Diffuse Intraretinal and Optic Disc Edema in a Case of Reversed Vaulted Sulcus-Implantation of a Multi-Piece Intraocular Lens in a 7-Year-Old Child

Aramis B. Torrefranca Jr.[1,2], Alvina Pauline D. Santiago[1,3,4,5], Jose Carlo M. Artiaga[1]

[1]Department of Ophthalmology and Visual Sciences, University of the Philippines – Philippine General Hospital, Manila, Philippines
[2]Department of Ophthalmology and Ocular Health, Governor Celestino Gallares Memorial Medical Center, Tagbilaran City, Bohol, Philippines
[3]Eye and Vision Institute, The Medical City, Ortigas Ave., Pasig City, Metro Manila, Philippines
[4]Eye Institute, St. Luke's Medical Center, Quezon City, Metro Manila, Philippines
[5]Department of Ophthalmology, Manila Doctors Hospital, Manila, Philippines

Correspondence: Aramis B. Torrefranca Jr.
Office Address: Department of Ophthalmology and Visual Sciences, University of the Philippines – Philippine General Hospital, Manila, Philippines
Email Address: aramis.torrefranca@gmail.com

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ABSTRACT

Objective: This paper reports a rare presentation of diffuse intraocular inflammation following reversed vaulted multipiece intraocular lens (IOL) implanted in the sulcus of a 7-year-old child.

Methods: This is a case report.

Case presentation: A 7-year-old child presented with persistent posterior pole inflammation and optic disc swelling after an improperly placed multipiece intraocular lens in the sulcus. Comprehensive eye and whole-body evaluations were performed with the aid of optical coherence tomography (OCT), magnetic resonance imaging (MRI) and systemic work-up to rule out other causes of uveitis to definitively diagnose the case. The reverse-vaulted lens was eventually explanted. After 1 week post-explantation, the visual acuity improved markedly to 20/100 with the appropriate spectacle prescription. The patient recovered from the ocular inflammation 8 months postoperatively.

Conclusion: This paper reports significant posterior pole inflammation as an uncommon yet potentially visually-disabling consequence of a reverse-vaulted sulcus placement of a multipiece intraocular lens in a child. Careful attention is warranted to ensure proper IOL orientation during implantation, especially in pediatric cataract surgery. Visual rehabilitation is important postoperatively.

Keywords: multipiece intraocular lens, reverse-vaulted, intraocular inflammation

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INTRODUCTION

Improper positioning of intraocular lenses during cataract surgery can occur even in skilled hands. Incorrect positioning of the lens has been reported in literature to occur in 1.3% of cases even among experienced surgeons[1-3]. Various complications may result from improper IOL positioning, which may include iris chafing[1], pigment dispersion[1], and pupillary block leading to glaucoma[1,2]. Proper identification and correction intraoperatively via reported techniques such as in vivo flipping[2] and repositioning the IOL will still allow for the achievement of good visual outcomes postoperatively[1]. While there are many published reports about the complications of improperly placing a multipiece IOL, this paper reports an unusual presentation of diffuse posterior pole inflammation and optic disc edema after uncomplicated lensectomy with reverse-vaulted multipiece sulcus IOL implantation.

CASE PRESENTATION

A 7-year-old Filipino male presented with a developmental cataract in both eyes which started at age 2 years. He subsequently underwent uncomplicated lens extraction with sulcus implantation of AcrySof MA60AC multipiece intraocular lenses (Alcon Laboratories, Fort Worth, Texas) in both eyes. Postoperatively, it was already noted that there was inadvertent reverse-vaulted positioning (S-configuration) of the sulcus multipiece intraocular lens in the right eye (Figure 1a). The left eye was positioned in the sulcus in the correct orientation–an inverted S configuration. Postoperative visual acuity of the right was counting fingers at 1 foot and 20/80 on the left eye. At this time, both eyes showed a grade 1+ anterior chamber inflammation and an intraocular pressure of 15 mmHg. The poor postoperative vision in both eyes was ascribed to profound sensory deprivation amblyopia because of the longstanding cataracts.

