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Angle-closure glaucoma after piggyback intraocular lens implantation

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PURPOSE. *To report a case of angle closure glaucoma after piggyback intraocular lens implantation and its treatment.*

METHODS. *The authors present the case of a 75-year-old woman who was seen in the emergency department with angle closure glaucoma. Two years before she had undergone piggyback intraocular lens (IOL) implantation in order to correct a refractive error after cataract surgery. Ultrasound biomicroscopy revealed a closed angle with synechiae in 360° as well as the presence of two IOLs: one in the capsular bag and the other in the ciliary sulcus. Extraction of the anterior IOL was precluded due to the poor endothelial count. Peripheral iridotomy and trabeculectomy were ineffective to lower the intraocular pressure (IOP); the authors decided to implant with an Ahmed valve and to place the valve's tube between the two IOLs to protect the endothelium.*

RESULTS. *After Ahmed valve implantation, IOP maintains stable around 10–12 mmHg without medical treatment.*

CONCLUSIONS. *Ahmed valve implantation is a good option in angle closure glaucoma due to piggyback. The placement of the valve's tube between the two IOLs is a good option to protect corneal endothelium. (Eur J Ophthalmol 2008; 18: 822-6)*

KEY WORDS. *Ahmed valve implantation, Angle closure glaucoma, Intraocular lens*

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INTRODUCTION

In 1993, Guyton et al reported the implant of two intraocular lenses (IOLs) to treat a case of microphthalmos (1, 2). Since then, this refractive procedure has been widely used to obtain the desired refractive power in patients with high hyperopia and to correct refractive errors induced by cataract surgery. The normal procedure employed to correct unexpected refractive errors produced after cataract surgery is to replace the original IOL with a new IOL of appropriate power. However, it is difficult to calculate the exact power needed for the new lens, especially when the power of the original IOL is unknown. Further, it is not known whether the new IOL will adopt the same plane as the original IOL, and it should also be realized that the removal of an IOL, whose haptics by now have been enveloped by scar tissue, can be a dangerous maneuver. All these hurdles can be overcome by implanting a second IOL (1, 2) using the so-called piggyback technique, though this procedure is not exempt of risks. The complications described so far associated with the piggyback procedure are interlenticular opacification (3, 4) and capture of the more anteriorly placed IOL by the pupil (5). Moreover, in 2004, Chang et al described a case of pigmentary glaucoma in a patient who underwent piggyback IOL placement (6) and a year later, Iwase et al reported two cases of high intraocular pressure (IOP) in two patients who had undergone piggyback lens implantation, in whom hyperpigmentation of the trabecular meshwork was observed (7). We describe the case of a patient im-

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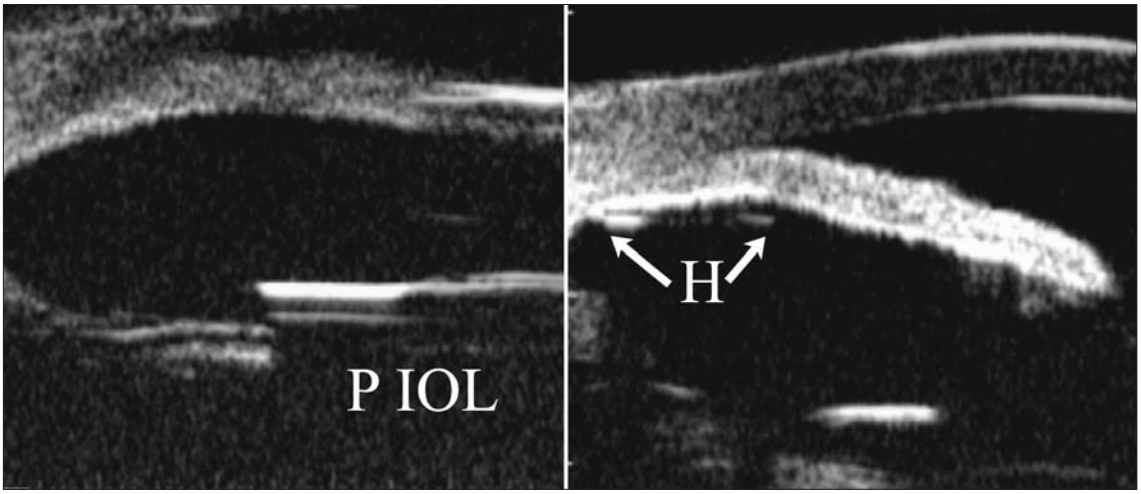

Fig. 1 - *Preoperative ultrasound biomicroscopy. Radial scans.* Right: *The anterior intraocular lens (IOL) haptic (H) is compressing the iris which is closing the angle completely. See the distance between both IOLs in the area we decided to insert the tube into the posterior chamber. P IOL = posterior IOL.*

planted with a piggyback IOL who developed glaucoma due to anterior chamber overcrowding and secondary angle closure.

