Opacification of hydrophilic acrylic intraocular lens following vitreoretinal surgery: a clinicopathological report

Intraocular lens (IOL) opacification is a rare complication following cataract surgery. IOL opacification has been reported in various types of IOL, including polymethylmethacrylate, hydrophobic acrylic, and hydrophilic acrylic lenses. This increasingly recognized clinical entity could result in a range of symptoms, such as reduced or foggy vision, glare, and halos around bright light. Not uncommonly, IOL exchange is necessitated to improve visual function. Over the past decade, there is a growing literature on IOL opacification following intracameral gas during lamellar corneal transplantation. However, only a few cases with IOL opacification following vitrectomy have been described. In this paper, we report 2 cases of late postoperative opacification of hydrophilic acrylic IOL following vitrectomy with intraocular silicone oil tamponade. Clinical, microscopic, and histological findings are discussed.

Case Description

Case 1

A 75-year-old man was referred to our ophthalmology unit with deteriorating vision in his left eye (OS). On examination, the best-corrected visual acuity (BCVA) was counting fingers OS. Examination revealed IOL opacification with otherwise unremarkable ocular findings. The patient had previous uncomplicated phacoemulsification with hydrophilic acrylic IOL (Rayner Intraocular Lenses, Ltd, Hove, U.K.) OS followed by YAG capsulotomy. After that, he had 3 vitrectomies OS for epiretinal membrane and recurrent retinal detachments, for which he underwent multiple vitrectomies involving perfluoroethane gas tamponade, internal and external limiting membranes peel, and silicone oil tamponade followed by oil removal a year later. After discussion of risks and benefits, he underwent IOL explantation with secondary IOL implantation in the anterior chamber. His BCVA improved to 6/36 at 3 months postoperation.

Case 2

A 70-year-old man with pseudophakia was reviewed in our ophthalmic unit with a few months’ history of blurred vision OS. His BCVA was 6/36 OS, and intraocular pressure was 16 mm Hg. Slit-lamp microscopy showed IOL opacification in the left eye. The patient had primary phacoemulsification with hydrophilic acrylic IOL (Rayner Intraocular Lenses, Ltd) in another ophthalmic unit. After that, he had multiple vitreoretinal surgeries OS in our unit, which included vitrectomy with silicone oil tamponade for retinal detachment followed by removal of silicone oil in 2013. He developed a redetachment and underwent further vitrectomy with perfluoroethane gas tamponade. He was found to have IOL opacification in the left eye. After discussion of risks and benefits, he was scheduled for IOL exchange in 2016. However, due to significant fibrosis of the IOL-bag complex, the IOL was explanted and a planned secondary scleral fixated IOL was scheduled for a later date. Each explanted IOL was immersed in balanced salt solution in a universal bottle and sent to laboratory for further analysis.

Histological and Optical Bench Analyses

On gross examination and detailed gross examination, the optic of IOL was partly opacified (Fig. 1). Each of the
explanted IOL was bisected for histological staining. Histological staining was performed with alizarin red and von Kossa staining method. The anterior and posterior surfaces of both IOLs did not stain with alizarin red (Supplementary Fig. 1a, available online), indicating the absence of calcium deposition on the external surface of IOL. On the other hand, the presence of calcium was identified within the cut lens section staining with alizarin red (Fig. 2) and with von Kossa stain (Supplementary Figs. 1b and 1c, available online). On optical bench analysis, the modulation transfer function (MTF) curves showed significant decrease in optical quality compared with International Organization for Standardization (ISO) standard (Supplementary Figs. 2a and 2b, available online).

**Discussion**

Opacification of hydrophilic IOL is a rare complication following cataract surgery. In the current literature, it is more commonly associated with injection of intracameral gas during lamellar keratoplasty where the anterior IOL surface is in contact with the gas bubble. Only a few cases with IOL calcification following vitrectomy have been previously reported. Our cases demonstrated late-onset IOL calcification in patients underwent previous vitreoretinal surgeries with silicone oil tamponade.

The reason for IOL opacification following vitrectomy is multifactorial. The IOL surface predisposed to gas bubble or oil could lead to calcification leading to opacification. Calcification on the posterior surface of the IOL is likely due to direct contact between the intravitreal gas bubble or oil with the posterior IOL surface. IOL opacification following vitrectomy is also often localized within pupillary area of the anterior IOL surface. It was proposed that there might be a leakage of gas or oil into the anterior chamber after surgery, causing an alteration of the anterior surface of the IOL in the pupillary area.

