

Severe prelenticular membrane formation on the surface of a hydrophilic acrylic intraocular lens after cataract surgery in an eye with an Ahmed valve implant

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Dear Sir,

I am Yong-Sun Ahn, from the Department of Ophthalmology of St. Vincent Hospital of Suwon, Kyungki-do, South Korea. Cataracts are a common problem in eyes with a glaucoma drainage device (GDD), because tube shunt surgery increases the incidence and progression of cataracts^[1]. An Ahmed valve, the most commonly inserted GDD, is composed of a silicone tube connected to a flat plate sewn to the sclera, and aqueous humor flows from the anterior chamber through the tube onto the plate to form a subconjunctival bleb^[2]. Although cataract surgery in eyes with a functioning GDD is generally safe, with less detrimental effect on intraocular pressure (IOP) control, compared to eyes with a functioning bleb^[1,3,4]. However, little is known of the interaction of a pre-existing silicone valve in the anterior chamber with the intraocular lens (IOL) material, and the effects on postoperative inflammation compared to standard phacoemulsification.

Hydrophilic acrylic IOLs are very biocompatible, with the smallest foreign body reactions, compared to other foldable IOLs^[5]. In terms of the interaction with other lens materials, however, increased calcification has been reported when they are exposed to silicone compounds^[6,7].

We experienced a case of a severe prelenticular membrane formation on the surface of an MI60 hydrophilic acrylic IOL after uneventful clear corneal phacoemulsification in an eye

with an Ahmed valve implant. After replacing the IOL with a silicone IOL, the inflammation subsided. The prelenticular membrane and explanted IOL were sent for histopathological analysis and examined using transmission electron microscopy (TEM), scanning electron microscopy (SEM), and energy-dispersive X-ray spectroscopy (EDS). And this study was performed with informed consent and following all the guidelines for experimental investigations required by the Institutional Review Board or Ethics Committee of St. Vincent Hospital.

A 51-year-old man with a 5-year history of diabetes mellitus had an Ahmed glaucoma valve (AGV-FP7) implanted superotemporally with a sclera graft in his left eye for neovascular glaucoma. About 8mo later, he presented with blurred vision in his left eye. He had a dense grade 5 posterior subcapsular cataract [NO2, NC2, C3, P5 according to the Lens Opacities Classification System III (*Arch Ophthalmol* 1993;111(6):831-836)], and the IOP was 17 mm Hg without anti-glaucoma eyedrops. The corrected distance visual acuity (CDVA) was 1.39 logMAR in the left eye. He had uneventful cataract surgery with implantation of a hydrophilic acrylic IOL (MI60, Bausch and Lomb, USA). A dispersive ophthalmic viscosurgical device [sodium chondroitin sulfate 4-sodium hyaluronate 3% (Viscoat)] was used. On the day following surgery, the CDVA had improved to 0.52 logMAR. The eye was treated with moxifloxacin 0.5% ophthalmic solution and dexamethasone 0.1% ophthalmic suspension four times a day. The cornea was clear with a trace of cellular activity. No postoperative complications such as fibrin formation or IOP elevation were observed. Five days later, the patient visited the clinic complaining of a sudden reduction in vision 3d after the surgery, and a CDVA of 1.69 logMAR. Some corneal edema was present, along with 1+ cellular activity and a thick white opacification was observed on the anterior IOL surface, which completely covered the capsulorhexis opening (Figure 1A). At 10d, the CDVA had not improved, so the IOL was replaced with a second-generation silicone foldable IOL (SoFlex Li61U, Bausch and Lomb, USA). After this, the inflammation subsided. One month later, the CDVA had improved to 0.69 logMAR and 6mo later, to 0.39 logMAR (Figure 1B).

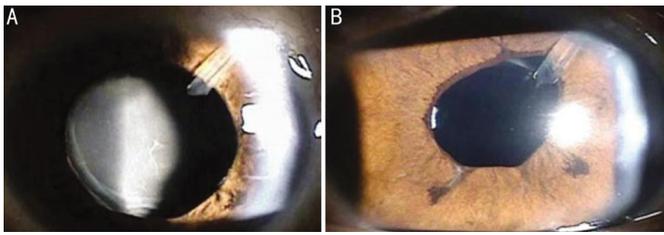


Figure 1 Anterior segment photography using tangentially applied slit lamp beam A: Prelenticular inflammatory membrane formation after phacoemulsification on postoperative day 3; B: Resolution of the membrane after changing the IOL.

When the prelenticular membrane was observed using TEM, multiple foreign body-giant cells with massive collagen fibers were noted. Several giant cells had fused into large, multinucleated giant cells (Figure 2). On SEM, linear cracks related to the deposits were noted on the IOL surface. No calcium peak was observed on EDS (Figure 3).

Clinical and histological studies have demonstrated that a foreign-body reaction can occur in eyes following IOL implantation [5]. Cellular proliferation on the IOL surface is a good indicator of the biocompatibility of the lens material and of postoperative inflammatory reactions [8]. Hydrophilic acrylic IOLs are very biocompatible, and there are fewer foreign body-giant cells, one of the indicators of biocompatibility, on a hydrophilic IOL than on other types of IOL [5]. In our case, however, a severe inflammatory reaction, with many foreign-body giant cells developed in the eye with a hydrophilic IOL 3d after uneventful phacoemulsification (Figures 1 and 2). In the prelenticular membrane, multinucleated giant cells surrounded by massive collagen fibers were seen, which is a clinically significant consequence of macrophage-IOL interactions (Figure 2). In our case, the inflammation subsided after the hydrophilic acrylic IOL was replaced with a silicone IOL. Therefore, the hydrophilic acrylic material of the IOL and its interaction with the pre-existing silicone valve appears to be the reason for the acute foreign-body reaction.

