CLOSURE OF IDIOPATHIC FULL-THICKNESS MACULAR HOLE AFTER INTRAVITREAL C3F8 INJECTION WITHOUT VITREOMACULAR TRACTION RELEASE: A CASE REPORT AND REVIEW OF LITERATURE

Farhad Fazel, MD,* Abdolreza Rezaeian-Ramsheh, MD,* Mohammadreza Fazel, MD,* Hamid Ahmadieh, MD*

Background: The purpose of this study was to describe a successful closure of macular hole without release of vitreomacular traction after intravitreal perfluoropropane (C3F8) gas injection.

Case Presentation: A 54-year-old woman was referred to our clinic with the history of declined vision after a period of distorted vision in her right eye. After dilated fundus examination and performing optical coherence tomography, a V-shaped vitreomacular traction complicated by full-thickness macular hole was diagnosed and she underwent pneumatic vitreolysis using intravitreal C3F8 gas injection. After 12 weeks, her visual acuity was significantly improved and fundus examination and optical coherence tomography revealed that the macular hole was completely resolved despite persisted vitreomacular traction.

Conclusion: Intravitreal gas injection would be a promising option to manage idiopathic macular holes not only by releasing the vitreous traction on the macula but also through some not proven or even unknown mechanisms.

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*From the *Department of Ophthalmology, Isfahan Eye Research Center, Isfahan University of Medical Sciences, Isfahan, Iran; and †Ophthalmic Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran.*

Macular hole (MH) is one of the most common macular diseases that causes significant central vision impairment. Tangential traction probably caused by Müller cells proliferation and posterior hyaloid traction on the macula are considered to be the major underlying mechanisms of MH formation.[1] Previous investigations revealed that vitreomacular traction (VMT) resolution after intravitreal injection of an expansible gas known as pneumatic vitreolysis was achieved in 80.6% of patients with symptomatic vitreous traction. It has been recently reported that the vitreous was successfully released in 95% of patients with VMT complicated by a small MH (Stage 2) and resulted in complete MH closure in up to 60% of the cases after performing pneumatic vitreolysis.[2]

In this article, we present the complete closure of a full-thickness MH after intravitreal perfluoropropane (C3F8) gas injection without release of VMT.

Case Presentation

A 54-year-old woman was referred to our clinic with complaints of decreased vision in her right eye from 1 month before, following a period of distorted vision that had lasted for 1 month. Her medical and surgical history was unremarkable.

Her best-corrected visual acuity was 20/200 right eye and 20/20 left eye. Anterior segment examination was unremarkable, and intraocular pressures were within normal limits in both eyes. Dilated fundus examination of the right eye revealed that the foveal reflex was decreased, and an MH was highly suspected. Optical coherence tomography showed a Stage-2 MH and a large

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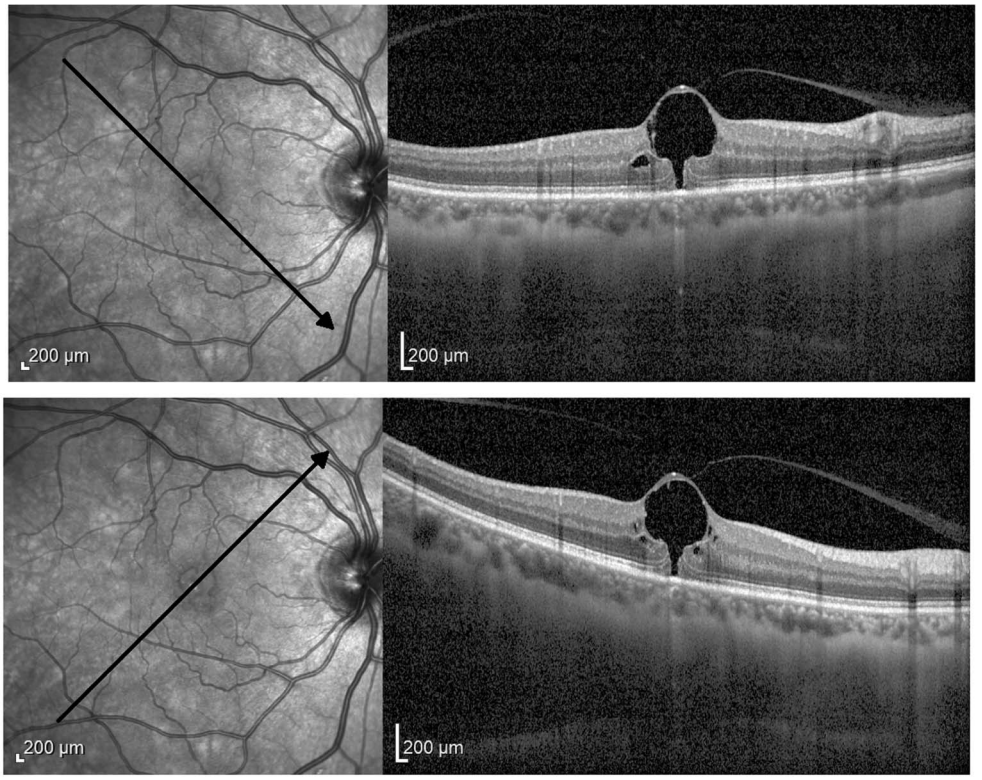

Fig. 1. Spectral domain optical coherence tomography of the right eye revealed a Stage-2 MH in the presence of VMT.

tractional cyst in the inner retinal layers accompanied by a V-shaped VMT without any sign of epiretinal membrane in the right eye (Figure 1).

