a Stage 2 FTMH with VMT. Pars plana vitrectomy without internal limiting membrane peeling was planned and the patient sent for preoperative clearance where she was diagnosed with atrial fibrillation and wanted to delay surgery. Two months later, the patient returned for follow up with a visual acuity of 20/80, a closed macular hole, and an incomplete PVD in her right eye. Four months later, the patient exhibited a completely closed FTMH with a visual acuity of 20/30.

Conclusions and Importance: Spontaneous resolution of full-thickness macular holes (Stage 2-4) is a rare event, occurring in less than 4% of affected eyes. We describe a patient with a Stage 2 full-thickness macular hole who exhibited spontaneous resolution while awaiting pre-operative clearance due to the resolution of VMT.

Keywords: *Macular Hole; Optical Coherence Tomography; Posterior Vitreous Detachment; Vitreomacular Traction*

Abbreviations

FTMH: Full-Thickness Macular Hole; SD-OCT: Spectral Domain Optical Coherence Tomography; VMT: Vitreomacular Traction; PVD: Posterior Vitreous Detachment; ELM: External Limiting Membrane; IS/OS: Inner and Outer Segment

Introduction

Macular holes are retinal breaks in the fovea involving a partial to complete dehiscence of the neural retinal layers. Formation of an idiopathic or primary macular hole has been attributed to mechanical forces or focal shrinkage exerting tangential traction at the vitreomacular interface [1,2]. This most commonly occurs during the development of a posterior vitreous detachment. Clinical evidence has shown that stage 1 macular holes have a 50% chance for spontaneous closure with resolution of symptoms [3]. Due to these findings, stage 1 holes are generally observed and not surgically treated. However, spontaneous resolution with closure and restoration of the normal foveal contour is rare in full-thickness macular holes (stages 2 - 4), occurring in less than 4% of affected eyes [4]. Therefore, these cases are usually treated surgically by pars plana vitrectomy, with or without internal limiting membrane peeling.

We present a case of spontaneous closure and resolution of a Stage 2 FTMH in a patient awaiting operative clearance for pars plana vitrectomy due to the resolution of vitreomacular traction (VMT), but not the development of a complete posterior vitreous detachment.

Case Report

A 69-year-old Caucasian woman presented with a two-week history of visual loss in the left eye. Her past medical history was significant for hypertension and hyperlipidemia. Her past ocular history was significant for mild cataracts in both eyes and early VMT in the right eye with a previous visual acuity of 20/40 (Figure 1A). Visual acuity, with correction, measured 20/200 in the right eye and 20/30 in the left eye. Pupils showed no evidence of afferent pupillary defect and color plates were full in both eyes. Applanation tonometry revealed intraocular pressures of 12 and 14 mm Hg in the right and left eye, respectively. Examination with the Amsler grid demonstrated central metamorphopsia in the right eye. Anterior segment examination was significant for minimal nuclear sclerosis. Dilated fundus examination of the right eye revealed a partial posterior vitreous detachment with a new full thickness (Stage 2) macular hole (FTMH). The left eye was within normal limits. High-resolution spectral-domain optical coherence tomography (SD-OCT) (Cirrus HD-OCT; Carl Zeiss Meditec, Dublin, CA) revealed a FTMH (Stage 2) with VMT (Figure 1B). After a discussion regarding treatment, pars plana vitrectomy without internal limiting membrane peeling was planned and the patient sent for preoperative clearance. The patient was found to have new onset severe atrial fibrillation and required a full cardiac evaluation and anticoagulation. The decision was made to put surgery on hold until her cardiac condition was stabilized.

Two months later, the patient returned for follow up with an improved visual acuity from 20/200 to 20/80 in her right eye. Posterior segment exam revealed a closed macular hole and an incomplete PVD. SD-OCT showed a closed macular hole with a large foveal cyst and resolution of vitreomacular traction (Figure 1C). Monthly visits and serial SD-OCTs demonstrated improving tissue architecture, resolution of the foveal cyst and hyperreflective foveal material, and attenuation of the inner and outer segment junction in the foveal region (Figure 1D-1F). Four months later, visual acuity improved to 20/30 in the right eye with restoration of the subfoveal ellipsoid zone and retinal architecture.

