Correction of negative dysphotopsia in Crystalens "Z syndrome"

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ABSTRACT: We report a case of negative dysphotopsia in the left eye of a 56-year-old patient three months after uneventful bilateral phacoemulsification and implantation of a Crystalens® intraocular lens (Bausch and Lomb®) placed in the capsular bag. Three months postoperatively, the patient described visual field loss in the inferior temporal quadrant in the left eye under low light conditions. Anterior capsulorhexis was eccentric, allowing the inferior temporal optic edge to move forward, producing late asymmetric vault of the lens. One month later, when the equatorial diameter of the capsular bag decreased, we pushed the inferior temporary hinge backwards so that the lens moved back into the correct position. Six months after relocation, the lens position remained stable and negative dysphotopsia was absent. This case shows Crystalens Z syndrome as a new etiology of negative dysphotopsia, and a successful novel treatment in a patient without capsular fibrosis.

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Pseudophakic dysphotopsia, first described by Davison[1], is a set of aberrant optical phenomena that can occur after uneventful cataract surgery with posterior chamber intraocular lens (PC IOL) implantation. Dysphotopsia can be positive, represented by halos and glare, or negative, with a dark crescent in the temporal field. Positive dysphotopsia are caused by the reflection of light at the IOL vertical optic edge acting like a mirror, generating undesired optical images like halos and glare. Therefore they have been associated with ovoid PC IOLs and a square edged design[2]. While in positive dysphotopsia bright artifacts appear on the retina, negative dysphotopsia blocks light from certain portions of the retina, manifesting as a patient-described observation of a dark shadow. The mechanism of negative dysphotopsia is not well known. For this reason, different causes of negative dysphotopsia following cataract surgery have been described. Negative dysphotopsia that disappears within the first few weeks after surgery has been related to edema associated with a temporal clear corneal incision[3,4]. In contrast, when negative dysphotopsia is permanent, proposed explanations include optics with a sharp or truncated edge[1,5], a reflection of the anterior capsulotomy edge projected onto the nasal peripheral retina[6] and an IOL anterior surface that is more than 0.46 mm from the plane of the posterior iris[7].

The Crystalens® is a silicone, multipiece, posterior chamber IOL which is surgically inserted into the capsular bag. It is designed to operate by translating the lens for and aft (optical-shift concept) in response to vitreous pressure changes due to ciliary muscle constriction and relaxation, respectively[8]. The Crystalens® IOL is designed with hinged silicone plate haptics in order to place the optic body posteriorly to the haptics in the capsular bag. To achieve a permanent correct lens position, it is mandatory to perform a round, centered 6 mm diameter capsulorhexis. Asymmetric

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vault is a postoperative complication unique to the accommodating Crystalens® IOL, and is explained by capsular fibrosis that pulls one haptic anteriorly while the other remains in the normal posterior position. This is known as Z syndrome[9]. We report a case of an asymmetric vault without capsular fibrosis resolved by a simple slit lamp procedure.

CASE REPORT

Preoperative examination

A 56-year-old man presented with a complaint of gradual onset of blurred vision in both eyes justified by cataracts. Preoperatively, uncorrected distance visual acuity (UDVA) was 20/25 in the right eye and 20/60 in the left eye. The best corrected distance visual acuity (BCDVA) was 20/20 with –1.00 –1.00 × 75 in the right eye and 20/30 with –3.75 –1.00 × 95 in the left eye. IOL Master measures showed the following keratometric readings: 44.25/44.50 @ 94 and 44.50/44.75 @ 96, and axial length measures of 23.62 mm and 23.55 mm in the right and left eye, respectively. Slit lamp biomicroscopy showed a 2+ posterior subcapsular cataract in the left eye and 1+ posterior subcapsular cataract in the right eye.