Based on the clinical findings, pneumatic vitreolysis was performed to achieve vitreous-macula separation; therefore, 0.3 mL of C3F8 gas was injected into the vitreous in a sterile condition. The patient was advised to perform "drinking bird"[3] head movement, pointing downward her nose, 10 to 20 times/hour and to take a prone position especially in the first week after injection. In addition, she was highly recommended to avoid sudden, extensive, or jerking eye movements in an effort to reduce the risk of MH enlargement. One month and 3 months later, the patient was re-evaluated clinically and an optical coherence tomography was also performed.

The best-corrected visual acuity improved to 20/63 and 20/32 at first and third months, respectively. The postinjection optical coherence tomography demonstrated the persistence of vitreous attachment to the macula; however, the MH completely closed, and the retinal cyst disappeared (Figure 2).

None of the authors has any financial/conflicting interests to disclose.

Ethics approval: This report has been approved by the medical ethics committee of Isfahan University of Medical Sciences. Consent for publication: The study patient has signed an informed consent to publish her clinical information and photographs.

Reprint requests: Mohammadreza Fazel, Department of Ophthalmology, Isfahan Eye Research Center, Isfahan University of Medical Sciences, Isfahan, Iran; e-mail: Mr.fazel90@gmail.com

Discussion

Pneumatic vitreolysis was first described in 1995 in patients with an idiopathic impending or full-thickness MH. Multiple new studies have shown that this method can help release the vitreous traction, improve the foveal contour, and close the MH.[1–4]

Abou Ltaif and Herbert[5] reported a case of MH closure after ocriplasmin injection in which VMT was not released. Reinherz and Rubin[6] also reported a case with MH associated with proliferative diabetic retinopathy and a spontaneous closure in the absence of VMT resolution.

It has been hypothesized that high glial cell proliferation and activity may have been the cause of MH closure in three cases of traumatic MH, as reported in the study by Yamada et al.[7] This mechanism was also considered to be the cause of MH closure without separation of the vitreous from the retina in a patient who had previously been treated by grid laser for diabetic macular edema.[8]

"Hydration theory" has been proposed for MH formation especially in those with a cystic structure.[9–12] Based on this theory, Tornambe indicated that intraretinal edema may highly form, while the macula was exposed to the liquefied vitreous, causing subsequent MH. Therefore, absorption of cystic fluid by the retinal pigment epithelium would be an important

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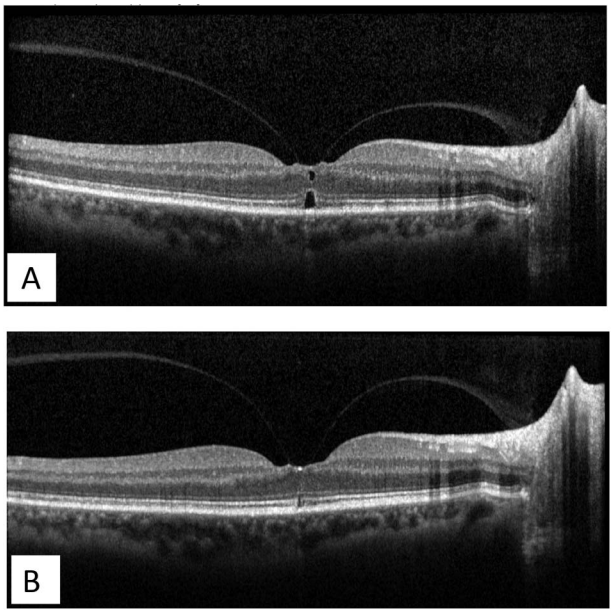

Fig. 2. One month after injection, spectral domain optical coherence tomography revealed a remarkable resolution of the cystic lesion without VMT release (**A**). Complete MH closure without VMT resolution was observed in the spectral domain optical coherence tomography performed in 3-month follow-up (**B**).

mechanism of MH closure besides VMT resolution.[10] Niffenegger et al investigated the effects of topical emulsion of difluprednate 0.05%, topical carbonic anhydrase inhibitors (dorzolamide 2% or brinzolamide 1%), and topical nonsteroidal anti-inflammatory drugs (bromfenac 0.07%) in nine eyes with secondary MH. Complete MH resolution was observed in 89% of their participants, which strongly supported the "hydration theory".[12]

Given these facts, we propose that the tamponade created by gas injection might have induced glial cell and retinal pigment epithelium cell proliferation and resulted in MH improvement. The bridge-like structure produced by the proliferation of Müller cells across the hole may facilitate the closure of the hole. Furthermore, the absorption of cystic fluid by the retinal pigment epithelium may play a key role in MH closure.

Conclusion

Idiopathic full-thickness MHs may be closed without VMT resolution after pneumatic vitreolysis. This event is in common with the same phenomenon of MH formation and its resolution independent of the mechanism of VMT, such as the "hydration theory" in MH genesis, and formation and resolution of secondary MHs unrelated to vitreomacular tractional forces.

Key words: macular hole, vitreous traction, pneumatic vitreolysis, C3F8.

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