

Case Report

Trapped Pre-Macular Bubble of Octafluoropropane Gas Masquerading as Retained Submacular Perfluorocarbon Liquid

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Keywords

Retinal detachment · Vitrectomy · Perfluorocarbon · Octafluoropropane · Macular hole · Optical coherence tomography

Abstract

Introduction: To demonstrate, with the aid of retinal imaging, an abnormal post-operative macular appearance caused by the presence of a "fragmented" pre-retinal bubble of octafluoropropane (C₃F₈) masquerading as retained subretinal perfluorocarbon liquid (PFCL). **Methods:** This is an interventional case presentation. **Results:** Colour fundus photography high-resolution spectral domain-optical coherence tomography (SD-OCT) and clinical progress demonstrate that the abnormal reflex was caused by the presence of a small fragment of C₃F₈ becoming lodged at the pre-foveal area. **Conclusion:** Submacular entrapment of various substances used during vitrectomy has been described in a number of case reports and case series. To our knowledge, this is the first described case of a retained fragment of fluorocarbon gas trapped at the macula following successful retinal detachment repair and highlights a previously unreported cause of an abnormal foveal appearance. However, clinical ex-

amination together with the use of SD-OCT is helpful in differentiating the appearance from that seen in other retained vitrectomy adjuncts.

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Introduction

Although first described in 1973 [1], expansile gases are now commonly used during primary retinal detachment repair, and longer-acting tamponade agents such as octafluoropropane (C_3F_8) can be used in the treatment of giant retinal tear-associated retinal detachment when the macula is still preserved [2]. Perfluorocarbon liquid (PFCL) represents a significant adjunct in the treatment of the aforementioned type of retinal detachment and although its intraoperative role is important, several intra- and post-operative complications associated with its use have been reported in the literature [3]. These include post-operative PFCL retention, retinal slippage, and toxicity [4].

We herein demonstrate, with the aid of retinal imaging, an abnormal post-operative macular appearance caused by the presence of a “fragmented” pre-retinal bubble of C_3F_8 masquerading as retained subretinal PFCL.

Case Report

A 60-year-old man presented to our institution with a right macula-off rhegmatogenous retinal detachment caused by a temporal giant retinal tear. Visual acuity was hand movements in the affected eye. He underwent a three-port 23-gauge pars plana vitrectomy with the use of PFCL and an endolaser, followed by 12% C_3F_8 gas for intraocular tamponade. Six weeks post-operatively, his vision was 6/60 and the retina was attached with a 20% C_3F_8 residual gas fill. An abnormal foveal reflex was seen with a bubble visible at the fovea (Fig. 1). Based on clinical examination, previously published literature about various substances trapped subretinally during vitrectomy, and the surgery adjuncts, it was assumed that this bubble consisted of trapped PFCL. The infra-red image (Fig. 2a) demonstrated a very distinct hyporeflectant lesion at the fovea. A cross-sectional spectral domain-optical coherence tomography (SD-OCT) scan through the centre of this point revealed a full-thickness macular hole along with shadowing at the level of the choroid (Fig. 2b). This shadow is probably caused by side-scatter of the light when it meets the surface of a foreign body present anterior to the macular hole. While subretinal PFCL has a distinct appearance, this bubble was not subretinal, thus making the differentiation difficult between a gas bubble or PFCL trapped in the margin of a macular hole.

Six weeks later the remaining C_3F_8 in the vitreous cavity had disappeared, including the bubble at the posterior pole. Further SD-OCT imaging confirmed the absence of the hyporeflectant reflex at the fovea, allowing a normal choroidal appearance in the presence of the macular hole (Fig. 2c). At this time, complete fundus examination was possible, allowing examination of the inferior fundus for a displaced PFCL bubble. Such a finding was not observed, confirming that this initially clinically visible bubble could not have been PFCL. In addition to this, the patient did not report reappearing of the blurring in his vision when in a supine position. At this point, taking into consideration the substances used during surgery and the fact that the bubble was no longer present, it was concluded that it consisted of a C_3F_8 bubble. The patient subsequently underwent vitrectomy with internal limiting membrane peeling and

injection of 12% C₃F₈ gas. Two weeks post-operatively, the macular hole was closed, and the patient's vision improved to 6/24.

Discussion

PFCL is widely used during complex retinal detachment repair associated with giant retinal tears, and retained PFCL is one of the most common complications of its use. When subfoveal PFCL is identified, surgical removal is recommended in view of its toxic effects on the retina [4]. OCT can be used for the imaging of the PFCL bubbles, demonstrating typical features such as retinal pigment epithelium disorganisation and disruption of the external limiting membrane [5].

Revising the published literature, there are reports of cases where other substances can be trapped subretinally during vitrectomy. Silicone oil particles resemble beads and are slightly mobile among subretinal strands by changing the eye position [6]. Triamcinolone granules gradually decrease over 2 weeks and resolve completely by 3 weeks, while on follow-up the retina appears successfully attached and no functional damage is observed, thus not necessitating any surgical intervention [7].

In our case the foveal bubble observed post-operatively was initially mistaken for retained subretinal PFCL. However, further careful examination together with SD-OCT imaging and along with the clinical progress of the finding clearly confirmed this was in fact a fragment of C₃F₈ lodged at the posterior pole.

Macular hole formation following retinal detachment surgery is not uncommon [8] and can be successfully closed following further surgery. In this case we do not believe the bubble of gas at the macula contributed to macular hole formation, given that there was no suspicion over expansion of the trapped gas bubble, for example due to changes of altitude or use of nitrogen monoxide during general anaesthesia. On the other hand, it is likely the macular hole allowed this phenomenon to become visible.

