DJCRO
DIGITAL JOURNAL OF CASE REPORTS IN OPHTHALMOLOGY

Silicone Oil Opacification After Macular Hole Surgery with Plasma Rich Growth Factors

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DOI: 10.62856/djcro.v11.94

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Introduction

A macular hole (MH) is a full-thickness defect of the neurosensory retina, typically centered at the fovea, extending through the internal limiting membrane (ILM) down to the retinal pigment epithelium.[1] A MH significantly impairs central vision, causing decreased visual acuity and a central scotoma and may be classified as primary, usually idiopathic, or secondary, associated with conditions such as high myopia, ocular trauma, or other retinal diseases including idiopathic macular telangiectasia (MacTel).[1,2] The coexistence of MacTel and a full-thickness MH is uncommon and may develop in part due to the cystic macular alterations in affected eyes as well as associated tangential vitreomacular traction.[3]

Pars plana vitrectomy (PPV) with induction of a posterior vitreous detachment, ILM peeling, and gas tamponade remains the gold standard for surgical repair of a MH.[1,4] Several adjunctive techniques have been proposed to improve anatomical and functional outcomes, including use of an inverted ILM flap, mechanical manipulation of MH edges, human amniotic membrane graft placement, and the use of plasma rich in growth factors (PRGF).[1-5]

The use of PRGF has gained relevance in complex scenarios, such as large (≥400 μm), persistent, myopic, or retinal detachment–associated MH, where closure rates and visual recovery are typically less favorable.[1,2] The use of PRGF manifests a more favorable safety profile and contains high concentrations of bioactive molecules, mainly growth factors.[2] These factors are believed to promote MH closure by stimulating glial cell proliferation and facilitating tissue remodeling.[2]

Selection of the optimal intraocular tamponade in these eyes depends on patient-specific and disease-related variables, including postoperative positioning capability, air-travel restrictions, and MH characteristics such as size and chronicity.[1] Silicone oil (SO) remains an important tamponade option, although it may be associated with untoward clinical sequelae such as SO opacification and emulsification[6] or SO opacification without

emulsification.[7] Here, we report a case of a full-thickness MH in a myopic patient with MacTel treated with PPV, epiretinal membrane (ERM) and ILM peeling with an inverted flap technique, PRGF placement, and SO tamponade that was complicated by early postoperative SO emulsification and opacification.

Case Report

A 59-year-old female with high myopia and MacTel type 2 presented with gradual painless decreased visual acuity in the right eye. Best-corrected visual acuity (BCVA) was 20/100 in the right eye and 20/25 in the left eye. Anterior segment evaluation revealed mild nuclear cataracts. Fundus examination demonstrated a MH and ERM in the right eye. There was no posterior vitreous detachment noted. Optical coherence tomography (OCT) demonstrated findings consistent with MacTel type 2 in both eyes and a large full-thickness MH measuring 493 μm in the right eye (Figure 1A). The patient underwent combined phacoemulsification with intraocular lens implantation and PPV with ERM and ILM peeling using an inverted flap technique, followed by application of PRGF [Endoret®; BTI, Vitoria, Spain], and 2000 centistokes silicone oil tamponade. A 25-gauge central and peripheral vitrectomy was performed, with induction of complete posterior vitreous detachment. The ERM and ILM were stained with 0.18% trypan blue and 0.03% Blulife [TWIN®; Moria, Antony, France] and peeled. The ILM was positioned over the MH. After fluid–air exchange, a PRGF membrane and seven drops of PRGF were placed over the MH. Given that the eye was highly myopic with a large MH, SO (2000 centistokes) tamponade was selected to provide prolonged tamponade. Intraoperatively, the interface between the SO and PRGF membrane remained intact. All sclerotomies were closed with 7-0 Vicryl suture. The patient was positioned supine for the first hour after surgery and afterwards, a prone position was recommended.

Two days postoperatively, BCVA in the right eye was counting fingers and intraocular pressure was 16 mmHg. There was a mild anterior chamber reaction, and fundus examination showed SO clouding with no signs of inflammation and no vitreous hemorrhage. One week later, BCVA remained unchanged, but further clouding of the SO was observed, raising suspicion of SO emulsification (Figures 2A, B). The SO with the same production batch number was utilized in other patients uneventfully, thus a manufacturing error was unlikely. The SO was removed 10 days postoperatively, with placement of 20% sulfur hexafluoride (SF_6) gas tamponade. A sample of the SO was submitted for chemical analysis; however, the results were inconclusive as to whether any abnormal components were present in its composition. Unused SO from the same batch was not submitted for testing.