A week postoperatively, he was accidentally hit on the back of his head which caused the optic of the multipiece intraocular lens of the right eye to anteriorize. This subsequently caused high intraocular pressures of 50-60 mmHg, corneal edema and bedewing with severe grade 4+ anterior chamber inflammation. The blunt head trauma was co-managed with general surgery for other contusions that the child may have sustained. Further systemic and cranial evaluations with other comanaging services were unremarkable. The lens immediately underwent repositioning of the anteriorized optic back to the sulcus which eventually corrected the pressure, edema and decreased the inflammation to grade 1+. Despite the corneal edema, indirect ophthalmoscopy was attempted and revealed an unremarkable posterior pole, with no optic disc edema, pallor, or intraretinal edema noted. The surgeon chose not to adjust the reversed vaulting at this time, as the pressure and corneal bedewing issues were promptly corrected intraoperatively, opting to leave the haptics untouched. One week postoperatively, repositioning normalized the intraocular pressure to 20 mmHg and resolved the corneal bedewing and anterior chamber inflammation. Two weeks postoperatively, the anterior segment remained quiet; however, the visual acuity remained at counting fingers. Repeat indirect ophthalmoscopy revealed diffuse intraretinal edema and 360 degrees optic disc edema of the right eye (Figure 1b). Intraocular pressure was still high at 40-50 mmHg. Relative afferent pupillary defect was technically difficult to evaluate at this time because of postoperative atropinization. Pigmented and non-pigmented cells of grade 1+ were noted retrolentally.

Further investigation using an optical coherence tomography of the optic disc (Figure 1c) revealed a diffusely edematous optic nerve. Macula evaluation revealed a similar diffuse edema (Figure 1d). To rule out an optic neuritis entity in this case, magnetic resonance imaging (MRI) of the orbits with gadolinium contrast was done which revealed no enhancement of the optic nerves (Figure 1e-f). A comprehensive systemic work-up for other causes of uveitis were performed (*i.e.,* ESR, CRP, chest x-ray, urinalysis, syphilis and tuberculosis work-up, complete blood count) and results were all unremarkable. Fluorescein angiography was not performed. Considering factors such as the persistence of posterior pole swelling despite resolution of the anterior segment inflammation, which threatened vision, and the workup suggesting that the inflammation was confined solely to the eye,

