

Surgical removal of subfoveal perfluorocarbon liquid using combined 41 gauge needle and active aspiration under perfluorocarbon liquid

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Abstract

A 57 years old patient underwent uneventfully 23-gauge pars plana vitrectomy (PPV) surgery containing perfluorocarbon liquid (PFCL) injection, endolaser retinopexy, fluid-air exchange, and silicone-oil implantation due to rhegmatogenous retinal detachment. The patient has admitted to the clinic due to decreased visual acuity caused by subfoveal retained PFCL detected with optical coherence tomography (OCT) 4 weeks after surgery. The patient underwent a reoperation to remove the residual subfoveal PFCL partially with a new technique.

Keywords: Subfoveal perfluorocarbon liquids; vacuum aspiration; 41 gauge needle

INTRODUCTION

Retention of the perfluorocarbon liquid (PFCL) under the fovea is a major complication of the small gauge vitreoretinal surgery. Subretinal PFCL, in particular subfoveal PFCL is a toxic substance to the retinal structures. Therefore, it should be removed as early as possible (1). In the literature, there are many surgical methods described by authors. Herein, we aimed to describe partially a new method to remove subfoveal PFCL.

CASE REPORT

A 57 years old woman was admitted to our clinic. She had a best spectacle-corrected visual acuity (BSCVA) of counting fingers from 2 meters in the pseudophakic left eye. Fundus examination of the left eye revealed a retinal detachment involving the macula. The patient underwent a 23-gauge pars plana vitrectomy operation including; PFCL injection, endolaser retinopexy, fluid-air exchange, and silicone-oil tamponade implantation. No subretinal retention of PFCL was observed at the end of surgery. The patient was informed to maintain a face down position for two weeks after the surgery. Retina was observed as totally attached on the first postoperative day with

no complication. At the first week after the surgery, the BSCVA of the left eye was measured as 20/100 by using Snellen chart and the fundus examination showed a totally attached retina. At the fourth postoperative week, the patient was admitted to our outpatient clinic with the complaint of decreased visual acuity in the left eye. On examination, the BSCVA of the left eye was counting fingers from 5 meters and subfoveal retained PFCL was detected by optical coherence tomography (OCT) (Figure 1).

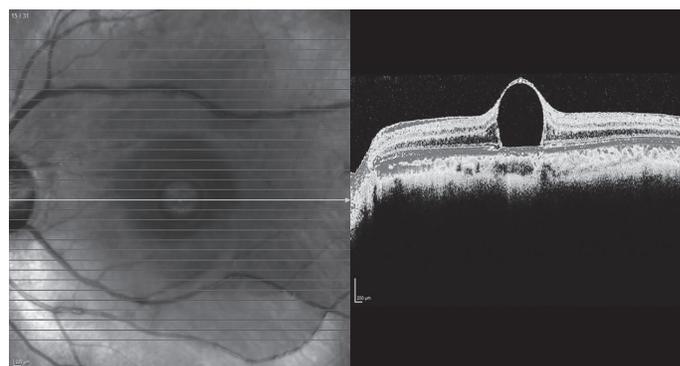


Figure 1. Spectral domain OCT shows subfoveal PFCL

We decided to remove the subfoveal PFCL five weeks after the surgery. Firstly, silicone oil was removed and then

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internal limiting membrane (ILM) stained with membrane brilliant blue dye under PFCL to facilitate removal of ILM, stabilize the retina during direct aspiration of the subfoveal PFCL. After ILM peeling, subfoveal PFCL was removed with 41-gauge cannula using active aspiration under PFCL. Then fluid-air exchange and air-20% SF₆ gas exchange were performed at the end of the surgery. The patient was instructed to maintain face down position for 3 days. Retina was totally attached under SF₆ gas on the first day after the surgery. One month after the last surgery, there was no detectable subfoveal PFCL with OCT. OCT examinations revealed an attached macula (Figure 2) and an intact retinal profile. BSCVA of the patient improved to 20/80 in the left eye.

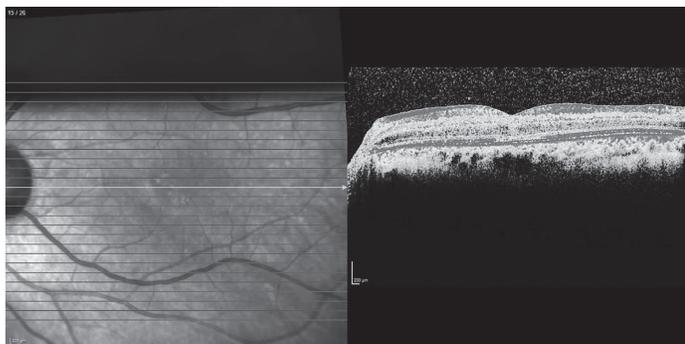


Figure 2. One month after surgery, spectral domain OCT shows absence of subfoveal PFCL

DISCUSSION

There are several reasons why the perfluorocarbon liquid migrates under the retina. The main reason is unresolved retinal tractions before injecting PFCL on the retinal tears. Small PFCL bubbles can easily migrate into the subretinal area. To avoid the formation of small bubbles, you should inject the PFCL slowly and dip the tip of the cannula into the PFCL bubble to create a large balloon. If PFCL is injected into the PFCL bubble quickly without dipping the tip of the cannula, a large number of PFCL bubbles can easily be created with a fish-egg-like appearance. PFCL's small fish-egg bubbles can easily pass into the subretinal space through the retinal tears. PFCL bubbles should be removed before the PFCL surface reaches the height of the retinal tears.

