CASE REPORT

Pupillary block glaucoma secondary to central port occlusion following insertion of a phakic implantable copolymer lens

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A 28-year-old woman had uneventful implantation of a phakic intraocular lens (pIOL) in her left eye (Visian ICL, EVO+ model, 13.2, −7.50 diopters) to correct myopia. Six days after the procedure, she presented with herniation of the iris. Surgical reduction was carried out successfully through the previous peripheral corneal paracentesis. On the following day, the patient reported ocular pain and blurry vision. Examination showed a shallow anterior chamber, moderate diffuse corneal edema, and ocular hypertension. The central port of the pIOL was blocked by iris pigment. The condition resolved completely after surgical iridectomy, and the postoperative course was uneventful. To our knowledge, this is the first reported case of pupillary block after implantation of a pIOL with a central hole. This uncommon complication should be taken into consideration when the iris is manipulated excessively after pIOL insertion.

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The 2011 introduction of the first-generation Visian ICL phakic intraocular lens (pIOL) (Staar Surgical Co.) with a central port design (model V4c) eliminated the need for preoperative laser iridotomy or intraoperative iridectomy by allowing free flow of the aqueous humor between the sides of the pIOL. The central hole shortens and simplifies the surgical procedure and eliminates the complications associated with iridotomy and iridectomy. Pupillary block glaucoma was a well-known complication of the procedures with previous models of posterior chamber pIOLs but has not been described with pIOLs with a central hole. In pIOLs without a central port, the condition was triggered when the opening made by the laser iridotomy was not sufficiently permeable, leading to acute ocular hypertension that required immediate treatment to minimize further potential complications. We present a case of pupillary block glaucoma secondary to obstruction of the central port of a Visian ICL by iris pigment. Although rare, this possibility should be considered, especially when the iris has been manipulated excessively.

CASE REPORT

A 28-year-old woman was referred to our clinic for surgical correction of myopia. The preoperative corrected distance visual acuity (CDVA) was 1.0 (Snellen lines) in both eyes, with a refraction of −5.75 −2.0 × 15 in the right eye and −5.50 −2.0 × 165 in the left eye. Intraocular pressure (IOP) was 18 mm Hg in both eyes, and the findings in the anterior segment and fundus examination were unremarkable. The Orbscan (Bausch & Lomb, Inc.) white-to-white measurement was 11.7 mm in both eyes, and the mean keratometry was 45.00 diopters (D) in the right eye and 45.75 D in the left eye. The endothelial cell count (ECC) measured by noncontact specular microscopy (SP-1P, Topcon Medical Systems, Inc.) was normal, with 3101 cells/mm^2 in the right eye and 2959 cells/mm^2 in the left eye. The ultrasound central corneal pachymetry value (Ocuscan RXP, Alcon Laboratories, Inc.) was 509 µm and 501 µm, respectively. Anterior chamber depth (ACD) including the corneal epithelium (IOLMaster 500, Carl Zeiss MeditecAG) was 3.65 mm in both eyes; thus, the ACD from the corneal endothelium was 3.15 mm in both eyes.

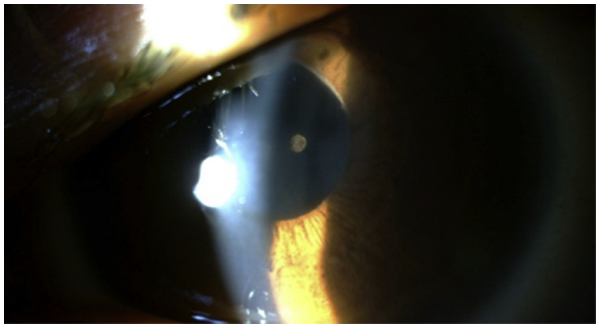

Figure 1. Slitlamp photograph of the left eye showing pupillary block glaucoma secondary to occlusion of the central port of a pIOL1 day after reduction of the iris hernia.