Case report

A 75-year-old woman presented at the emergency department of our hospital with a painful and reddened right eye. Two years earlier, she had undergone cataract surgery on the right eye (OD) with the implant of a Corneal ACR6D SE IOL of power –10 D in the posterior chamber (axial length of this eye was 24.46 mm). The patient's subjective postsurgery refraction in this eye was –12.5 –1.5 ×60º, and the following month, a second IOL (Corneal ACR6D SE of +14 D) was piggybacked over the first IOL. After this second operation, the patient's best-corrected visual acuity (as determined using Snellen optotypes) was 0.5 (refraction 0.5 –2.5 ×80º). On presentation, biomicroscopy examination revealed perikeratic conjunctival hyperemia, corneal epithelial edema, and peripheral iridocorneal contact; IOP was 55 mmHg in the OD and 16 mmHg in the left eye (OS). Treatment was started with oral acetazolamide and topical timolol maleate (0.5%). When the corneal edema subsided, we observed severe anterior chamber overcrowding and areas of iris atrophy. The pupil was slightly displaced upwards and was nonreactive and mid-dilated; no synechiae between iris and anterior lens were observed. To deepen the anterior chamber, neodymium: YAG laser peripheral iridotomies were performed at sectors 24 and 20 hours of the iris periphery. This measure was unsuccessful and oral acetazolamide medication could not be withdrawn (IOP remained between 28 and 35 mmHg). A gonioscopy demonstrated full closure of the iridocorneal angle affecting the entire 360º. Ultrasound biomicroscopy (UBM) revealed a closed angle with synechiae in 360º as well as the presence of two IOLs: one in the capsular bag and the other, whose haptics were crossed, in the ciliary sulcus (Fig. 1). The space between the two lenses was approximately 1.390 µm and the anterior chamber depth 2300 µm. OS anterior chamber depth was 4300 µm (Pentacam, Oculus USA©). Reliable measures could not be obtained in the OD using Pentacam. Cell count was 750 cells/mm² OD and 2560 OS (SP. 2000P, Topcon USA©). The decision was made to undertake a trabeculectomy in the right eye. When we checked the mobility of the anterior lens during surgery, it was seen to be firmly attached to the sulcus. After an initial control period, IOP rose to 33 mmHg stabilizing at 30–34 mmHg with the maximal treatment regimen (oral acetazolamide 250 mg/8 h, topical timolol maleate 0.5%/12 h, and topical brimonidine tartrate/12 h). On examination of the eye, observations included a superior diffuse-plane bleb, an overcrowded anterior chamber, and a patent superior iridectomy. A gonioscopy demonstrated that the trabeculectomy was open. Two months after the trabeculectomy, the patient underwent surgery again and was implanted with an Ahmed valve. The valve's tube was placed between the two IOLs (Fig. 2) and the body of the valve in the superior temporal subconjunctival space. One month after the implant procedure, IOP in the OD was 10 mmHg. The patient has been followed since then, and at the last follow-up session in April 2006 she did not require hypotensive treatment; IOP was stable at around 10–12

