

Removal of subfoveal perfluorocarbon droplet combined with internal limiting membrane peeling to flatten the macular

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Dear Editor,

I'm Dr. Dan Li from the Department of Suzhou Kowloon Hospital, Shanghai Jiao Tong University School of Medicine, Suzhou, Jiangsu Province, China. I'm writing to present an interesting case. It is well known that retained subretinal perfluorocarbon droplets are a possible surgical complication after intravitreal injection of perfluorocarbon liquid (PFCL). The retinal neuroepithelial layer and retinal pigment epithelial layer cannot be bonded where it located. The retina is in a state of detachment. When the patient is lying on the bed, due to the action of gravity, the subretinal PFCL will gradually shift to the posterior pole, especially the macular region. Subfoveal PFCL droplet may seriously affect the visual function. Clinicians are committed to finding a method of removing subfoveal PFCL with less damage. We recently encountered a case of this complication, reported here.

A 23-year-old man was referred to our department with visual loss onset in his right eye, started one month prior. His best-corrected visual acuity (BCVA) was limited to finger counting/50 cm in the right eye and 1.0 in the left eye. The ophthalmoscopic examination found a large inferior retinal detachment, extending clockwise from the 1-9 o'clock with a circular hole at 7-o'clock and striped subretinal membrane

(SRM) in the inferior nasal quadrant, near the macular area. A successful 23-gauge pars plana vitrectomy was performed the following day, with 5 mL silicone oil tamponade injection and endolaser retinopexy. During the operation, a retinostomy was performed to remove the SRM with intraocular forceps, and PFCL was used to flatten the retina.

One month later, the retina was reattached, and the BCVA was 0.05 in the right eye. However, a directly subfoveal PFCL bubble (the base width is about 2104 μm , height is about 596 μm) was observed with an optical coherence tomography (OCT) examination (Figure 1). Therefore, a rapid intervention was planned to avoid further PFCL toxicity. We performed a second surgery to remove the retained PFCL and silicone oil through a 3-port pars plana route. The silicone oil was removed first; then, the subfoveal droplet was directly aspirated, using a 25-gauge needle with a silicon tube within. Under intraocular illumination, the needle was inserted subretinally approximately 500 μm from the foveola, at the edge of the PFCL bubble. Subsequently, the internal limiting membrane (ILM) was stained with brilliant blue and peeled in the macular area. Intraocular pressure was monitored during the surgery. Fluid/air exchange was then performed at the end of the operation, followed by one week of face-down positioning.

At the one-week and three-month follow-ups, fundus examination showed that the retina remained attached. In addition, no subfoveal PFCL or postoperative macular hole was observed. A repeat OCT showed a relatively well-preserved fovea profile but with the disruption of ellipsoid zone (Figure 2). Compared with left eye, the thickness of macular area was significantly thinner (Figure 3). The BCVA was improved to 0.1.

PFCL is a series of fluoro-chemicals with high specific gravity, low viscosity, low surface tension, and optical transparency. It is insoluble in water, blood, and silicone oil. Based on these characteristics, it is widely used in vitreoretinal surgeries as a helpful tool^[1]. The most undesirable complication of PFCL application is its retention, especially in the subretinal space. Its well-known toxicity may lead to irreversible alterations, such as retinal pigment epithelial atrophy, photoreceptor

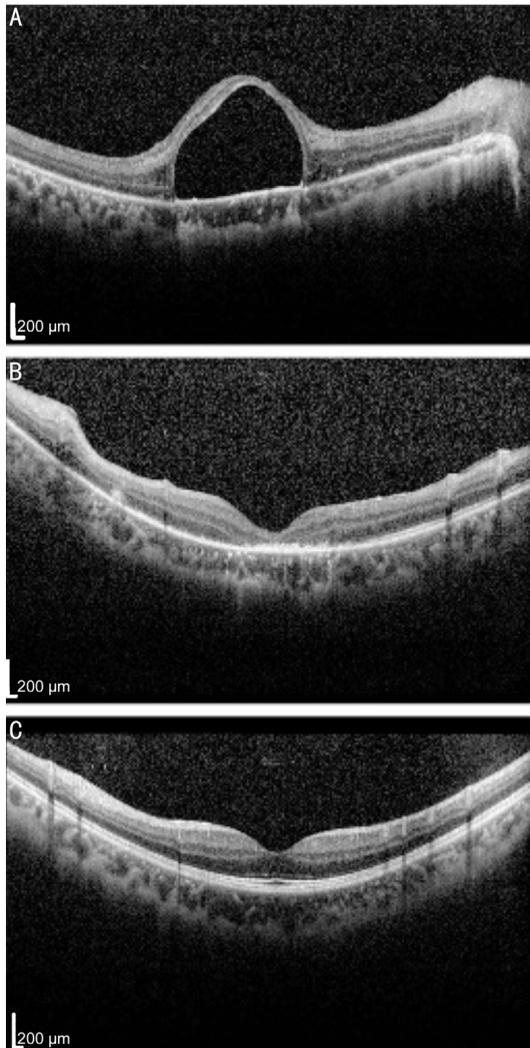


Figure 1 OCT images of patient in diseased eye before and after the surgery, as well as in his healthy eye A: A subfoveal PFCL bubbles (the base width is about 2104 μm , height is about 596 μm) was detected and confirmed by OCT after pars plana vitrectomy and silicone oil removal in his right eye at one-month visit; B: At the one-week and three-month follow-ups after the second operation, OCT showed a reattached foveal profile but with the disruption of ellipsoid zone disruption (the thickness of foveola is about 111 μm); C: OCT image of macular area of left eye (the thickness of foveola is about 229 μm). PFCL: Perfluorocarbon liquid; OCT: Optical coherence tomography.

