SCIENTIFIC REPORT

The course of surface deposits on a hydrophilic acrylic intraocular lens after implantation through a hexagonal cartridge

A L Marcovich, G Kleinmann, D Epstein, A Pollack

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Aim: To evaluate the outcome of surface deposits that occurred during implantation of hydrophilic acrylic intraocular lenses (IOLs) through a hexagonal cartridge.

Methods: Surface deposits were observed on the posterior surface of the ACR6D SE IOLs that were injected through a hexagonal cartridge filled with sodium hyaluronate 1%. All the patients were examined 1 day, 1 week, 1 month, 6 months and 1 year postoperatively. The location of the deposits was recorded and photographed. The patients were questioned about blurred vision, glare or halos.

Results: Linear or curly deposits were detected on the posterior surface of the IOL in six patients. In four patients, the deposits were peripheral and were observed 1 week postoperatively. In two patients, the deposits were noticed immediately after implantation. In one eye, they were misinterpreted as a crack in the IOL's optic and were left in the eye. In the second patient the deposits were removed immediately after implantation with forceps. The deposits that were left after implantation (five eyes) did not resolve during 1 year of follow-up. None of the eyes developed abnormal inflammatory reaction. In three eyes the best-corrected visual acuity (BCVA) was 6/6. In the other three eyes the BCVA was 6/12. None of the patients experienced any visual disturbance.

Conclusions: Implantation of the ACR6D SE IOL through a hexagonal cartridge can lead to the formation of deposits on the posterior surface of the lens. The deposits do not resolve and may resemble a crack in the IOL. The deposits left on the IOL had no clinical relevance in our patients.

PATIENTS AND METHODS

Deposits were observed on the posterior surface of the ACR6D SE IOL in six patients. The ACR6D SE IOL (fig 1) is a single-piece hydrophilic acrylic IOL, with 26% water content. The IOL is biconvex, with 10° angulation, and has a refractive index of 1.47. The overall diameter is 12.0 mm and the optic diameter is 6 mm. All the IOLs in this study were implanted by a single surgeon (ALM). Before implantation, the capsular bag was filled with sodium hyaluronate 1% (Biolon, Bio-Technology, Rehovot, Israel). The same viscoelastic agent was applied to the barrel and the inner sides of the hexagonal cartridge that comes with the lens (CEC 001, Corneal Laboratories). The IOL was grasped by the haptic and placed on the central hinge. Slight downward pressure was exerted with a blunt spatula-like instrument (Loader CL 200, Corneal Laboratories), and the trailing haptic was bent over the optic before the wings of the cartridge were closed. The IOL was advanced into the anterior part of the cartridge using the straight side of the loader. The cartridge was then loaded into the injector handpiece (INJ103M; Corneal Laboratories). All the IOLs were loaded by the surgeon. With gentle pressure on the injector's plunger, the IOL was implanted into the

Figure 1 A schematic illustration of the ACR6D SE intraocular lens (Corneal Laboratories, Pringy, France).

Surface deposits on different types of intraocular lenses (IOLs) were observed after implantation.^{1–4} Jensen *et al*¹ described a series of 11 patients, who had crystalline deposits on their IOLs, which remained for a long period after the surgery. The deposits were attributed to the use of Healon GV (sodium hyaluronate 1.4%). Olson *et al*² reported precipitation and crystallisation on the surface of silicone IOLs. Surface deposits on hydrophilic acrylic IOLs were reported by Faschinger.^{3,4} He described plastic exfoliations from a hexagonal cartridge on three hydrophilic acrylic ACR6D SE (corneal; Corneal Laboratories, Pringy, France) IOLs, and related it to implantation without using an ophthalmic viscoelastic device (OVD).⁴ In a previous laboratory study, we suggested that these deposits were not related to the lack of OVD but rather to the mismatch between the oval, folded IOL and the hexagonal cartridge shape.⁵

This paper describes a 1-year clinical follow-up of surface deposits on ACR6D SE IOLs after implantation through a hexagonal cartridge.

Abbreviations: BCVA, best-corrected visual acuity; IOL, intraocular lens; OVD, ophthalmic viscoelastic device

Figure 2 Clinical slit-lamp photographs showing central linear deposits on the posterior surface of the intraocular lens (IOL) resembling a crack in the IOL's optic (arrows). The deposits did not resolve during 1 year of follow-up (patient no 3), but a slight change in their location was detected at the 1-year follow-up examination. (A) One month postoperatively. (B) One year postoperatively. The deposits moved downward in comparison to the 1-month evaluation (A).

capsular bag. Postoperatively, patients received lomefloxacin 0.3% (Okacin Novartis Ophthalmics, Hettlingen, Switzerland) drops for 1 week and dexamethasone 0.1% (Maxidex Alcon, Puurs, Belgium) drops for 4 weeks. All the patients were examined 1 day, 1 week, 1 month, 6 months and 1 year postoperatively. The location of the deposits was recorded and photographed. The patients were questioned about blurred vision, glare or halos.

