Anterior segment optical coherence tomography of intraocular lens opacification

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Postoperative opacification of a hydrophilic acrylic intraocular lens (IOL) is an uncommon complication. A 57-year-old diabetic female who had undergone phacoemulsification with IOL implantation in her right eye 16 years back presented with diminution of vision in the same eye for 3 years. Significant IOL opacification was observed clinically and anterior segment optical coherence tomography clearly delineated the intraoptic deposits, sparing the haptics, and edges of the optic. IOL explant and exchange was performed leading to restoration of visual acuity to 6/9. Histochemical evaluation of the IOL confirmed that the hydrophilic acrylic IOL optic had calcium deposits.

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Intraocular lens (IOL) opacification is a rare phenomenon that can cause significant visual deterioration, especially in hydrophilic acrylic IOLs and may necessitate IOL explantation. While careful slit-lamp examination can identify this entity, misdiagnosis can lead to unnecessary procedures such as neodymium: YAG (Nd: YAG) capsulotomy and vitrectomy.[1] We describe a case of delayed postoperative IOL opacification that necessitated IOL explantation and exchange.

Case Report

A 57-year-old diabetic female presented with decreased vision in her right eye for 3 years. She had undergone phacoemulsification with IOL implantation 16 years back elsewhere, of which no records were available. There was no documented history of uveitis.

Best-corrected visual acuity (BCVA) was the perception of light positive and accurate projection of rays in the right eye. Milky white opalescence of the IOL resembling a cataract was observed on slit-lamp examination [Fig. 1]. There was no anterior chamber reaction. Intraocular pressure was 16 mmHg on Goldmann applanation tonometry. The fundus was not visible; ultrasound B scan was unremarkable. The left eye had a BCVA of 6/6 with a completely transparent IOL and normal fundus.

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Anterior segment optical coherence tomography (AS-OCT) of the right eye performed using RTVue SD-OCT (Optovue Inc, Fremont, CA) showed a ring of hyperreflectance beneath the anterior surface and in front of the posterior surface of the IOL optic, with a clear zone in between. The internal structure of the IOL showed no signs of abnormal reflectance [Fig. 2].

After written informed consent, IOL explantation was carried out after bisecting it into two halves, through a superior 4-mm clear corneal incision and a 3-piece hydrophobic acrylic IOL (AcrySof, Alcon Laboratories, Fort Worth, TX) was implanted into the capsular bag. BCVA improved to 6/9 N6 postoperatively. Gross analysis of the IOL revealed that it was a single-piece hydrophilic acrylic foldable IOL, also known as a hydrogel lens. A round area of opacification was noted confined to the IOL optic with clear optic edges and haptics [Fig. 3a]. Histochemical staining was done to ascertain the nature of the deposits leading to opacification and they stained positive for calcium by Von Kossa method in a distribution akin to the AS-OCT image [Fig. 3b].

Discussion

Calcium is the most common cause of IOL opacification, especially in hydrophilic IOLs.[2] Risk factors include diabetes mellitus, glaucoma, uveitis, postoperative inflammation, and intraocular calcium concentration.[2,3] The opacification usually has a late onset, maybe severe and is irreversible.[2] Two types of delayed postoperative opacification have been described in hydrophilic acrylic IOLs. The first consists of IOL optic opacification due to calcium precipitates on the IOL surfaces. This has been described in the Hydroview IOL (Bausch and Lomb, Rochester, NY)[4] and the MemoryLens (CIBA Vision, Duluth, GA).[3] The second comprises fine granular calcium deposits within the substance of the IOL optic, sparing the portion just beneath the anterior surface and in front of the posterior surface of the lens optic, the haptics as well as the edge of the optic. This is the more severe degree of opacification and has been associated with the single-piece hydrophilic acrylic IOL manufactured by Medical Developmental Research, Inc.(Clearwater, FL).[5] Our case likely belongs to the second group, and this was clearly demonstrated on preoperative AS-OCT [Fig. 2].