Two months postoperatively, fundus examination confirmed closure of the MH, and BCVA in the right eye had improved to 20/200, though worse than the preoperative BCVA of 20/100. OCT imaging corroborated successful full-thickness MH closure with a subfoveal lucency (Figure 3A), and the ellipsoid zone had not yet repopulated (Figure 3B).

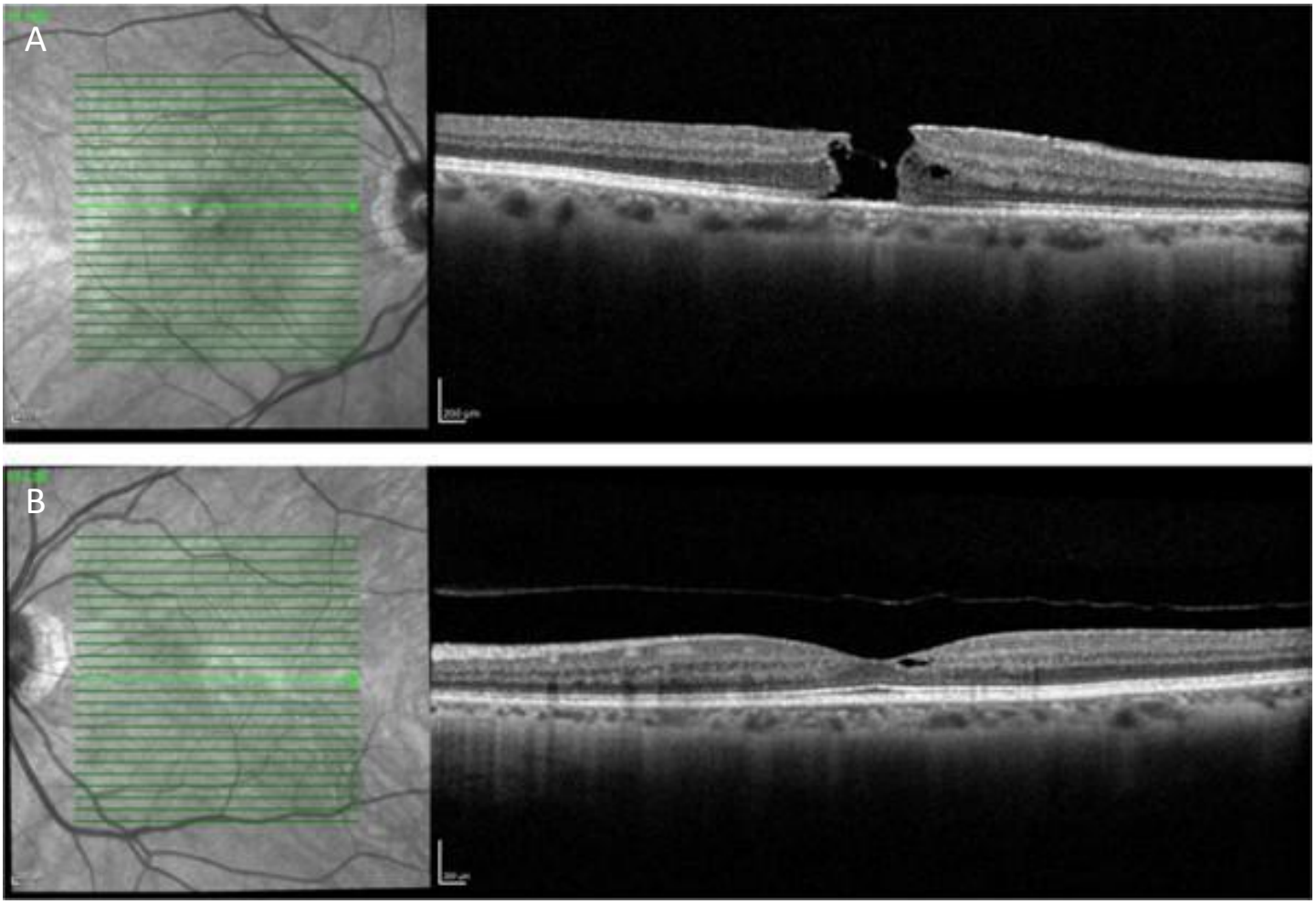


Figure 1. Preoperative optical coherence tomography of the macula. A. A full-thickness macular hole was present in the right eye along with a nasal epiretinal membrane. Minimal surrounding intraretinal fluid was present, and the posterior hyaloid was attached. B. A parafoveal temporal cavitation was present in the inner nuclear layer of the left eye, consistent with idiopathic macular telangiectasia type 2.

