

Case Report

A novel way of Subfoveal Perfluorocarbon liquid Removal using 26 gauge spinal anesthesia needle

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Abstract

Introduction: Perfluorocarbon Liquid (PFCL) is an essential adjunct of retinal detachment surgery. Subfoveal migration of PFCL is a rare and vision threatening complication of its use. Various techniques have been described for its removal. However, no consensus on ideal technique of its removal has been established. We present a novel, relatively atraumatic and cost effective way of PFCL removal using a widely available 26G spinal anesthesia needle.

Case: An 18 years old myopic patient who had undergone left eye pars plana vitrectomy (PPV) for myopic Rhegmatogenous Retinal Detachment (RRD) in the past presented after 1 month with retained subfoveal PFCL. Its subretinal location was confirmed by Optical Coherence Tomography (OCT). He was taken up for early Silicone Oil Removal (SOR) along with removal of retained subfoveal PFCL under high magnification by using a surgical disposable contact macula lens. A 26G spinal anesthesia needle tip was used to dissect a small separation parallel to the nerve fibers at the temporal edge of tense cystic PFCL bleb. Silicone tipped flute cannula was used to passively aspirate the sub retinal PFCL under fluid with no additional intervention. No barrage LASER was done.

Observation: Anatomical restoration of the retina was noted both intraoperatively and post-operatively. SD-OCT showed complete restoration of anatomical layers with no presence of intraretinal cystic cleft both at day 1 and 30 days postoperatively.

Conclusion: Safe removal of subfoveal PFCL can be done with 26G spinal anesthesia needle which is atraumatic, inexpensive and readily available. However, long term validity of this process needs to be established in a case series.

Key words: Subfoveal PFCL, Atraumatic removal, 26G Spinal Anaesthesia Needle.

Background

Perfluorocarbon liquids (PFCL) are essential adjuncts to Pars Plana vitrectomy. Introduction and removal of PFCL is a simple procedure with high safety margin. Subretinal migration of PFCL is a rare but known complication encountered in clinical practice. Its incidence ranges between 0.9 to 11% (Roth, et al., 2004),

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(Garcia-Valenzuela, et al., 2004), (Bourke, et al., 1996). In 2009, Tewari A and colleague's suggested that retained PFCL causes chemical toxicity due to its high oxygen carrying capacity and direct mechanical compression on the retina leading to irreversible damage to retinal pigment epithelium (Tewari, et al., 2009). Mirshahi A (Mirshahi, et al., 2017), Tewari A (Tewari, et al., 2009) and friends agree to its prompt removal to avoid permanent loss of visual function. Several techniques have been described in literature (Tien, et al., 2008) (Roth, et al., 2004) (García-Arumí, et al., 2008). However, no standard treatment method has been yet established. We hereby present a novel, relatively atraumatic and cheap way to remove retained Subretinal PFCL at fovea using a widely available 26Ga spinal anesthesia needle.

Case description

A 18 year old myopic high myopic boy underwent Pars Plana Vitrectomy (PPV) with Silicon Oil tamponade for Rhegmatogenous Retinal Detachment (RRD) with multiple inferior breaks in Left Eye. Post operatively his best corrected visual acuity (BCVA) was 3/60 with complaint of halos around light at 1month follow up. Fundus examination revealed a retained subfoveal PFCL bleb measuring 1 disc diameter in size, which was confirmed by SD-OCT in the Silicone oil filled eye (Figure 1). Patient was planned for an early Silicon Oil removal along with subfoveal PFCL removal using a 26Ga spinal anesthesia needle after explaining the relative urgency of the situation and intraoperative risks involved with subfoveal PFCL removal. Surgery was performed as described below.

At one month post-operative visit patient's visual acuity improved to 6/36 with refractive

correction. SD-OCT showed complete anatomical restoration of all layers with no evidence of entrapped PFCL (in the form of hyporeflective layer) (Figure 2). SD-OCT indicated thinning on Macular Thickness map with corresponding loss of Outer Retinal Layers. This could be attributed to toxic and mechanical effects of subfoveal PFCL which was there for almost a month.