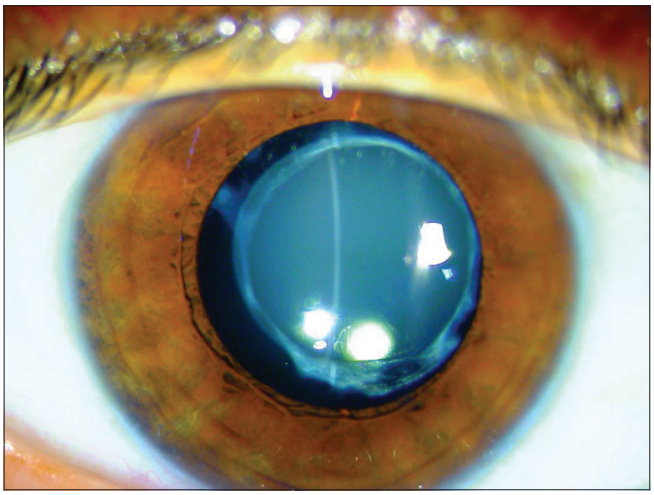

Figure 1: Slit-lamp photograph of the right eye showing milky white opalescence of the intraocular lens implant

It is important to differentiate IOL opacification from posterior capsule opacification (PCO) or anterior lens epithelial cell proliferation. Nd: YAG laser has been performed in some cases to "clean" the optical surfaces, without success, resulting in pitting of the IOL. Excessive Nd: YAG laser treatment could also jeopardize "in-the-bag" implantation of a new lens following explantation of the opacified IOL.[6] Misdiagnosis of IOL opacification as vitreous haze or hemorrhage has also been described and may lead to unnecessary vitrectomy.[1] Furthermore, while fully developed calcification can be evaluated by routine examination, slight calcification may not be apparent.[7]

In vitro analysis of explanted IOLs has been performed using AS-OCT and concluded that very superficial changes cannot be clearly differentiated from the overall outline of the IOL surface, however, AS-OCT maybe helpful in assessing the presence, location and density of intraoptic changes, and avoiding misdiagnosis.[8] This is one of the few clinicopathological reports of AS-OCT evaluation of delayed postoperative IOL opacification. The intraoptic calcification of the hydrophilic acrylic IOL could be well imaged by AS-OCT as hyperreflectivity and corroborated with the sagittal section of the explanted IOL following histochemical staining. This appearance has not been elaborated previously. The first case report on AS-OCT in two calcified hydrophilic IOLs

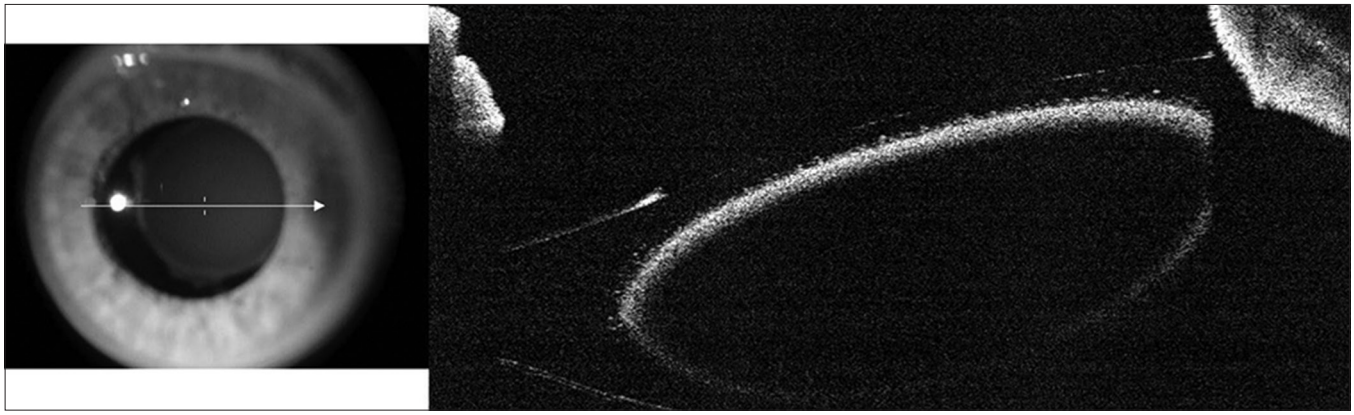

Figure 2: Anterior segment optical coherence tomography through the intraocular lens demonstrating a ring of hyperreflectivity with a clear area beneath the anterior surface of the intraocular lens confirming the presence of intraoptic deposits