It is thought that there is a significant breakdown of the blood-ocular barrier (BOB) after vitreoretinal surgery. Combined and repeated surgeries increase the risk of BOB breakdown by inducing inflammation, which then leads to increased calcium concentration in the anterior chamber promoting calcification. Our patients had undergone multiple intraocular surgeries, which may have led to prolonged exposure of IOL to blood-derived inflammatory substances present in the aqueous. In addition, presence of exogenous gas or substances (such as silicone oil) in the eye may exacerbate metabolic change in the anterior chamber, leading to calcification of IOL.

The ISO standards 11979-2 and 11979-9 define the guidelines for the in vitro measurement of the optical quality of an IOL. Optical bench evaluation of the MTF provides valuable information about the optical quality of IOLs. The MTF describes how the transfer of contrast information by an optical system decreases with increasing spatial frequency. Our cases showed significant reduction in the optical quality compared with the ISO standard. Granular deposits below the surface of the IOLs were responsible for the decreased vision, which subsequently warranted an IOL exchange to improve visual function.

In both cases, the IOL calcification is associated with previous vitreoretinal surgery with gas and silicone oil tamponade agent. Direct contact of the tamponading agents, breakdown of the BOB, and inflammatory factor could have contributed to the IOL calcification. Surgeons should be aware of this potential complication when using hydrophilic acrylic IOL in these cases.

**Supplementary Materials**

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.jcjo.2020.07.012.

**Supplementary Fig. 1**—(a) Intraocular lens did not stain with alizarin red. This indicates absence of calcium deposition.
on the lens surface. (b) Light microscopy of the cross section of the IOLs analyzed with von Kossa stain showed numerous fine, granular, crystalline-like deposits below the surface of the IOL. (c) Image showing deposits in higher magnification.

Supplementary Fig. 2—(a, b) The modulation transfer function curves showed a significant decrease in optical quality compared with ISO standard.

References


Footnotes and Disclosure

The Department of Ophthalmology, Heidelberg University Clinic has received research grants from Rayner Intraocular Lenses, Ltd.

Rosai-Dorfman disease with corneal anaesthesia: case report and review of literature

Rosai-Dorfman disease is a rare systemic histioproliferative disease characterized clinically by cervical lymphadenopathy and pathologically by lymph node sinuses containing histiocytes with intact phagocytosed lymphocytes (emperipolesis).1

Extranodal sites may be involved by the disease.1 Ocular involvement is uncommon and manifests most frequently as eyelid or orbital masses; other ocular manifestations are extremely rare.2–5 We report a novel case of a patient with unilateral corneal anaesthesia and neurotrophic keratitis as presenting features of Rosai-Dorfman disease.

A 16-year-old male presented with a corneal ulcer in the left eye. He had a history of global developmental delay with seizure disorder, making clinical examination challenging. On examination, there was an absence of corneal sensation in the left eye with a small (1.5 mm x 1.5 mm) inferior corneal ulcer. Corneal sensation was normal in the right eye. There was no lagophthalmos. The rest of the anterior segment was unremarkable. He also had a painless left temporal orbital mass that had been gradually increasing in size for the previous few months. There was no proptosis. Extraocular movements were normal. The ulcer was managed with artificial tear drops, antibiotic ointment, and lid taping; and it healed with corneal vascularization (Fig. 1). A magnetic resonance imaging (MRI) of brain and orbits, examination under anaesthesia (EUA), biopsy of the orbital mass, and left tarsorrhaphy were scheduled.

The MRI (Supplementary Figs. 1A and 1B, available online) showed an ill-defined mass in the superior-temporal aspect of the left orbit, involving the left lacrimal gland. It measured 17 mm x 34 mm x 27 mm. It had mild mass effect on the left globe as well as the lateral rectus, superior oblique, and superior rectus muscles. No proptosis was seen. The extraocular muscles and optic nerve were normal. Expansile soft-tissue masses involving the nasal cavity, ethmoids, and right osteomeatal complex were seen.

Fig. 1—Left vascularized corneal opacity. The superior-temporal orbital mass is also partly visualized.