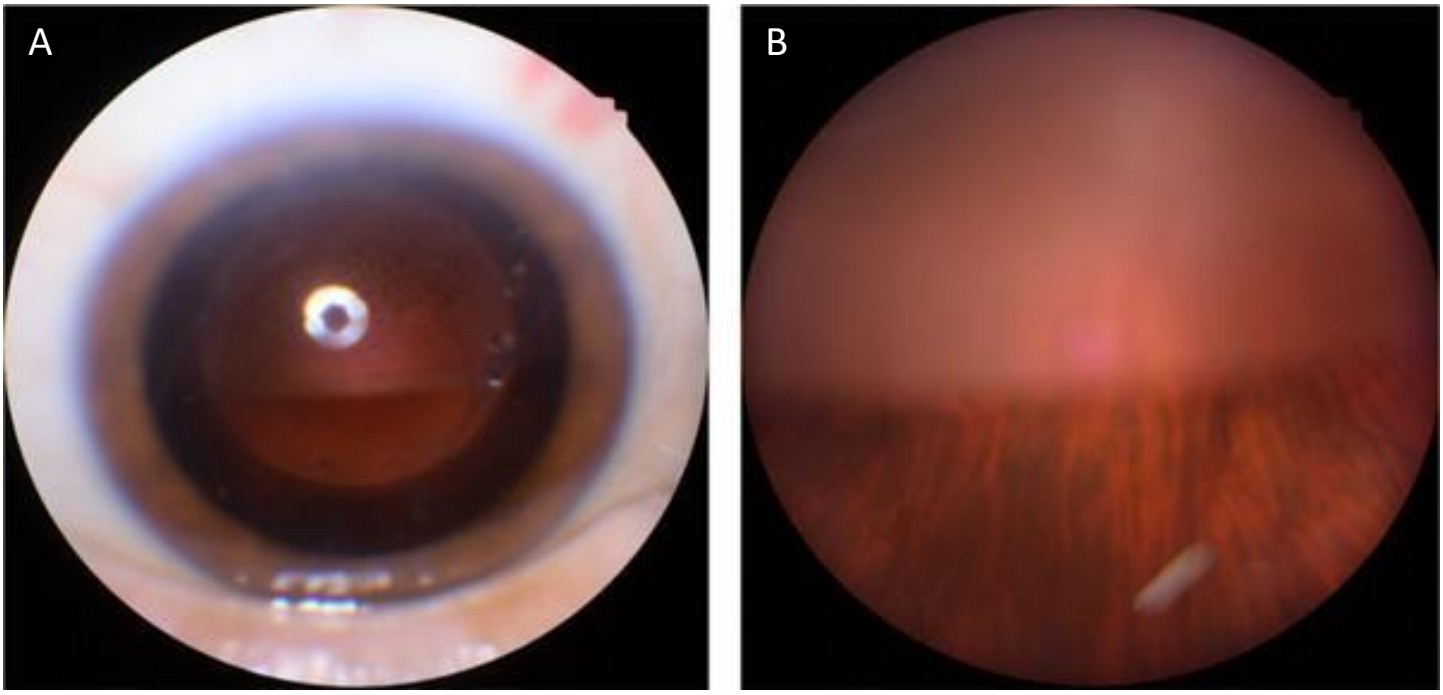


Figure 2. One week following vitreous surgery for a full-thickness macular hole. A. Slit-lamp photograph of the anterior segment (left image) demonstrated an altered red reflex due to the silicone oil opacification superiorly. B. Fundus photograph revealed the silicone oil emulsification and opacification. No vitreous hemorrhage was present. The surgeon opted for a silicone oil underfill, as noted in both photographs.