In March 2010, bilateral phacoemulsification was performed through a clear corneal incision. A 6 mm diameter capsulorhexis was well centered in the right eye, but in the left eye the capsulorhexis was oval and inferiorly decentered. The Crystalens® IOL was placed in the capsular bag and Atropine 1% was instilled just after the surgery according the standard protocol for implantation. One day postoperatively, the UDVA in the left eye was 20/80 and the pupil was fixed at 7.0 mm. On slit lamp examination, the IOL were well positioned in the capsular bag and properly vaulted posteriorly in both eyes. The haptics were fully covered by the anterior capsule in the right eye, while in the left eye the inferior haptic was only partially covered by the anterior capsule. One month postoperatively, the patient was satisfied with the visual results, obtaining UDVA in the right eye of 20/20 and 25/20 in the left eye, intermediate visual acuity (VA) of 20/25 (measured with Bausch and Lomb® charts at 80 cm) in both eyes and near VA of 20/25. The lens was correctly positioned into the capsular bag (Figure 1).

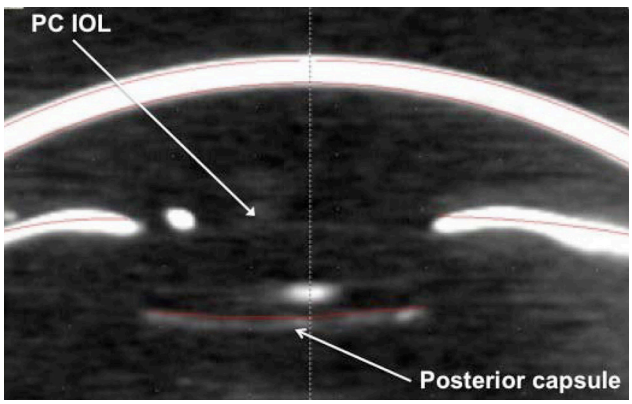

Figure 1. Scheimplug image 1 month postoperatively. Correct position of the IOL in the capsular bag.

Main problem

Three months postoperatively, the patient reported loss of vision and inferior temporal negative dysphotopsia in the left eye. He described worsening of symptoms under photopic conditions and particularly while shaving. The UDVA in the left eye decreased to 20/50 and BCDVA was 25/20 with –0.50 –1.25 × 160°, with significant dysphotopsia remaining. Uncorrected near VA was 20/20. After pharmacological left eye pupil dilatation, we observed that the infero-temporal haptic was significantly vaulted anteriorly, while the supero-nasal haptic remained vaulted posteriorly. The optic was tilted and the posterior capsule remained transparent without fibrotic bands (Figures 2-4).

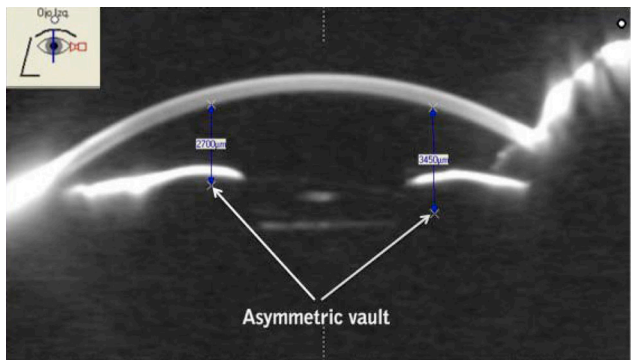

Figure 2. Scheimplug image 3 months postoperatively with asymmetric vault.

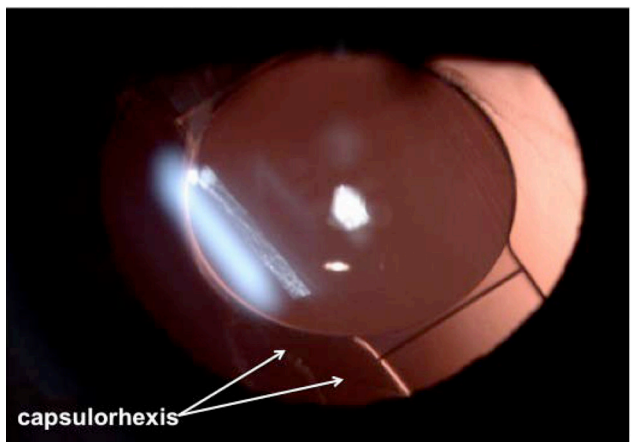

Figure 3. Color photograph of decentered capsulorhexis.

