Intraoperative Opacification of a Hydrophilic Acrylic With Hydrophobic Surface IOL With Spontaneous Resolution in 24 Hours

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ABSTRACT

PURPOSE: To report an intraocular lens opacification case during cataract surgery.

METHODS: An 80-year-old woman with a history of hypertension and type 2 diabetes mellitus presented with advanced nuclear cataract in her left eye and underwent coaxial phacoemulsification through a 1.8-mm micro-incision and insertion of an in-the-bag intraocular lens (IOL). There was subsequently rapid, homogenous, and complete opacification of the lens, which remained opaque for 2 hours postoperatively. At 24 hours postoperatively, the IOL was transparent with no signs of opacification and the only findings were moderate corneal edema and mild remains of sub-incisional cortex. At the last postoperative visit 1 month after surgery, the IOL remained clear and the visual acuity was 20/20.

RESULTS: After an extensive review of the literature about other IOL opacification cases reported, no previously published case related to this condensation was found.

CONCLUSION: The description of the temporary IOL opacification phenomenon due to condensation could be useful to cataract surgeons, who might avoid cold storage of IOLs. The known self-resolution of this type of IOL opacification makes advisable to delay IOL surgical explantation in these cases.


Intraocular lens (IOL) opacification has been described to occur not only in acrylic hydrophilic lenses but also in other materials, and supposes a cause of patient visual impairment with extensive clinical and legal implications. We describe a case of transient opacification after implantation of a hydrophobic surface acrylic hydrophilic IOL.

CASE REPORT

An 80-year-old woman presented with advanced nuclear cataract in the left eye. She underwent bimanual phacoemulsification (Stellaris; Bausch & Lomb Surgical, Rochester, NY) through a 1.8-mm micro-incision under topical anesthesia (Oxybuprocaine-Tetracaine; Alcon-Cusi, Barcelona, Spain) plus 1% intracameral lidocaine (B. Braun, Barcelona, Spain). The ophthalmic viscoelastic device used was 1.5% sodium hyaluronate, cohesive 15 mg/mL (Z-hyalin plus; Carl Zeiss Meditec, Jena, Germany), and after surgery 0.1 mL of 10 mg/mL cefuroxime was injected in the anterior chamber (1 mg/0.1 mL). BSS Plus (Alcon Laboratories, Inc., Fort Worth, TX) was used as intraocular irrigating solution during surgery.

The IOL used in this case (CT Spheris 204; Carl Zeiss Meditec) was a monofocal, single-piece hydrophilic acrylic IOL with a hydrophobic surface. These IOLs have a 6-mm optical zone and a total diameter of 11 mm. After in-the-bag placement of the IOL, we observed rapid, homogenous, and complete opacification of the lens. Due to the possibility of spontaneous resolution, IOL exchange was delayed. Twenty-four hours postoperatively, the IOL was found to be spontaneously transparent again. At the last postoperative visit 1 month after surgery, the IOL remained clear and the visual acuity was 20/20.

The IOL used in our case was confirmed to have been stored in a cold place for 12 hours. We hypothesized this opacification to be due to a sudden temperature change and to be related to water condensation. To reproduce the conditions that occurred during surgery, we performed a simple experiment in vitro. A CT Spheris 504 IOL was kept cooled at 4°C for 24 hours and then placed in 37°C balanced salt solution. Rapid, homogenous, and complete opacification of the IOL was observed, compatible with the images observed in the discussed case. As seen in Figures 1 and 2, the opacification occurred only on the optical surface and subsurface. This experiment confirms our main hypothesis.

DISCUSSION

A review of the literature revealed various publications on IOL opacification involving hydrophilic and hydrophobic lenses with similar material composition and early appearance after or even during surgery.