To our knowledge, this is the first described case of a retained fragment of fluorocarbon gas at the macula following successful retinal detachment repair and highlights a previously unreported cause of an abnormal foveal appearance. We believe the small bubble of gas became anchored in place by the edges of the macula hole, thus allowing the gas bubble to bridge over it. Clinical examination together with the use of SD-OCT is helpful in differentiating the appearance from that seen in retained PFCL, silicone oil, or triamcinolone.

Statement of Ethics

Compliance with ethical standards.

Disclosure Statement

The authors have no conflict of interest to declare. None of the authors has any proprietary interest related to this paper.

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References

- 1 Norton EW. Intraocular gas in the management of selected retinal detachments. *Trans Am Acad Ophthalmol Otolaryngol.* 1973 Mar-Apr;77(2):OP85–98.
- 2 Hoffman ME, Sorr EM. Management of giant retinal tears without scleral buckling. *Retina.* 1986;6(4):197–204.
- 3 Scott IU, Murray TG, Flynn HW Jr, Feuer WJ, Schiffman JC; Perfluoron Study Group. Outcomes and complications associated with giant retinal tear management using perfluoro-n-octane. *Ophthalmology.* 2002 Oct;109(10):1828–33.
- 4 Shulman M, Sepah YJ, Chang S, Abrams GW, Do DV, Nguyen QD. Management of retained subretinal perfluorocarbon liquid. *Ophthalmic Surg Lasers Imaging Retina.* 2013 Nov;44(6):577–83.
- 5 Soheilian M, Nourinia R, Shoeibi N, Peyman GA. Three-Dimensional OCT Features of Perfluorocarbon Liquid Trapped Under the Fovea. *Ophthalmic Surg Lasers Imaging.* 2010 Mar:1–4.
- 6 Honda Y, Ueno S, Miura M, Yamaguchi H. Silicone oil particles trapped in the subretinal space: complications after substitution of the vitreous. *Ophthalmologica.* 1986;192(1):1–5.
- 7 Sampangi R, Venkatesh P, Garg SP. Natural history of sub-retinal triamcinolone acetonide deposition after triamcinolone-assisted vitrectomy. *Int Ophthalmol.* 2008 Oct;28(5):359–62.
- 8 Garcia-Arumi J, Boixadera A, Martinez-Castillo V, Zapata MA, Fonollosa A, Corcostegui B. Macular holes after rhegmatogenous retinal detachment repair: surgical management and functional outcome. *Retina.* 2011 Oct;31(9):1777–82.

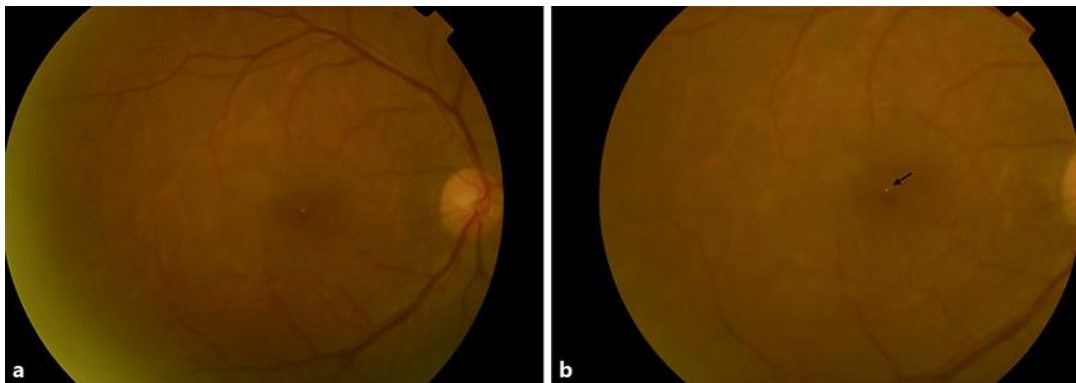


Fig. 1. **a** Colour fundus photograph of the right eye at the first post-operative review demonstrating a well-defined yellow foveal appearance with a bubble of retained C₃F₈. **b** Magnified image of the macula focusing anteriorly on the bubble itself (arrow). Notice that the bubble is trapped at the superior edge of the macular hole.

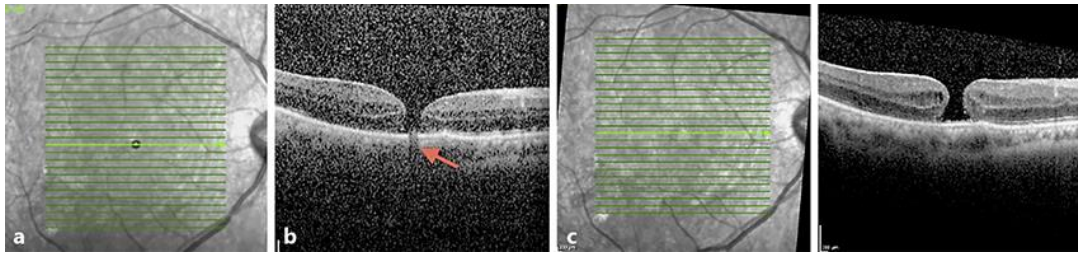


Fig. 2. Images at the 6-week post-operative review. **a** Infra-red image showing a hyporeflective foveal spot. **b** Cross-sectional SD-OCT through the fovea showing a full thickness macular hole. In addition, there is shadowing at the level of the choroid (red arrow) caused by the pre-retinal bubble of C_3F_8 . **c** 12 weeks after RD repair showing absorption of the gas bubble and normal appearance of Bruch's membrane and choroidal layers.