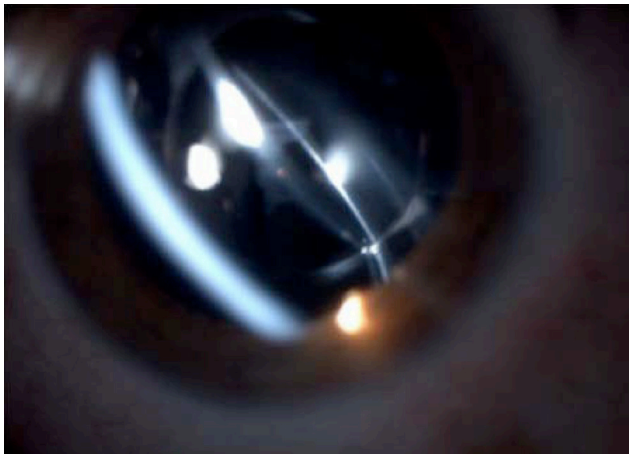

Figure 4. Color photograph with the inferior haptic anteriorly vaulted.

Pentacam measurements were performed, showing an anterior chamber depth of 4.34 mm in the right eye and 4.22 mm in the left eye. We believe that reduction of the equatorial bag diameter produced haptic bending, while the anterior capsule (inferiorly oval shaped and excessively peripheral) did not hold the inferior haptic properly, allowing it to move forward.

Solution

We decided to wait one month in order to allow capsule contraction. With a reduced equatorial bag diameter, we were able to push the inferior haptic backwards. Once the lens passed the equatorial plane of the bag, it remained stable. A reduced bag diameter held the IOL well positioned and both haptics very tilted back, making it impossible for the lens to return to the equatorial plane.

We performed this easy procedure on slit lamp under topical anesthesia. Moxifloxacin drops (Vigamox®) (two drops every 30 minutes for one hour), povidone iodine 5% (two drops every 15 minutes for 30 minutes) and tetracaine eye drops (two drops every 15 minutes) were administered before performing the maneuver. With the aid of an eyelid speculum, we introduced a 30 gauge needle into the anterior chamber at 3 o´clock with a tilted trajectory towards the infero-temporal edge of the lens. We pushed the IOL inferior hinge backwards, until the haptic reached the vertical plane. Once there, the lens moved posteriorly by itself and adopted a concave arch shape. As a result, the IOL returned to its correct posterior position along the capsule (Figure 5). After thirty minutes, the UDVA was 25/20 and the negative dysphotopsia had disappeared. On slit lamp examination, the IOL asymmetric vault was completely resolved. After six months, the uncorrected VA was 30/20 and the patient remained asymptomatic.

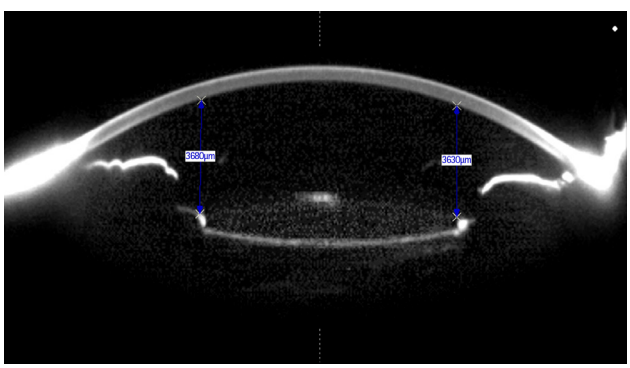

Figure 5. Scheimplug image 6 months after reposition of the lens; the optic remains stable along the posterior capsule.