Surgical technique

Following removal of silicone oil, sub-foveal PFCL was removed under high magnification using a surgical disposable contact macula lens (Grieshaber, Alcon). The pointed tip of 26 Ga spinal anesthesia needle (Figure 2C) was used to dissect a small separation parallel to the nerve fibers at the temporal edge of tense cystic PFCL bleb, at the farthest boundary from anatomical fovea. Care was taken to tether the nerve fibers parallel to their orientation and not to cut the fibers perpendicularly under fluid infusion. After tethering the nerve fiber layer to create a small separation, the tip of the 26 G needle was used to puncture the tense bleb. Care was taken to only partially enter the bleb so that the effective opening in the bleb is 1/3rd the size of the maximum tip diameter of the needle. Special precaution was taken not to puncture the choroid with the pointed tip while entering the bleb. High magnification and slow careful maneuvers aided in prevention of any complication. After a small opening was made in the bleb, 26 Ga needle was removed. At the puncture site, passive suction was applied with silicon tipped Flute Needle until complete removal of the PFCL. The puncture site closed spontaneously on table. Laser barrage was avoided around the puncture site due to its close proximity to the fovea. Fluid air exchange was done and the eye was closed under 14% perfluoropropane gas (C3F8) tamponade.

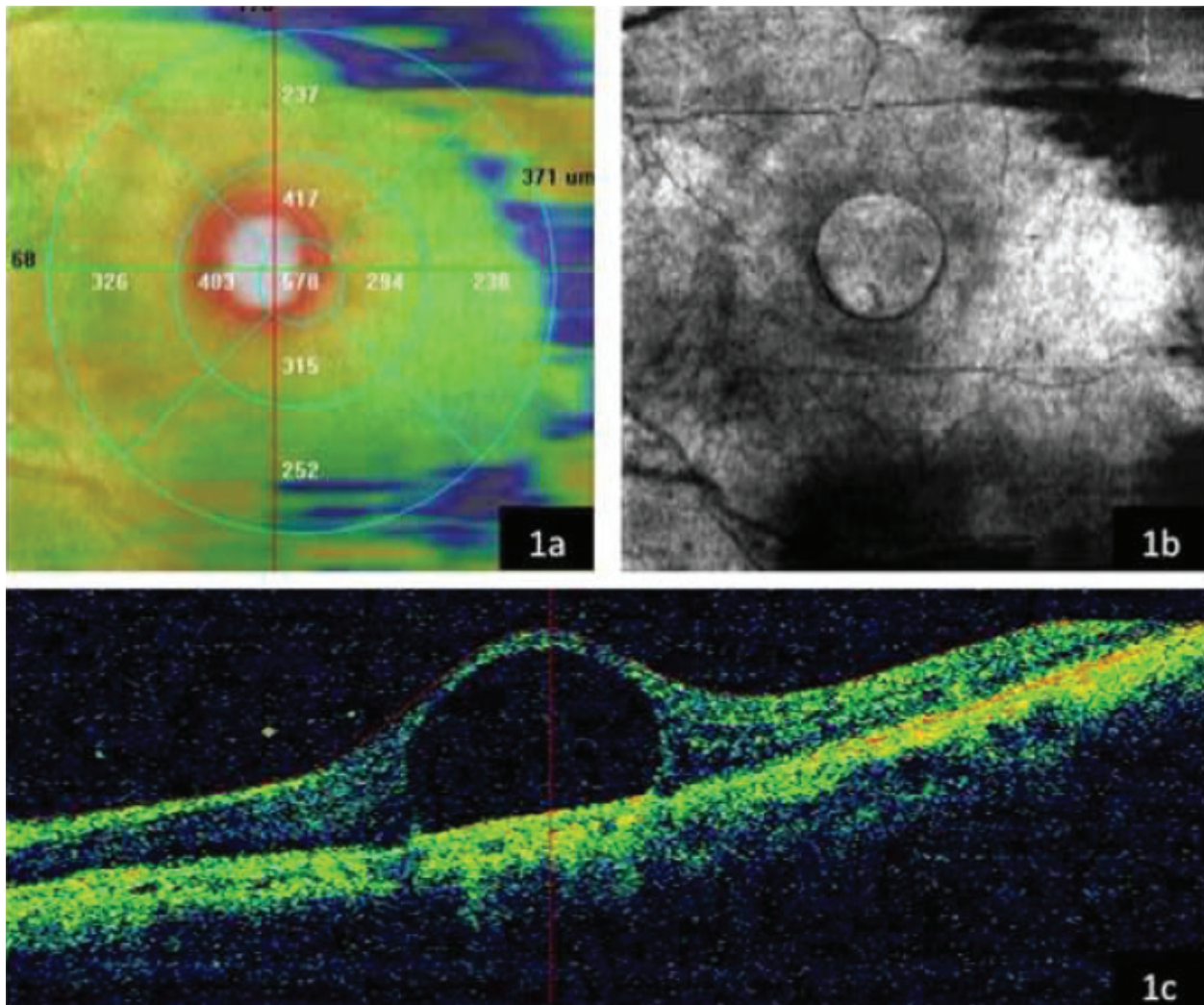


Figure 1: Pre-operative photograph with subfoveal PFCL bleb.

1a: Retinal thickness map depicting a focal central elevation.

1b: Enface image on SD-OCT showing PFCL bleb.

1c: Horizontal section on SD-OCT through PFCL bleb showing tense and encysted bleb

Discussion

PFCL is widely used in primary or recurrent retinal detachment surgery caused by giant retinal tear, proliferative vitreoretinopathy, penetrating ocular trauma and posterior dislocation of nucleus. Subfoveal retention of PFCL is a rare and dreadful complication resulting in permanent visual loss. Formation of small bubbles of PFCL, high velocity of injection, presence of retinal traction and inadequate saline rinse during fluid air exchange

are the risk factors for retained subretinal PFCL (Ohji, 2016). Though some authors have reported cases of spontaneous resolution of subfoveal PFCL (Oellers, et al., 2015), and others have reported good visual recovery after delayed removal of PFCL (Sierra-Rodríguez, et al., 2016), almost all vitreo-retinal surgeons agree to its urgent removal to prevent long term blinding visual sequelae.

Methods of subfoveal PFCL removal described in literature are limited. Ohji and colleagues

