Delayed accumulation of lens material behind the foldable intraocular lens

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Foldable acrylic intraocular lenses (IOLs) are known to reduce posterior capsule opacification by preventing migration of lens epithelial cells with its square edge design and its property of tackiness. Studies have reported a mean adhesiveness to posterior capsule more than three times higher for certain acrylic foldable IOLs than polymethyl methacrylate IOLs. The authors would like to report two cases where the force of tackiness was compensated, thereby presenting with delayed accumulation of lens material in the capsular bags behind the IOL with temporary loss of vision.

Key words: Foldable, posterior capsule opacification, phacoemulsification

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Hydrophobic acrylic lens material (AcrySof ®, Alcon, Fortworth, Texas, USA) is believed to have a strong adhesive property with capsular bag.[1,2] But the strength of this adhesion *in vivo* is not exactly known. The authors report two cases where regenerated cortical lens material descended in clumps in the plane between the posterior capsule and the intraocular lens

(IOL) probably overcoming the adhesive force between the two. Such a complication has not been reported earlier.

Case Reports

Case 1

A 61-year-old diabetic gentleman, with high myopia and posterior subcapsular cataract in both eyes, underwent uneventful phacoemulsification with in-the-bag IOL implantation (AcrySof® Alcon, Fort Worth, Texas, USA; Model: MA30BA, Power: 12D, Length: 12.5 mm, Optic: 5.5 mm, SN: 506409.091) in both eyes The postoperative period was unremarkable and best corrected visual acuity (BCVA) was 20/20, N6 achieved in both eyes independently.

The patient returned after four years with the complaint of sudden blurring of vision in the left eye. On examination, BCVA in the affected eye was 20/80. Slit-lamp evaluation revealed a quiet anterior segment with presence of conglomerated whitish fluffy material as well as crystalline bodies of different sizes [Figs. 1, 2] in the capsular bag behind the IOL covering almost the entire pupillary area in the left eye. A well-developed Soemmering's ring was appreciated in the periphery of the capsular bag beyond the IOL optic after mydriasis. The

Figure 3: (Case 2) Slit-lamp photo showing fluffy whitish lens material between IOL and posterior lens capsule

Figure 1: (Case 1) Slit-lamp photo showing whitish lens material between the IOL and posterior lens capsule. A well-defined Soemmering's ring is also seen

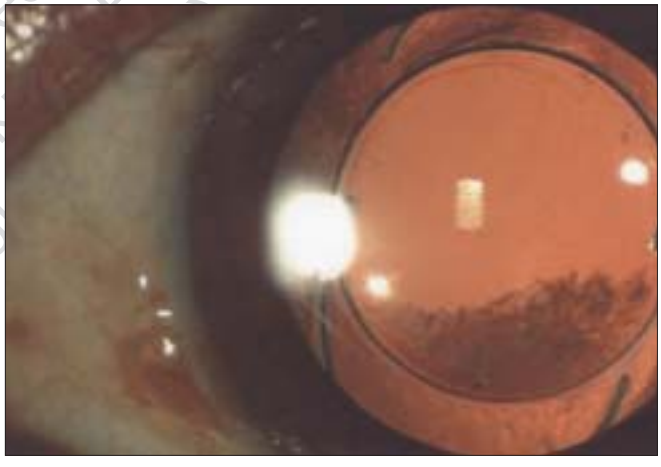

Figure 4: (Case 2) Slit-lamp photo taken with retro illumination depicting the lens material with shrinkage of the haptics

Figure 2: (Case 1) Slit-lamp photo taken with retro illumination depicting the lens material

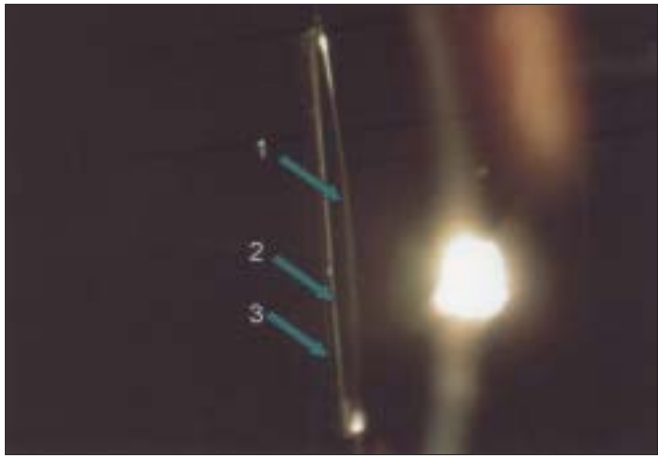

Figure 5: (Case 2) Slit-lamp photo taken with slit section showing anterior (1), posterior (2) surface of the IOL optic and posterior lens capsule (3) (arrows). A clear space between the posterior surface of the optic and posterior capsule, devoid of lens matter is seen

accumulated material was gravity-dependent and was moving minimally along with eye movement. A clinical diagnosis of delayed accumulation of regenerated cortical lens material was made. It was believed that the equatorial regenerating cortical matter from the superior fornix of the capsular bag got dislodged and gravitated down behind the IOL. The patient was advised lavage of the capsular bag (with histopathological examination of the material) but he refused to undergo any surgical intervention and was therefore kept on regular follow-up without any medications. On subsequent checkups it was noted that the material in the capsular bag behind the IOL was spontaneously decreasing and at the end of a one-year period, the visual axis cleared with BCVA of 20/30. The posterior capsule was clear and there was slow absorption of the material.