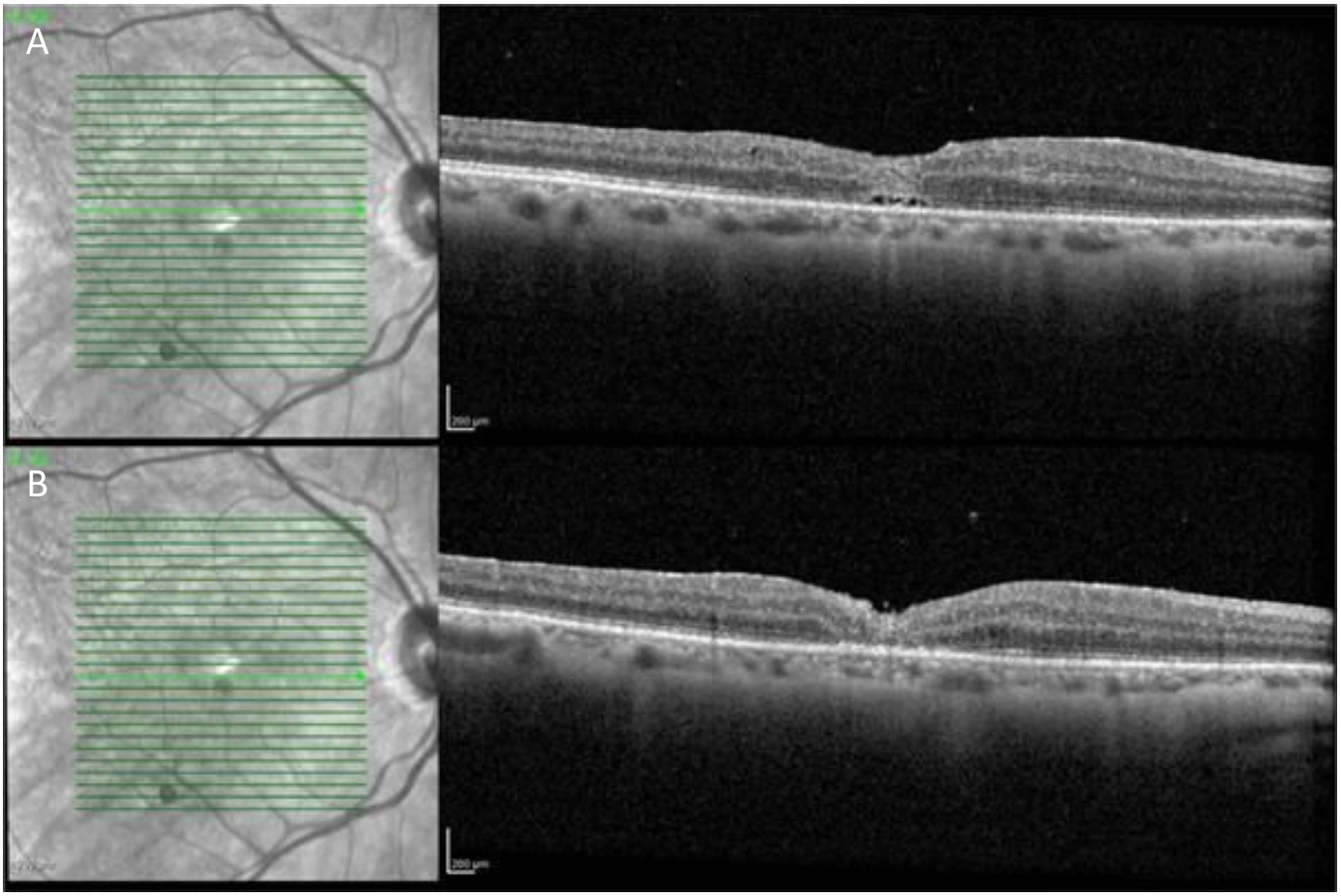


Figure 3. Two months postoperatively, optical coherence tomography images of the macula in the right eye demonstrated full-thickness macular hole closure with a subfoveal lucency (A) and absence of the ellipsoid zone layer.

Discussion

This case describes a full-thickness MH in a patient with MacTel type 2 and high myopia, treated with PPV using an inverted ILM flap technique and adjunctive PRGF, followed by SO tamponade. Notably, postoperative SO opacification and emulsification were observed two days postoperatively. Since manufacturing error was thought to be unlikely, we hypothesized that an interaction between PRGF-derived proteins and SO may have contributed to the premature opacification.

Obtained through centrifugation, PRGF is an autologous, platelet-enriched plasma, yielding three fractions: a plasma fraction, a second fraction with approximately three-fold higher platelet concentration, and a third

fraction enriched in red blood cells.[3] The final PRGF membrane is predominantly composed of fibrin, which binds and retains growth factors, enabling their sustained release at the application site.[8]

Although no standardized approach exists for MH repair in eyes with MacTel type 2, several reports describe successful outcomes with PRGF, likely mediated by Müller cell activation and enhanced tissue regeneration.[3, 8] In our case, anatomical closure was accomplished and with partial recovery of BCVA thus far.