DISCUSSION

The Crystalens® is a biconvex silicone IOL designed to allow anterior-posterior movement in the eye. The silicone haptics are hinged at the optic-haptic junction and two flexible polyimide loops are attached to each distal haptic, making the IOL´s total length 11.5 mm, in order to obtain adequate adaptation to the equatorial diameter of the capsular bag[10,11].

Capsular contraction always occurs after cataract surgery, although it does not usually have any clinical implications. However, this phenomenon might be more relevant when accommodating IOLs are implanted. Small capsulorhexis (5-6 mm), careful cortical removal and capsule polishing are mandatory to avoid capsular fibrosis. Although all these procedures are warranted, the Crystalens® may have a higher incidence of clinically significant capsule fibrosis than non-accommodating IOLs[12,13]. This case report represents a common case of capsular contraction in addition to a decentered capsulorhexis that did not hold one of the haptics properly, causing asymmetric tilt with one plate haptic being vaulted anteriorly and the other haptic being planar or vaulted posteriorly. This asymmetric vault is a postoperative complication unique to the accommodating Crystalens® IOL that acquires a typical configuration in the capsular bag resembling the letter Z, with the tilted optic in the middle. This tilted configuration induces a refractive defect with myopia and a negative cylinder oriented in the main lens axis[9]. As the posterior capsule remained transparent and mobile in our patient, we hypothesize that the strength vector came from equatorial contraction of the capsular bag. Unfortunately, this IOL cannot be rotated months after implantation, which would have allowed us to position both haptics well covered by the anterior capsule and so achieve a more stable lens position. Thus, we resolved the described complication on slit lamp, pushing the haptic backwards with a 30-gauge needle. Pressure must be applied during the procedure until the equatorial plane of the capsular bag is reached; once there,

the IOL moves itself backwards due to pressure that the equatorial bag exerts on the four loops. We consider that this maneuver will be effective when the posterior capsule is not rigid secondary to asymmetric fibrosis. When this happens, selective capsulotomy should be performed14 or the accommodative lens should be exchanged[15].

The incidence of negative dysphotopsia is significant in the immediate postoperative period, occurring in one in every four patients[5] and diminishing over time until it definitively disappears in between 0.3 and 2.4%.[16] The mechanism of negative dysphotopsiais not adequately explained. It has been related to early local corneal edema, incision location[17] and with anomalous refraction at the IOL edge and material[18,19,5]. As far as we could conclude from the literature review, this is the first case report of severe negative dysphotopsia symptoms associated with a Crystalens® IOL.

Another unresolved issue is regarding the ideal treatment for negative dysphotopsia. Different approaches have been made including the use of different miotic eye drops such as brimonidine or pilocarpine[20], anterior capsule enlargement with Nd-YAG laser[20], lens rotation[21] implanting a piggyback IOL in the ciliary sulcus[22,23] and, most frequently, IOL exchange with another IOL designed using a different material, placed in the bag or the ciliary sulcus[1,22,24]. All of the aforementioned treatments have been successful in eliminating negative dysphotopsia in all cases. The proposed treatment of the asymmetric vault by creating a Nd:YAG capsulotomy[6,9] is more a theoretical than practical solution that is proving ineffective. Some authors consider that excessive separation between the IOL and iris generates negative dysphotopsia, so that a sulcus IOL implantation would be the most successful treatment as it reduces this distance[7]. In our case, we found the opposite, as negative dysphotopsia was generated when the IOL moved closer to the iris, and disappeared when it was moved back, increasing the iris-IOL distance. The current case report suggests that asymmetric iris-IOL distance due to a tilted IOL optic body can be the trigger factor for negative dysphotopsia and suggests a new simple procedure for in-office relocation of the lens.

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