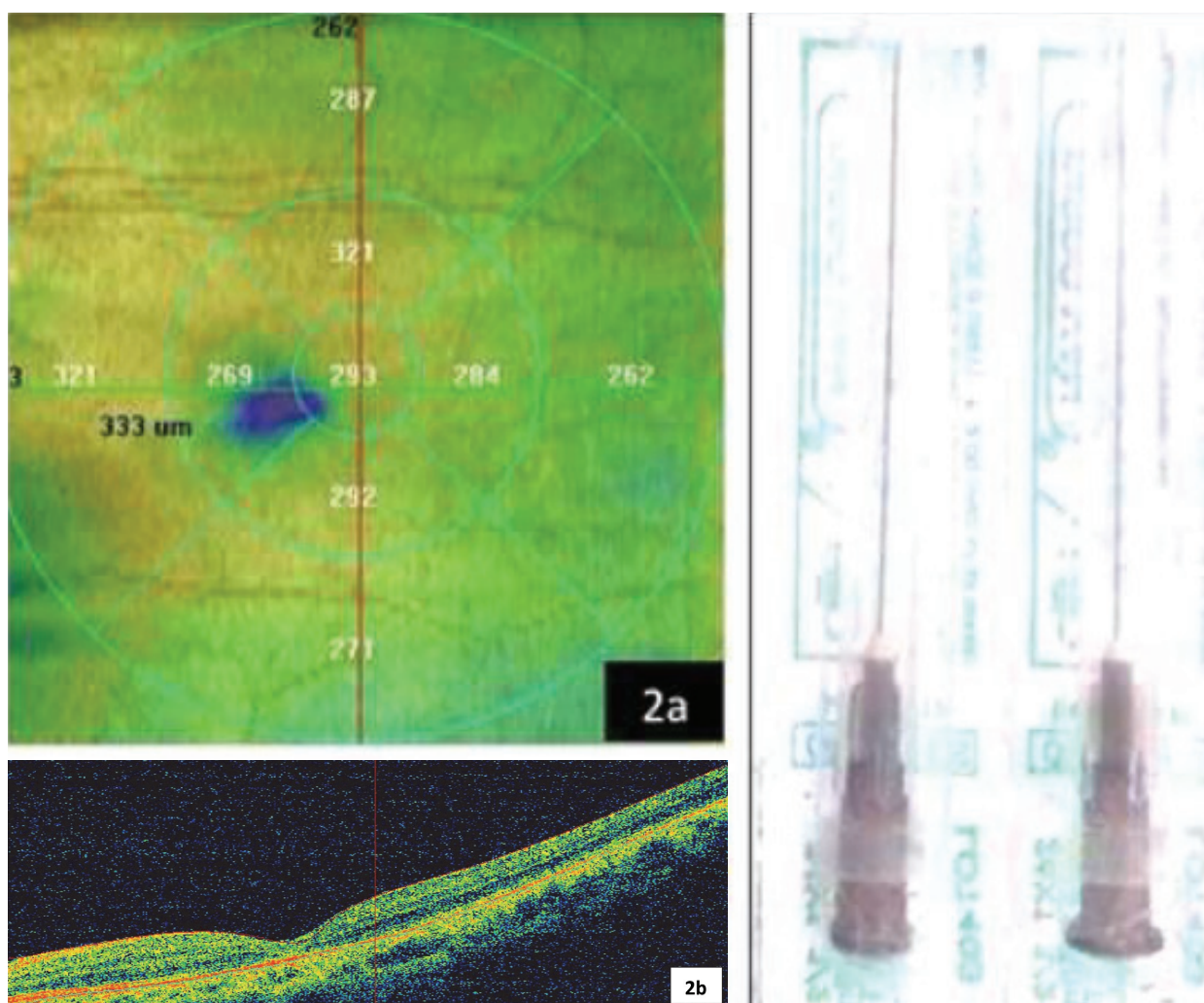


Figure 2: Post-operative photograph after surgical removal with spinal anesthesia needle.
 2a: Retinal thickness map showing resolution of the central elevation.
 2b: Horizontal section on SD-OCT showing total anatomical restoration at the area of encysted PFCL bleb.
 2c: 26 Ga spinal anesthesia needle, (DispoVanMake, 26 G, 0.45 × 38mm)

(Ohji, 2016) have described its passive aspiration with flute needle by making a small retinotomy adjacent to the PFCL bleb with the help of 23G, 39G, 40G needle. However these small gauge needles are not easily available and are costly. At the same time it may result in subretinal haemorrhage. Direct active aspiration by connecting a 27G cannula to vitrector as suggested by Mirshahi (Mirshahi, et al., 2017) can result in enlargement of retinotomy,

macular hole formation, microstructural damage, subretinal fibrosis and RPE atrophy (Lesnoni, et al., 2004).

Pneumatic displacement of sub-Foveal PFCL to inferior retina displaces it away from sensitive fovea and allows safe removal. A retinal detachment at the posterior pole and inferior periphery can be created by injecting balanced salt solution in the subretinal space through a retinotomy near the inferotemporal

vessels (Tien, et al., 2008). Variable success has been reported with this method.

Kim (Kim, et al., 2013) had attempted creation of therapeutic macular hole with bent tip of a 23G machinery vapor recompressor blade and passive removal of PFCL with variable results. This procedure required maintaining prone position which is cumbersome to the patient and lacks cooperation. Besides, the use of gas may lead to raised intraocular pressure and delayed visual rehabilitation.