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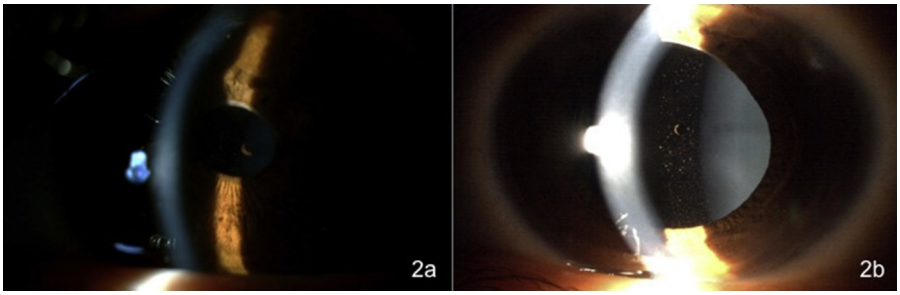

Figure 2. Slitlamp photographs of the left eye 3 hours (*a*) and 24 hours (*b*) after iridectomy and surgical clearance of the port.

A spherical pIOL was proposed, the surgical procedure was explained, and written consent was provided. The pIOL (EVO+ Visian ICL, 13.2, –7.50 D) was implanted uneventfully in the left eye. Three days postoperatively, the uncorrected distance visual acuity (UDVA) was 0.7 and the CDVA was 1.0 with +0.50 −1.25 × 174. The central vault measured using optical coherence tomography (OCT) (Cirrus, Carl Zeiss Meditec AG) was 990 µm under mesopic conditions, with good pupil dynamics. The IOP was 16 mm Hg.

Six days later, the patient presented with ocular pain and pupil ovalization. Biomicroscopy showed that the iris had herniated through the main corneal incision, which was 3.2 mm and located at the steepest preoperative meridian (75 degrees). The patient did not report previous blunt ocular trauma. The hernia was surgically reduced with a blunt spatula inserted through 1 corneal paracentesis under topical and intracameral anesthesia (lidocaine 1.0%) using hydroxypropyl methylcellulose 2.0% (Ocuvis) and intracameral acetylcholine chloride 1.0%. The pIOL remained well positioned in the posterior chamber at all times. Corneal incisions did not have to be sutured once watertightness was confirmed after stromal hydration. At the end of the procedure, 0.1 mL of intracameral cefuroxime 1.0% was injected. Postoperatively, oral acetazolamide 250 mg was prescribed every 8 hours (2 doses) and topical moxifloxacin 0.5%, tobramycin 0.3%, and dexamethasone 0.1% every 6 hours.

On the first postoperative day, the patient reported ocular pain during the night and blurry vision. Biomicroscopy showed a shallow anterior chamber and moderate and diffuse corneal edema; the central port of the pIOL was blocked by iris pigment (Figure 1). The IOP was 42 mm Hg, and the pIOL vault was approximately 1000 µm, with anterior displacement of the iris and narrowing of the angle and anterior chamber. The pupil was centered, rounded, in mild mydriasis, and slightly reactive to light. After treatment with oral acetazolamide (500 mg) and intravenous mannitol 20% (500 mL), neodymium:YAG (Nd:YAG) laser iridotomy was attempted but was unsuccessful because of the condition of the cornea and iris.

Two iridectomies were then performed in the superior temporal quadrant; a 23-gauge vitrectome was inserted through the initial inferior paracentesis under topical and intracameral anesthesia (lidocaine 1.0%), and hydroxypropyl methylcellulose 2.0% was used to facilitate access. A Sinskey hook was used to release the pigment from the blocked central port. The clinical situation improved almost immediately and 2 hours later, the IOP had decreased to 8 mm Hg. The patient was discharged with topical treatment comprising a combination of tobramycin 0.3% and dexamethasone 0.1%, as well as moxifloxacin hydrochloride 0.5% and cycloplegic 1.0%, 4 times a day.

On the following day, the UDVA in the left eye was 0.8 and biomicroscopy showed a wide anterior chamber with a mild reaction, a round pupil without corectopia under pharmacological mydriasis, and a well-positioned pIOL. The IOP was 21 mm Hg (Figure 2). One week later, the IOP was 16 mm Hg without hypotensive treatment and the central vault value measured by OCT was 784 µm. The postoperative course during the following days was uneventful, and topical treatment was tapered over 3 weeks.

Fifteen days after the left-eye procedure, a Visian ICL that was 1 size smaller (12.6) than the first pIOL was implanted in the right eye. One month after the second procedure, the 2 iridectomies and the central port in the left eye were permeable. A pigmented line was visible at the edge of the main incision, and sectoral atrophy of the iris reflected the sequelae of the hernia (Figure 3). In both eyes, the UDVA was 0.95 and the CDVA was 1.0 with a refraction of +0.75 –1.5 × 15 in the right eye and +0.25 –1.25 × 180 in the left eye. The IOP was 12 mm Hg in both eyes. The ECC was 2964 cells/mm^2 in the right eye and 2811 cells/mm^2 in the left eye. The central vault measured by OCT was 348 µm and 792 µm, respectively (Figure 4).