SO remains a commonly used tamponade agent in vitreoretinal surgery, particularly when long-term support is required or when gas tamponade is contraindicated.[6] However, SO may emulsify and opacify, obscuring the view of the fundus. Several physicochemical factors influence this process, such as viscosity, interfacial tension and polydispersity, and residual impurities.[6] In 2020, Nepita and colleagues investigated the effect of endogenous proteins on SO emulsification *in vitro* and demonstrated that exposure to protein-containing aqueous solutions significantly altered interfacial rheology, promoting emulsion formation.[9] More recently, a 2026 prospective multicenter study analysed the SO stability in the presence of biological surfactant agents and concluded that a pro-inflammatory and pro-fibrotic microenvironment in the perisilicone compartment, as well as the presence of proteins, was associated with unstable emulsions.[10] In addition, the concentration and type of endogenous proteins present in the vitreous cavity influenced emulsification resistance.[10] In our case, we hypothesize that early SO clouding and emulsification may have been triggered by a surfactant-mediated reaction with PRGF-derived proteins.

Conclusion

This novel report describes this possible PRGF-related consequence in an eye with 2000 centistokes SO. Further investigation is warranted to determine its prevalence in clinical practice and to clarify whether specific PRGF components or application techniques influence the stability of SO tamponade. Building such evidence may help refine surgical decision-making in complex MH cases, especially when using novel surgical techniques.

References

1. Amaral DC, Monteiro MLR, Alves MR, et al. Autologous Platelet Concentrate for the Treatment of Macular Hole: A Systematic Review and Meta-analysis. *Einstein (Sao Paulo).* 2024;22:eRW0832.
2. Kim M, Won JY, Choi SY, et al. Therapeutic Efficacy of Autologous Platelet Concentrate Injection on Macular Holes with High Myopia, Large Macular Holes, or Recurrent Macular Holes: A Multicenter Randomized Controlled Trial. *J Clin Med.* 2021;10(12):2727.
3. Bertolani Y, Arnaiz-Camacho A, Fernández-Engroba J, et al. Successful Use of PRGF-Endoret and ILM Peeling for Full-Thickness Macular Hole in MacTel Type 2: Case Report and Review of Literature. *Eur J Ophthalmol.* 2025;35(2):NP33-NP38.
4. Sigler EJ, Randolph JC, Calzada JI, et al. Pars Plana Vitrectomy with Internal Limiting Membrane Removal in Type 2 Idiopathic Macular Telangiectasia. *Retin Cases Brief Rep.* 2013;7(4):380-385.
5. Michalewska Z, Michalewski J, Dulczewska-Cichecka K, et al. Inverted Internal Limiting Membrane Flap Technique for Surgical Repair of Myopic Macular Holes. *Retina.* 2014;34(4):664-669.
6. Jayadev C, Tendulkar K, Vidyasagar S, et al. The Downside of Tamponade: Silicone Oil Emulsification and Its Ocular Impact. *Surv Ophthalmol.* 2025;S0039-6257(25)00229-2.
7. Zheng Y, de Vries JW, Herrmann A, et al. Clouding of Intraocular Silicone Oil in the Absence of Emulsification. *Retinal Cases Brief Rep.* 2023;17(2):144-151.
8. Arias JD, Córdoba-Ortega CM, Martinez-Pulgarín DF, et al. Plasma Membrane Rich in Growth Factors for the Treatment of Macular Holes Associated with Macular Telangiectasia Type 2. *Retin Cases Brief Rep.* 2026;20(1):43-46.
9. Nepita I, Repetto R, Pralits JO, et al. The Role of Endogenous Proteins on the Emulsification of Silicone Oils Used in Vitreoretinal Surgery. *Biomed Res Int.* 2020;2020:2915010.
10. Rechi-Sierra T, Lomelino-Pinheiro R, Julião-Campos E, et al. Biocompatibility and Inflammatory Pathways of Silicone Oil in Complex Retinal Detachment: An In Vitro and Clinical Study. *Ophthalmologica*. 2026;249(2):197–211.

Statement of Ethics

This case report adheres to patient confidentiality and ethical principles in accordance with the guidelines of the Declaration of Helsinki and relevant local regulations.

Patient Consent and Privacy

Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

Conflict of Interest Statement

The authors have no conflict of interest to disclose.

Funding

There was no funding source for the development of this article.