Creating a retinotomy adjacent to the bleb is often uncontrolled regarding the eventual size. Retinotomy size tends to increase during passive or active suction and there is periretinotomy atrophy postoperatively due to collateral damage.

Creating a subtotal detachment and displacing the PFCL bubble away from the fovea requires injection of fluid wave subretinally. Presence of non-isotonic fluid in the internal milieu and their effect on the cellular integrity is a matter of speculation. It can be presumed that fluid currents during injection can cause some mechanical damage. Post subtotal detachment, the PFCL molecule has to be physically displaced away from the fovea and either left in the peripheral site or evacuated through a peripheral retinotomy. There remains a chance of breakage of PFCL molecules during this tethering process and small molecules might be left behind at the original position.

Our method involves creating a very small opening with the tip of a 26G spinal needle. Due to very thin tissue overlying the tense bleb, there is very little chance of retinal tissue damage by the tip of a 26 gauge needle. Besides, spinal anesthesia needle is inexpensive and readily available worldwide. We have used passive suction by silicone tipped flute needle which is way more controlled and safe.

Conclusion

Subfoveal PFCL can be safely removed with a 26G spinal anesthesia needle which is atraumatic, cheap and widely available. However, due to the rarity of the disease entity our method needs to be validated and established in the long run. Further study with a greater number of patients is warranted.

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