DISCUSSION

To our knowledge, this is the first reported case of pupillary block glaucoma after implantation of a pIOL with a central hole. The defining characteristic of the Visian ICL EVO+ model and its predecessor, the V4c model, is a 360 µm hole (or port) in the center of the optic that is designed to enable aqueous flow and obviate the need for iridotomy. Some studies have shown the effectiveness of the central port in controlling IOP after surgery.[1–4] With previous pIOL models that did not have a central hole, isolated cases of pupillary block and acute glaucoma were recorded despite preoperative laser iridotomies.[5–8]

In our case, the central port obstruction that triggered the pupillary occlusion and subsequent acute glaucoma was unequivocally related to excessive pigment dispersion after iris manipulation to reduce the hernia. Other factors that could have contributed to the port occlusion were small iris fragments released during the surgical maneuvers and the increased inflammatory factors present in the aqueous humor, which may have facilitated adhesion between the iris particles and between the iris particles and the pIOL.

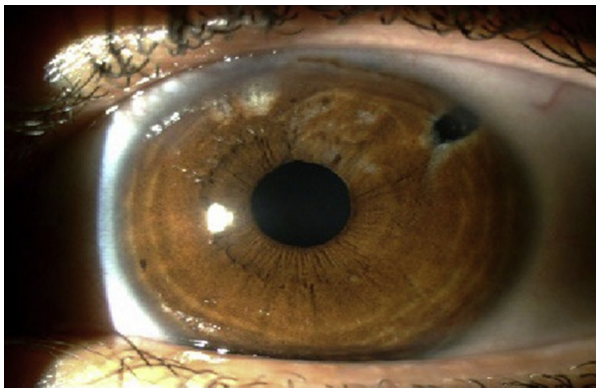

Figure 3. Slitlamp photograph of the left eye 1 month after onset of pupillary block glaucoma. The glaucoma has resolved completely with a deep and quiet anterior chamber. The openings made by both surgical iridectomies (one at 1 o'clock and a larger one at 2 o'clock) are permeable.

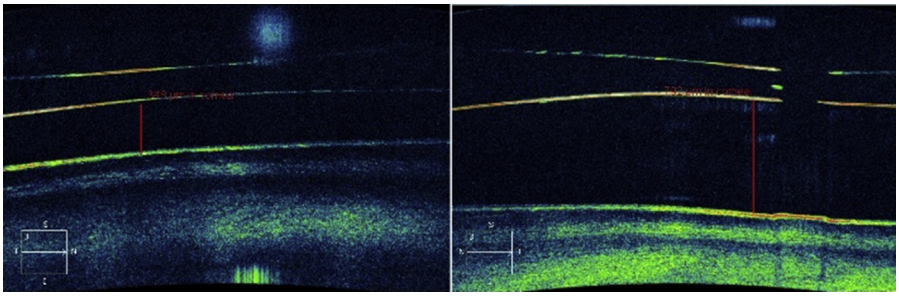

Figure 4. Optical coherence tomography 1 month after surgery showing vaulting of 348 μm in the right eye (pIOL size 12.6) and 792 μm in the left eye (pIOL size 13.2).

Neodymium:YAG laser iridotomy might have resolved the acute glaucoma; however, the advantage of the surgical approach was the possibility of mechanically clearing the central port. Similarly, simple mechanical clearance would have been sufficient to resolve the pupillary occlusion, albeit at a high risk for recurrence considering the severity of the case. Finally, it was decided to perform 2 iridectomies. Direct Nd:YAG over the occluded pIOL port was not considered due to the considerable risk for damage to the pIOL and the crystalline lens.

Although the complication is extremely uncommon, pupillary block glaucoma after implantation of a pIOL with a central hole can occur and should be considered after excessive manipulation of the iris in primary pIOL implantations as well as secondary procedures. In these cases, it may be advisable to dilate the pupil prophylactically after the procedure to prevent pupillary block until subsequent examination confirms the port is not occluded. Further experience with these pIOLs will indicate whether the port could be blocked under other clinical circumstances, such as severe anterior uveitis. The many implantations with this type of pIOL to date show the effectiveness of the central port in controlling IOP in the short and medium term.

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