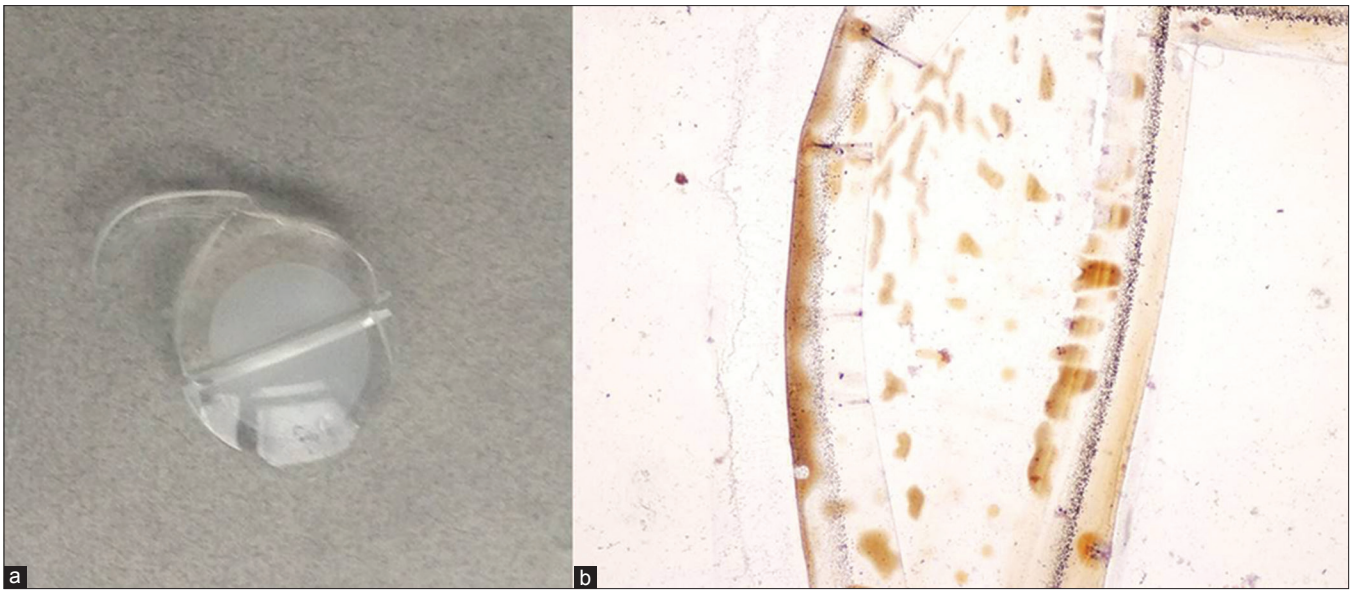

Figure 3: (a) Gross photograph of the explanted intraocular lens showing well-circumscribed opacification confined to central 4 mm of the optic. (b) Histologic sagittal section of the intraocular lens optic showing the deposits staining positive (dark brown – black) with the Von Kossa method confirming their composition of calcium. The distribution corresponded to the hyperreflectivity on anterior segment optical coherence tomography

demonstrated high reflectivity on the anterior and posterior IOL surfaces; however, histopathological evaluation of the explanted IOLs was not mentioned.[7] A similar picture was described in the only other recent case report; they also demonstrated an irregularity on the posterior IOL surface using AS-OCT that was hypothesized to lead to calcium and phosphate deposition by altering the normal IOL architecture.[9]

Conclusion

To conclude, this report describes the role of AS-OCT in detecting intraoptic calcification leading to IOL opacification. Use of this modality for *in vivo* evaluation of opacified IOLs may prevent potentially avoidable procedures with their antecedent risks. A careful follow-up of diabetes patients implanted with hydrophilic acrylic lenses is also to be emphasized.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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