Membrane peeling under PFCL can be also performed. PFCL may pass into the subretinal area through the retinal tear or the edge of the retinotomy (2,3). Some techniques have been proposed to prevent subretinal PFCL migration such as saline rinse during fluid-air exchange, "soft shell technique" which is the use of sodium hyaluronate to cover the retinal tears prior to intravitreal PFCL injection, and elimination of retinal tractions before PFCL application.

Garg and Theventhiran reported their results related to retained subretinal PFCL in 234 patients who underwent rhegmatogenous retinal detachment repair operation with 23-G or 20-G PPV (4). Subretinal PFCL was observed in 4 of 176 eyes (2.3%) underwent 20-G PPV and in 6 of 58 eyes

(%10.3) underwent 23-G PPV operation. In their study, the difference between the two groups was attributed to the higher fluid flow in the 23-G vitrectomy system than the 20 G vitrectomy system. The authors also revealed that higher fluid flow causes disruption in the surface tension of PFCL resulting in the small PFCL bubbles migrating into the subretinal area.

Subretinal PFCL droplets can be easily detected by Optical coherence tomography (OCT). Soheilian et al. reported structural changes in the retina and retinal pigment epithelium (RPE) due to subfoveal PFCL retention using OCT in 2 patients (5). They showed RPE irregularity and impairment of external limiting membrane back reflection and reflectivity of the inner and outer segment junction. Hyperreflectivity at the base of the PFCL bubble corresponding to the interface region of the PFCL was also shown. In another study, Lee et al. showed that subretinal PFCL can cause RPE atrophy (6). Cohen et al. revealed a retinal hole secondary to prolonged subretinal PFCL (7).

Use of small-gauge cannula or needle to remove retained subretinal PFCL has been described (8-10). In our case, we successfully removed subfoveal PFCL with active aspiration using 41-gauge cannula. Surgical manipulation was performed under PFCL to reduce the length of the therapeutic macular hole and protect the retinal structures. ILM peeling was performed under PFCL liquid and before the active subfoveal PFCL aspiration. The aim was to facilitate the closure of the drainage area and minimize the risk of postoperative macular hole formation. Two methods have been defined to prevent direct damage to the central macula during aspiration of the PFCL. The first one is displacement of PFCL with removal and the second one is displacement of PFCL without removal (10). The first way is induction of a macular detachment through a juxtafoveal or paramacular retinotomy and removal of the PFCL bubble with washing by using BSS solution. The other method is the formation of a retinal detachment at the posterior pole and the inferior periphery through a retinal puncture near the inferior temporal vessels. Then fluid-air exchange is performed, and the patient has to maintain an upright head position for a length of time in the postoperative period, and PFCL droplets expect to migrate towards the lower periphery. Intraoperative OCT usage during surgical maneuvers may facilitate subretinal PFCL removal and also decrease intraoperative and postoperative complications.

CONCLUSION

Subretinal PFCL is a rare complication of vitreoretinal surgery. Reducing the incidence of this complication involves lowering the infusion pressure and keeping the injection in a single PFCL balloon to prevent multiple bubbles. The prone position immediately after vitreoretinal operation can also prevent residual subfoveal PFCL. We think that our surgical technique is safe and less traumatic technique for removing subfoveal PFCL.

Conflict of interest: The authors declare that they have no competing interest.

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REFERENCES

1. Chang S, Ozmert E, Zimmerman NJ. Intraoperative perfluorocarbon liquids in the management of proliferative vitreoretinopathy. *Am J Ophthalmol* 1988;15:668-74.
2. Shulman M, Sepah YJ, Chang S, et al. Management of retained subretinal perfluorocarbon liquid. *Ophthalmic Surg Lasers Imaging Retina* 2013;44:577-83.
3. Joondeph, BC, Nguyen H. Ocular coherence tomography finding with retained submacular perfluorocarbon. *Clin Experiment Ophthalmol* 2006;34:85-6.
4. Garg SJ, Theventhiran AB. Retained subretinal perfluorocarbon liquid in microincision 23-gauge versus traditional 20-gauge vitrectomy for retinal detachment repair. *Retina* 2012;32:2127-32.
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;9:1-4.
6. Lee GA, Finnegan SJ, Bourke RD. Subretinal perfluorodecalin toxicity. *Aust N Z J Ophthalmol* 1998;26:57-60.
7. Cohen SY, Dubois L, Elmaleh C. Retinal hole as a complication of long-standing subretinal perfluorocarbon liquid. *Retina* 2006;26:834-43.
8. Pan Q, Deng Y, Wu W, et al. Surgical removal of subfoveal perfluorocarbon liquid using combined flute needle and vacuum aspiration in silicone oil-filled eyes: A novel technique to remove subfoveal PFCL. *Indian J Ophthalmol* 2018;66:1463-5.
9. Oellers P, Charkoudian LD, Hahn P. Spontaneous resolution of subfoveal perfluorocarbon. *Clin Ophthalmol* 2015;9:517-9.
10. Kim JM, Woo SJ, Park KH, et al. Surgical Removal of Retained Subfoveal Perfluorocarbon Liquid through a Therapeutic Macular Hole with Intravitreal PFCL Injection and Gas Tamponade. *Korean J Ophthalmol* 2013;27:392-5.