Silicone contamination has been implicated in the calcification of a hydrophilic acrylic IOL [7]. In addition, calcium-phosphate deposits on a hydrophilic acrylic IOL have been reported after silicon oil tamponade [6]. The opacification of a hydrophilic acrylic IOL, which is related to calcium/phosphate precipitation, is usually recognized as a late postoperative complication [9]. In our case, we explanted the IOL on postoperative day 10, and EDS did not reveal any peak for calcium or phosphate (Figure 3). The surface calcification of a hydrophilic acrylic IOL after inflammatory membrane formation in eyes with a combined vitrectomy and phacoemulsification has been reported [10]. The prelenticular membrane that developed in that case might have been at high risk for IOL calcification later, unless the IOL was not explanted, because eyes with diabetic retinopathy usually have a high calcium concentration in the aqueous humor.

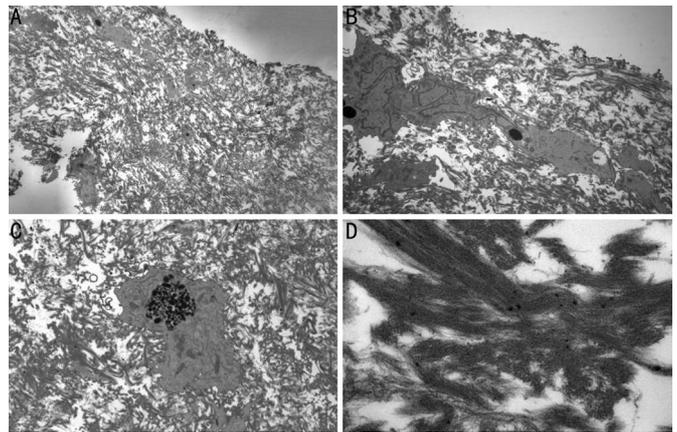


Figure 2 Transmission electron microscopy images of the prelenticular inflammatory membrane A: Foreign body giant cells surrounded by massive collagen fibers ($\times 100$); B: Several giant cells have fused into a large, multinucleated giant cell ($\times 200$); C: A large foreign body giant cell ($\times 500$); D: Collagen fiber bundles ($\times 500$).

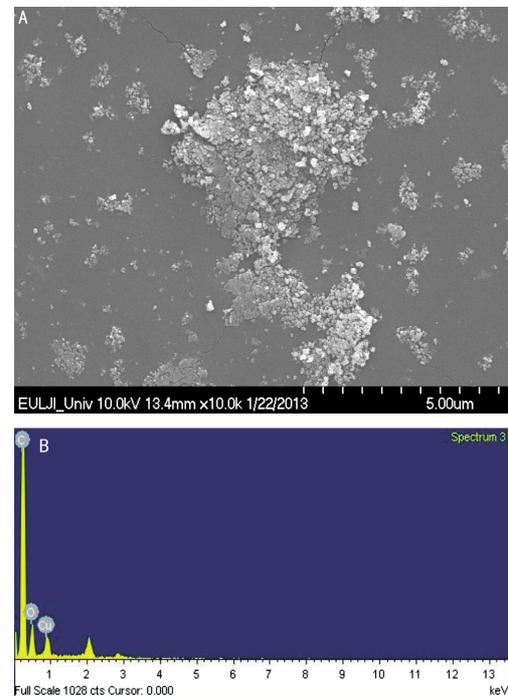


Figure 3 Clinical and laboratory images of the explanted intraocular lens A: Scanning electron microscopy image of the deposit on the surface of the intraocular lens; B: X-ray microanalysis obtained using energy-dispersive spectroscopy does not show any peak for calcium.

There are several reports on the outcomes of phacoemulsification with prior Ahmed glaucoma valve insertion, and these studies focused on postoperative IOP control [1,3,4]. However, the optimal phacoemulsification procedure and postoperative care in patients undergoing cataract surgery in the presence of a tube shunt device have not been reported in the recent literature. In previous reports, the IOLs used were silicone IOLs [3,4]. Therefore, further study of IOL selection in eyes with prior GDD insertion is warranted.

A GDD is usually inserted in cases with intractable glaucoma complicated with proliferative diabetic retinopathy, *i.e.* uveitic glaucoma [2]. These eyes are prone to evoking a stronger inflammatory reaction [5,11]. Further, we presume that the hydrophilic acrylic IOL and its interaction with the pre-existing silicone valve contributed to this undesirable postoperative complication. The interaction between the IOL material and a pre-existing silicone tube in eyes with GDDs requires further investigation.

To the best of our knowledge, this is the first *in vivo* documentation of an acute foreign body reaction on the surface of a hydrophilic acrylic IOL after phacoemulsification in an eye with an Ahmed valve implant.

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Conflicts of Interest: Ahn YS, None; Choi JA, None.

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