damage, or full-thickness retinal holes^[2]. These alterations are particularly harmful when occurring in the subfoveal region, where they may affect the anatomy and function of the macula, deteriorating the visual function. Some scholars believe that subretinal droplets may be extruded spontaneously through a transient macular hole, which closes spontaneously afterward^[3-4]. Considering that the long-term presence of PFCL can cause retinal toxicity, surgery is usually recommended, especially for subfoveal PFCL. Several techniques have been proposed to remove subfoveal PFCL, including direct aspiration and displacement. Direct aspiration is mainly

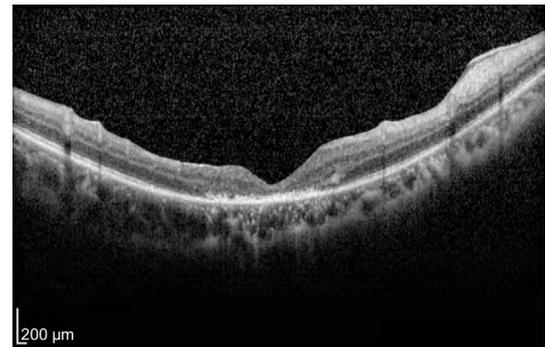


Figure 2 At the postoperative one-week and three-month visit for PFCL removal, OCT showed a reattached foveal profile but with the disruption of ellipsoid zone disruption (the thickness of foveola is about 111 μm) PFCL: Perfluorocarbon liquid; OCT: Optical coherence tomography.

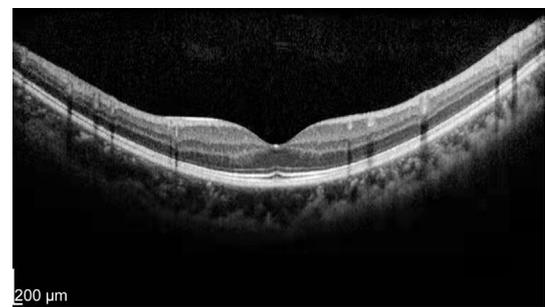


Figure 3 OCT image of macular area of left eye (the thickness of foveola is about 229 μm) OCT: Optical coherence tomography.

performed at the edge or at the top of the PFCL bubble using various cannulas, ranging from 25 to 50 gauge^[5-7]. PFCL displacement may be performed inducing a temporary retinal detachment or with a small retinotomy, followed by direct aspiration, intraoperative body position change, or injecting/flushing saline solution gently^[5,8-9]. However, surgery for displacement or removal of the subfoveal PFCL may incur several complications, including retinal pigment epithelium, nerve fiber layer damage, macular hole, submacular hemorrhage, proliferation, fibrosis, and expansion of the extrafoveal retinotomy^[2]. Therefore, the timing and proper handling of the subfoveal PFCL are critical factors.

In this case, we used a 25-gauge needle with a silicon tube within, inserted subretinally approximately 500 μm from the foveola, to avoid damaging the macular nerve tissue. Subsequently, the ILM of the macular region was peeled to increase the elasticity of the retina and facilitate the self-sealing of the retinal hole, minimizing the risk of an iatrogenic macular hole. In this case, the patient achieved a relatively satisfying postoperative outcome. Nevertheless, residual subfoveal PFCL should be carefully avoided in vitreoretinal surgeries. We suppose that the possible reasons for the retained subfoveal PFCL in the first operation are as follows: 1) the retinotomy position was close to the macular area, resulting in

a PFCL bubble exceeding the posterior edge of the hole; 2) the subretinal proliferative membrane loosening was insufficient. Thus, small PFCL droplets could enter the subretinal space; 3) when injecting the PFCL, the perfusion pressure was insufficiently low and the speed excessive, causing the formation of PFCL droplets. We suggest some feasible techniques to prevent retained subretinal PFCL in pars plana vitrectomy: when injecting the PFCL, the perfusion pressure should be reduced appropriately to decrease the impact of water flow on PFCL; In addition, it is advisable to use the injection needle which can drainage liquid, reduce the injection speed, and adopt bubble injection technology using the PFCL. In the case of a retinal hole, its boundaries should not be injected. In conclusion, we showed that subfoveal PFCL droplets might be removed using a direct aspiration adjacent to the fovea, combined with ILM peeling and short-term gas tamponade. However, further studies with a larger sample size are required to confirm this result.

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