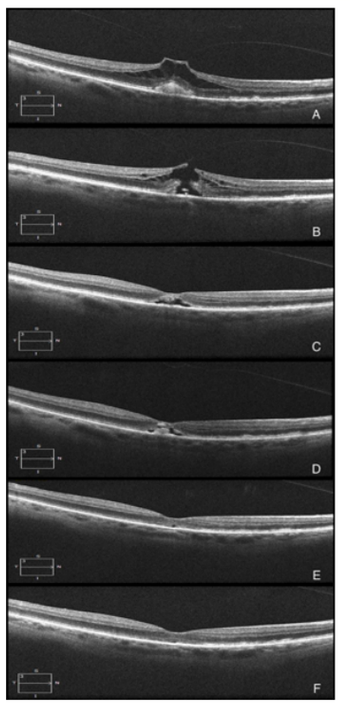

Figure 1: *Serial high definition horizontal SD-OCT B-scans through the fovea.*

A: Diffuse macular schisis is noted involving the outer plexiform and outer nuclear layer of the right eye secondary to vitreomacular traction (VMT) with foveal elevation.

B: Formation of a Stage 2 full-thickness macular hole (FTMH) with persistent VMT. There is evidence of peri-foveolar cystic changes.

C: Closure of FTMH two months post figure 1B. Bridging of external limiting membrane has occurred with persistent subretinal fluid.

D: Closed FTMH three months post figure 1B with subfoveal ellipsoid zone remodeling.

E: Closed FTMH four months post figure 1B with restoration of subfoveal ellipsoid zone.

F: Closed FTMH five months post figure 1B with restoration of subfoveal ellipsoid zone and restoration of normal anatomy.

Discussion

Spontaneous closure of traumatic macular holes is described as a common event in peer-reviewed literature [3]. However, spontaneous resolution of FTMHs (Stage 2-4) is a rare event, occurring in less than 4% of affected eyes [4,5]. In fact, spontaneous closure of stage 3 and 4 idiopathic macular holes is even more unlikely and reported infrequently in the literature [4,7-10]. Proposed mechanisms of spontaneous macular hole closure include: 1) complete detachment of the posterior hyaloid from the foveal area leading to a reduction in antero-posterior tractional forces, 2) cell proliferation at the base of the hole, 3) formation of a contractile epiretinal membrane resulting in shrinkage and closure of the hole, and 4) bridging of the retinal tissue across the hole [7-10]. The most consistent findings in cases of spontaneous closure include bridging of the sensory retina and the smaller size of the macular hole, while posterior vitreous detachment and epiretinal membrane formation may or may not always be evident [6-10].

Okubo., *et al*. used serial SD-OCT measurements to hypothesize that FTMH closure begins with extensions of Müller cells bridging retinal tissue, and that this would explain the recovery of the external limiting membrane (ELM) [10]. They report that because the ELM is formed by the adherence junctions between Müller cells and photoreceptors, the ELM should be seen in the SD-OCT images after Müller cells reach the photoreceptors. In addition, a centripetal attractive force produced by the proliferation of the Müller cells toward the center of the FTMH could lead to adhesion of other disrupted retinal layers, including the inner and outer segment (IS/OS) junction. Therefore, primary bridging by Müller cells might facilitate the recovery of the foveal detachment by pressing the elevated tissue back to the retinal pigment epithelium. This would lead to photoreceptor activation and IS/OS junction restoration [10].

In our patient, we believe that VMT started the formation of the FTMH. The delay in surgery provided time for a partial posterior vitreous detachment to alleviate the VMT, giving the FTMH a chance at spontaneous closure. Our serial SD-OCTs support the hypothesis of Okubo and colleagues [10]. Due to the gap in follow up, we are unable to document the tissue involved in the initial step of bridging. More studies are necessary to document the exact mechanism of spontaneous closure.

Conclusion

Spontaneous resolution of full-thickness macular holes (Stage 2-4) is a rare event, occurring in less than 4% of affected eyes. We describe a patient with a Stage 2 full-thickness macular hole who exhibited spontaneous resolution while awaiting pre-operative clearance due to the resolution of vitreomacular traction without the development of a complete posterior vitreous detachment.

Patient Consent

This report does not contain any personal information that could lead to the identification of the patient.

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Conflicts of Interest

The following authors (MJ, AJO, JO, PSP) have no financial disclosures.

Authorship

All authors attest that they meet the current ICMJE criteria for authorship.

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