RESULTS

Linear or curly deposits were detected on the posterior surface of the IOL in six patients. Table 1 shows the location of the deposits, IOL power and best-corrected visual acuity (BCVA) 1 year postoperatively. In four patients the deposits were peripheral and were observed 1 week postoperatively,

when dilated examination was carried out. In two patients the deposits were noticed immediately after implantation of the IOL. In one patient, they were misinterpreted as a crack in the IOL's optic (fig 2A) and were left in the eye. In the second patient the deposit was prominent and central (fig 3A). A trial to remove it by irrigation and aspiration was unsuccessful. The capsular bag was filled again with OVD and the linear deposit was removed with capsulorrhexis forceps (fig 3B). The deposits that were left after the implantation (five eyes) did not resolve during 1 year of follow-up. In one eye the deposits descended slightly, but their size remained unchanged (fig 2A,B). None of the eyes developed abnormal inflammatory reaction. In three eyes the BCVA was 6/6. In the other three eyes the BCVA was 6/12. These eyes had additional ocular pathological features that could explain the

Figure 3 Intraoperative photographs showing a central deposit on the intraocular lens noticed immediately after the implantation (patient no 6). The deposit was removed by capsulorrhexis forceps (arrows).

Table 1 Patient data, location of deposits and best-corrected visual acuity at 1 year postoperatively

Patient	IOL power (diopter)	Location of deposits on posterior IOL surface	BCVA 1 year	Additional eye pathology
1	22.5	Nasal periphery	6/12	Posterior capsule opacified
2	24	Lower periphery	6/6	Pseudoexfoliation glaucoma
3	18.5	Central horizontal	6/12	Corneal opacity, degenerative myopia
4	8	Upper and lower periphery	6/12	Myopia, s/p retinal detachment surgery
5	23.5	Horizontal below centre	6/6	
6	21	Central—removed during surgery	6/6	

IOL, intraocular lens; BCVA, best-corrected visual acuity.

reduced visual acuity: posterior capsular opacity, corneal opacity and myopia, and previous operation for retinal detachment. None of the patients had any visual disturbance.

DISCUSSION

In this study, we present the course of surface deposits that occurred on the posterior surface of the hydrophilic acrylic ACR6D SE IOL after implantation through a hexagonal cartridge. Faschinger³ described multiple white lines on the surface of hydrophilic acrylic IOLs implanted by an injector. Like the deposits we described, he found the deposits to be located mainly on the posterior surface. He could not remove the deposits by irrigation or forced rinsing. After 1 month, these surface abnormalities had disappeared. In another report, Faschinger⁴ described plastic exfoliations from a hexagonal cartridge after implantation of ACR6D SE IOL (corneal) without the use of OVD. He detected defects in the inner walls of the cartridge that corresponded to the exfoliations that occurred on the IOL. As he did not present a follow-up, it is unclear if these deposits also disappeared spontaneously. In our patients, the deposits on the posterior surface of the IOLs were similar to the exfoliations described by Faschinger and, as mentioned, remained unchanged for at least 1 year. We used a similar hydrophilic acrylic IOL (ACR6D SE, Corneal Laboratories) and the same supplied hexagonal cartridge (CEC 001, Corneal Laboratories). The deposits occurred in our patients despite the use of OVD (sodium hyaluronate 1%, Biolon). In a previous laboratory study, we showed that injection of the ACR6D IOL through a hexagonal cartridge resulted in deposition of particles that adhered to the posterior surface of the IOL and could be removed by forceps.⁵ These deposits were not observed when the injection of the same IOL was carried out through an oval cartridge. The advantage of the hexagonal cartridge is that it can prevent rotation of the IOL during implantation. However, the friction during the passage of the folded, oval IOL through the hexagonal tube may dislodge plastic particles or coating from the inner part of the cartridge despite the application of OVD. Various OVDs have been shown to differ in their performance with regard to cartridge cracks or IOL insertion through the cartridge.^{6–7} Contradictory reports are available regarding the advantages of various OVDs' viscosity and pseudoplasticity at different shear rates.^{6–8} It is recommended that applying OVD at the terminal areas of the troughs be avoided so that the cartridge is not overloaded with OVD, and that a balanced salt solution be added into the cartridge before closing the wings.⁸

The surface deposits described in this paper can be misinterpreted as cracks in the IOL optic and could lead to IOL exchange, which seems to be unnecessary and may expose the patients to the risks of intraocular surgery. If these

deposits are detected intraoperatively, it is possible to remove them with forceps. In our six cases, no problem had arisen at year of follow-up. None of the patients had any type of dysphotopsia, and all the patients had good BCVA. A coexisting ophthalmic pathology could be the reason for the cases of slight decrease in BCVA (6/12). However, deposits from the cartridge are not supposed to enter and remain in the eye, as they may cause late complications.

In conclusion, after implantation of the ACR6D SE (corneal) IOL through a hexagonal cartridge (CEC 001, Corneal), deposits on the posterior surface of the IOL were observed. The deposits resembled cracks in the IOL and their origin is probably the inner part of the hexagonal cartridge. The deposits did not resolve over a 1-year follow-up. Central deposits that are noticed during IOL implantation can be removed during the primary operation. In asymptomatic patients with surface deposits on the IOL, surgical intervention may not be indicated.

Authors' affiliations

A L Marcovich, D Epstein, A Pollack, Department of Ophthalmology, Kaplan Medical Center, Rehovot, Israel

G Kleinmann, Department of Ophthalmology and Visual Sciences, Laboratories for Ophthalmic Devices Research, John A Moran Eye Center, University of Utah, Salt Lake City, Utah, USA

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Correspondence to: A L Marcovich, Department of Ophthalmology, Kaplan Medical Center, Rehovot 76100, Israel; danaarie@barak.net.il

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