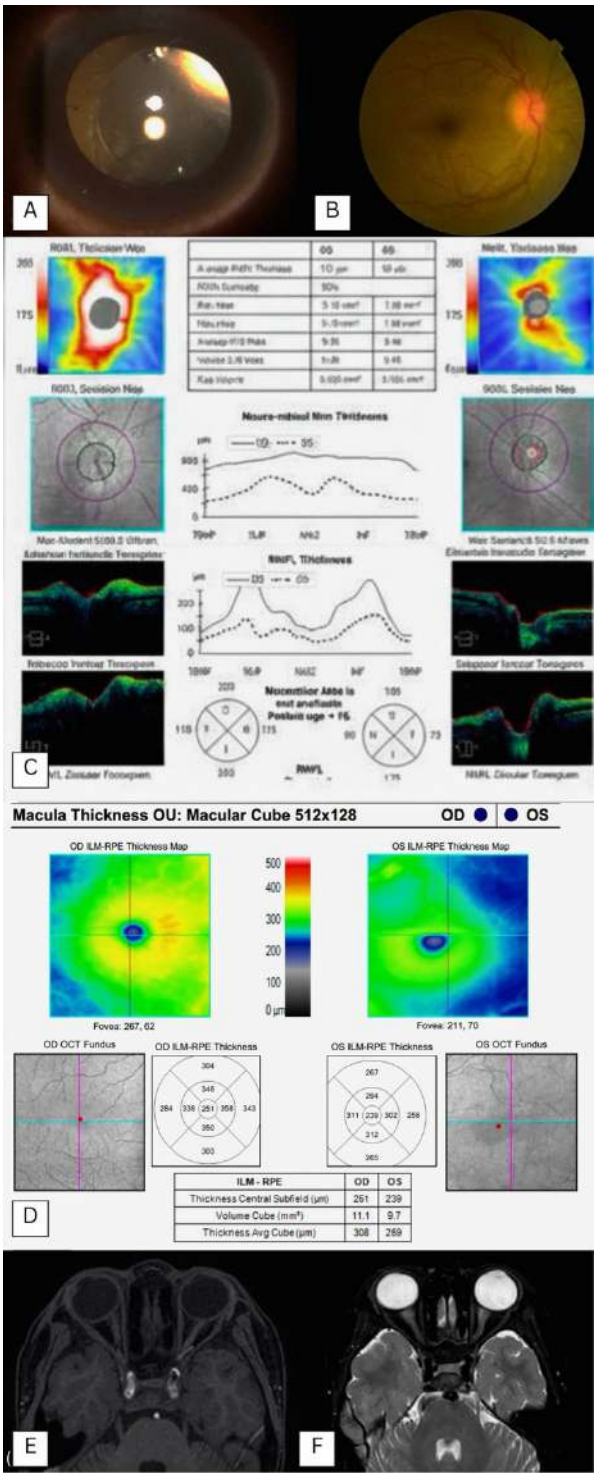

Figure 1 (a-f). (a) Slitlamp examination showing a reversed-vaulted (S configuration) multipiece IOL in the sulcus, (b) indirect ophthalmoscopy after reversed-vaulted implantation showing diffuse whitening of the retina with optic disc edema, (c) optical coherence tomography of the optic nerves demonstrating right optic disc edema and (d) macular OCT demonstrated posterior pole thickening, although the central macular thickness did not reach the conventional quantitative threshold for severe macular edema. Macular thickening severity described was based primarily on the clinical appearance and qualitative OCT findings rather than absolute retinal thickness measurements alone. Further investigation using (e-f) magnetic resonance imaging (MRI) of the orbits with gadolinium contrast demonstrated no enhancement of the optic nerve, which limits the swelling to the optic nerve from the retinal inflammation.

as evidenced by the absence of markers for systemic inflammation, the surgeon performed intraocular lens explantation and left the patient aphakic to allow complete resolution of the inflammation. Prior to the explantation, the patient was given hourly topical steroids and oral systemic steroids to control the inflammation. No periocular steroids were given. Postoperatively at day 3, the eye was noted to improve showing grade 1+ anterior chamber inflammation and decreasing swelling of the posterior pole. Day 7 post-explantation, the visual acuity improved markedly to 20/100 with the correct spectacle prescription. Complete resolution of the posterior pole inflammation was documented at 2 weeks postoperatively. The patient was followed up regularly until 1 year of follow-up and trends of improvement in the visual acuity were noted. The best corrected visual acuity with a refraction of +13.00 sph was 20/80 with complete resolution of the anterior chamber (grade 0) and posterior pole inflammation on the last follow up at 8 months postoperatively.

DISCUSSION

The advancement in intraocular lenses technology provided an option to implant lenses in the sulcus in cases where bag implantation is not possible[1,3]. Multipiece intraocular lenses have been developed with large optic and long haptics that can be accommodated in the sulcus. A three-piece IOL, which was the multipiece IOL implanted in the case, has an overall length of 13 mm and an optic size of 6.5 mm, large enough to fit in the sulcus. However, the design and the haptic angulation of multipiece IOLs vary from 5 to 10 degrees[3], and improper implantation leads to postoperative anterior segment inflammation and complications such as iris chafing, pupillary block, pigment dispersion and glaucoma for uncontrolled elevated IOPs[2,3]. Several reports have been published documenting these complications of incorrect IOL placement[1-6]. To the best of our knowledge, posterior pole inflammation and optic disc edema following an incorrect placement of a multipiece IOL in a child has not

been previously reported. A literature search using PubMed, Google Scholar, and Scopus databases was performed for articles published up to May 2026 using combinations of the terms "multipiece intraocular lens," "incorrect IOL placement," "posterior pole inflammation," and "optic disc edema." Although there are anecdotes about posterior pole inflammation, currently available literature shows no prior reports describing posterior pole inflammation with optic disc edema secondary to incorrect multipiece IOL placement in pediatric cataract surgeries have been published.