Case 2

A 50-year-old gentleman reported with nuclear sclerosis and posterior subcapsular cataract in both eyes and underwent routine uneventful phacoemulsification with in-the-bag IOL implantation in both eyes (AcrySof ® Alcon, Fort Worth, Texas, USA; Model: MA30BA, Power: +23.0 D, Length: 12.5 mm, Optic: 5.5 mm, SN: 516960.070). The postoperative period was unremarkable and with a BCVA of 20/20, N6 both eyes. Seven years following the surgery, he returned with an interesting history of sudden dimness of vision in the left eye, which lasted for a period of few months followed by spontaneous recovery. This temporary visual impairment was characteristic; as if a screen descended from above with clouding of vision followed by spontaneous clearance in the same order. His corrected vision in the affected eye was 20/20. Slit-lamp examination revealed a quiet eye with normal intraocular pressure. Slit-lamp examination after mydriasis revealed whitish fluffy material inferiorly, trapped between the IOL and the posterior capsule (similar to that described in Case 1) encircling 360° with regenerative lens material (Soemmering's ring) beyond the IOL optics. Further noteworthy was the proximity between the haptic and optic, indicating capsular fibrosis and loss in memory of the IOL haptics [Figs. 3, 4]. Similar to Case 1, it was also diagnosed as accumulation of regenerated lens material which dislodged from the superior fornix of the capsular bag. As there was no visual impairment, the patient refused any intervention and was under regular observation till the last checkup which showed total absorption of the lens matter. The posterior capsule was maintaining clarity and was noted to be separated from the posterior surface of the IOL [Fig. 5].

Discussion

Acrylic polymer material of AcrySof® IOL is reported to have a tacky surface. The posterior as well as the anterior capsule remain adherent to the lens surface after implantation in the bag[3-5] and prevent posterior capsular opacification (PCO), capsular fibrosis and lens decentration. Nagata and co-authors[5] reported a mean adhesiveness of 2.76 gw for AcrySof®, making it more than three times higher adhesive than polymethyl methacrylate (0.81 gw) with lens capsule. Nishi and Nishi, in Japan, have published evidence[6] that a square-edge design of an IOL creates a discontinuous capsule bend angle and retards the migration of equatorial lens epithelial cells onto the posterior capsule, resulting in posterior capsular adherence to the posterior surface of the IOL. Design factors such as posteriorly angulated haptics, size and posterior convexity of the optic and tackiness of the surface of IOL enhance the opportunity for the capsular bend to occur.[7] Investigators have concluded that the property of adhesiveness of acrylic IOLs to the capsular bag contributed significantly to the edge design in creating this discontinuous bend and, therefore, in decreased PCO with AcrySof® IOL.[8]

In pursuance of their 'sandwich theory',[9] Linnola *et al*. have also concluded that the sandwich structure of IOL/1 cell layer/capsule was observed with a significantly higher incidence in association with the AcrySof® IOL and fibrinectin was identified as the extra-cellular protein involved in the formation of this structure.[10,11]

In the present report, both the cases underwent standard, uneventful, phacoemulsification with in-the-bag posterior chamber IOL implantation after an intact continuous curvilinear capsulorhexis (CCC), with the CCC margin covering the anterior surface of the optic with a minimal overlap. The ring of Soemmering from the capsule epithelium develops postoperatively in course of time and normally it does not dislodge as both anterior and posterior capsules are in strong adherence due to fibrosis. However, in these two cases, probably a plaque from the superior portion of this ring dislodged and descended inferiorly through the retrolenticular space negating the force of tackiness between the IOL and the posterior capsule. During the course of its descent downwards, there was impairment of vision so long as the material was in the visual axis. The tissue pressure inside the ring of Soemmering was considered to be higher to overcome the force of tackiness and this suggests there is a limitation of tackiness which might not have any considerable role in maintaining the clarity of the posterior capsule. Unlike capsular bag distension syndrome, there was evidence of slow absorption of material. In both the situations, it was suspected that the *in vivo* tackiness of the AcrySof® IOL to the posterior capsule may not be as firm as that reported in *in vitro* studies. The authors did not come across any other report of a similar nature. However, chemical analysis and microscopic study of the accumulated material could clearly explain its nature which was not possible in these cases.

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