Opacification of Hydrophilic Lenses
Hydrophilic lenses are made of a combination of polyhydroxyethylmethacrylate and a hydrophilic
acrylic monomer. They are soft lenses with good biocompatibility, providing easy handling in and out of the eye. However, the hydrophilic properties favor cell migration across the surface and proliferation of epithelial cells is high in this type of IOL. Anecdotally, a case of IOL opacification was reported involving an Acqua IOL (Mediphacos, Belo Horizonte, Brazil), secondary to trypan blue dye application (Vision Blue; DORC International, Zuidland, the Netherlands). In this case, intraoperative opacification proved to be permanent and explantation of the IOL was required.2

Since 1999, there have been numerous reports of late post-surgical complications associated with hydrophilic lens implantation. Most opacification occurred during the second postoperative year. IOL surface calcification has been found in various types of hydrophilic lenses, but the best-known and documented cases have involved the Hydroview IOL (Bausch & Lomb Surgical). Factors that appear to be associated include contamination of the lenses with silicone coming from the lens packaging, chemical buffers used in the manufacturing processes, and patient metabolic factors.3,4 Calcium deposits have also been shown in other lenses similar to the Hydroview, including MemoryLens (Ciba Vision, Duluth, CA), SC60B-OUV (Medical Development Research, Clearwater, FL), and Aqua-Sense (Ophthalmic Innovations International, Ontario, FL), but the location of the deposits differed in both of them.

For ophthalmologists who perform cataract surgery, awareness of this complication implies caution about apparent posterior capsule opacification after cataract surgery with capsular bag lens implantation. If IOL opacification is suspected, it is preferable to avoid Nd:YAG laser capsulotomy, which may significantly hamper subsequent explantation of the IOL.

**Opacification of Hydrophobic Lenses**

In 2004, two cases of intraoperative Acrysof (Alcon Laboratories, Inc.) hydrophobic IOL explantation were published.5 The reason for explantation was a deposit of material on the lens surface during implantation in the capsular bag. Despite irrigation-aspiration maneuvers, the material could not be removed. In both cases, the lenses were explanted using the manufacturer’s recommended injector. Both IOLs were explanted during surgery and then subjected to study with electron microscopy, energy dispersive x-ray, and mass spectroscopy. The results seem to suggest that in both cases the deposit was caused by crystallization of the ophthalmic viscoelastic device used during cataract surgery.6 This suggests that the lens should not be loaded too long before

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**Figure 1.** Intraocular lens opacification (A) 30 minutes after surgery, (B) 2 hours after surgery, and (C) 3 days after surgery.

**Figure 2.** (A) 37°C degree balanced salt solution. (B and C) Opacified lens immersed in 37°C degree balanced salt solution.
intraocular injection and surgeons should carefully follow the manufacturer’s instructions and use the recommended injectors.

Another functional complication of some IOLs is glistening, widely reported in AcrySof IOLs. This acute phenomenon occurs in the first week after surgery when fluid-filled micro-vacuoles appear within the optic of the lens. Although initial studies indicated that this phenomenon was limited to AcrySof IOLs with AcryPack packaging, Christiansen et al. reported the glistening effect in these lenses with Wagon Wheel packaging.7

**EFFECT OF CONDENSATION ON IOLs**

The physical phenomenon of condensation is the change of the physical state of matter from gaseous to liquid phase, such as gas (or steam) to liquid. Condensation generally occurs when a vapor is cooled, but can also occur when the vapor is compressed (pressure increases) or subjected to a combination of cooling and compression. Water vapor in the air will only condense on a surface with a lower temperature or when its saturation limit is exceeded. In our case, although we suspect that this is what happened during surgery, we had never witnessed such IOL clouding that did not resolve within minutes inside the eye.

A case of IOL opacification similar to ours was reported in 2007, involving a MemoryLens.8 In this case, opacification occurred rapidly after surgery and resolved spontaneously, without the need for explantation. The possibility of condensation being responsible for IOL opacification was not mentioned.

Knowledge of this type of reversible IOL opacification is important and suggests taking precautions to avoid cold storage of IOLs before implantation. Furthermore, in case of rapid IOL opacification during surgery or within the next few hours, surgeons should consider delaying the explantation for a day or two because such early opacification, if due to condensation, may resolve spontaneously.

**AUTHOR CONTRIBUTIONS**

Study concept and design (LG); data collection (LG, PR, DAG); drafting of the manuscript (LG, DAG); critical revision of the manuscript (PR)

**REFERENCES**