Our case presented with a secondary form of both anterior and intermediate uveitis. To explain such severe occurrence, it is theorized that children tend to mount a more severe inflammatory response after surgery compared to adults, leading to graver complications[8-9]. Signs of posterior segment inflammation, such as macular and optic disc edema, can be attributable to primary causes in front of the eye. For example, in juvenile idiopathic arthritis which presents mostly as anterior and intermediate uveitis, macular thickening or edema is found in up to 74% of cases [10,11]. Optic disc edema is also a common complication of intermediate uveitis among children, occurring in up to 71% of cases in one study[12]. In our case, the findings of severe macular and optic disc edema appeared to be secondary to inflammation of the iris and ciliary body caused by improper positioning of the multipiece lens. This theory was supported by the resolution of inflammation following IOL explantation, the asymmetric response in both eyes (i.e., no inflammation in the properly placed IOL in the other eye), and the exclusion of primary causes of optic disc edema (such as idiopathic intracranial hypertension) by MRI. A clinical relative afferent pupillary defect (RAPD) examination could have served as a useful tool for monitoring optic nerve and extensive retinal involvement. However, in this case, assessment of RAPD was limited because postoperative atropinization was part of the routine pediatric cataract surgery protocol. Since RAPD evaluation depends on pupillary movement, accurate assessment became technically difficult due to pharmacologic dilation and the additional iris manipulation during the repeated surgeries. Consequently, both RAPD and reverse RAPD could not be reliably elicited even during the later stages of recovery.

Because of these well-documented complications from literature[1-6], many authors have described various techniques to avoid inadvertent reversed vaulting in implantation[3] and performing an optic capture of a reversed vaulted lens[6]. Khokhar et al. elaborated that most mistakes of reversed vaulting happen during insertion of the IOL. As the plunger was pushed, the IOL rotated inside the cartridge, creating a torque. The key to a successful placement lies in nullifying this torque by rotating the hand while inserting the lens[2,3]. Prasad et al in 2022 managed a reverse-vaulted lens by pushing down the IOL and capturing the optic behind the posterior capsular openings[6]. This maneuver relieved the pupillary block. In this paper, considering that this was the better functioning eye and occurring in a child, instead of performing an in vivo flip of the IOL, the authors decided to remove the IOL and leave the child aphakic. After intraocular lens explantation, the optic disc edema and retinal edema resolved promptly. The child was monitored closely and underwent aggressive postoperative visual rehabilitation. It is crucial that the long-term visual prognosis and management plan be thoroughly explained to the parents and guardians. Given that this case already carried a poor visual prognosis due to long-standing cataract-related sensory deprivation amblyopia, visual rehabilitation was nevertheless initiated to maximize the child's visual potential. Adequate chair time and continued counseling were therefore essential components of management.

CONCLUSION

This paper reports significant posterior pole inflammation as an uncommon yet potentially visually disabling consequence of a reversed vaulted sulcus placement of a multipiece intraocular lens in a child. Careful attention is warranted to ensure proper IOL orientation during implantation, especially in pediatric cataract surgery.

ETHICS COMPLIANCE STATEMENT

The authors affirm that this case report was prepared in accordance with the ethical standards of the *Philippine Journal of Ophthalmology*, the principles outlined in the Declaration of Helsinki, and applicable institutional and national guidelines on research involving human participants. Written

informed consent for publication of clinical details and accompanying images were obtained from the patient's parents prior to manuscript submission. The authors confirm that all identifying information has been removed or anonymized to protect patient privacy. The authors declare that the case report did not require formal institutional review board (IRB) approval, as per the policies of the authors' institution, because it describes a single clinical case without experimental intervention.

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