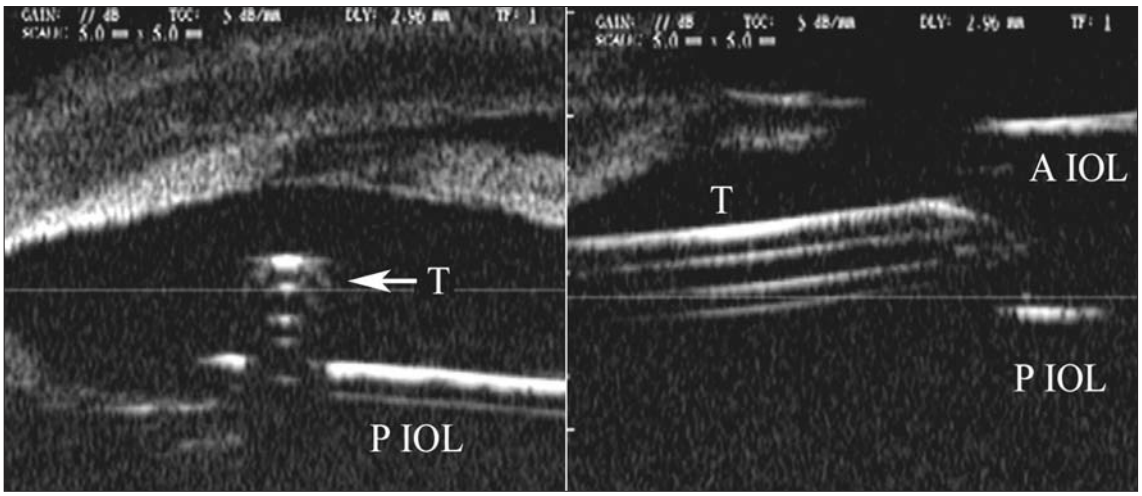

Fig. 2 - *Postoperative image. Note the valve tube placed between the two intraocular lenses.*

mmHg, best-corrected visual acuity was 0.4 (+0.5 –3.25 ×70°), and the endothelial cell count was 725 cells/mm² (all values for the right eye).

DISCUSSION

Despite continuous technological advances in cataract surgery, cases of postoperative refractive errors continue to arise. When this occurs, the surgeon has the options of replacing the inadequate IOL or undertaking corneal refractive surgery (1, 2, 7). If the decision is made to replace the IOL, calculating the precise power of the new IOL can be an arduous task since the power of the original IOL is sometimes not known and we cannot be certain that the new IOL will adopt a position in exactly the same plane as the previous lens. In addition, the removal of an IOL around whose haptics scar tissue has been laid down can be excessively traumatic for the eye (2). This last problem can be avoided by implanting the second IOL directly over the original IOL using the piggyback procedure. This method has worked well in most cases to correct pseudophakic refractive errors (1, 2) and so far it has also proved be relatively safe (2). However, there have been reports of certain inherent complications of the technique such as interlenticular opacification (3, 4) or capture of the IOL optics following pharmacologically induced mydriasis (5); to prevent the former, the capsulorhexis should be larger than the lens optic or alternatively, one IOL should be placed within the capsular bag and the other in the ciliary sulcus with their haptics crossed (in this case the rhexis size should be less than the optic diameter) (3, 4). Iwase et al reported two cases of glaucoma as complications of the piggyback implant method, in which the disease mechanism seemed to be the dispersion of pigment generated by the friction of the anterior IOL on the posterior surface of the iris; these authors also placed the anterior IOL in the sulcus (7). Chang et al described a similar case of glaucoma after placement of the anterior IOL in the sulcus (6). Interestingly, in each of these cases, the anterior IOL was an AcrySof, such that it was probably the sharp edge of this lens that provoked chafing of the iris (6, 7).

With regard to the IOL selected for sulcus implantation, we consider that a Corneal ACR6D SE is not a proper choice. Corneal ACR6D SE is a single piece, hydrophilic, open loop haptic, foldable IOL; its total diameter is 12 mm; we consider that a IOL with total diameter of 12.5 mm or more should be used for sulcus implantation to avoid decentration (8). Theoretically, the design of the AcrySof IOL could be a good option for sulcus implantation, with its open loop haptic design and 13 mm of total diameter; nevertheless, many publications have highlighted the danger of a secondary pigment dispersion syndrome related with the chafing between the iris and the sharp edge of this IOL when it is placed in the ciliari sulcus (6, 7) and even when inserted into the capsular bag (9). Considering the above, we believe that a three piece, open loop haptic could be a good option for sulcus implantation. Why a Corneal ACR6D SE was chosen remains unexplained.

The possibility of chronic glaucoma, caused by iritis induced by chafing between the lens and the iris, should also be considered in those cases; iritis could provoke a

chronic inflammatory glaucoma or an angle-closure glaucoma secondary to pupil blockade caused by synechiae formation between the anterior IOL and the iris (6, 7). Although we consider that a prophylactic iridectomy should be performed during the piggyback implantation in order to avoid pupil blockade, this measure was not undertaken in our patient. In our case, the physiopathologic mechanism generating the glaucoma was not pigment dispersion or inflammation but rather closure of the angle induced by the spatial restriction produced by the presence of two IOLs in the posterior chamber. Although we are unaware of the exact initial size of the anterior chamber, using the contralateral eye as reference and considering the large space between the two lenses, it can be deduced that the starting anterior chamber was probably sufficiently deep for the option of implanting a second IOL to have seemed reasonable. Notwithstanding, given the position adopted by the second lens, this lens should have been removed in the immediate postoperative period, before it caused severe endothelial damage and irreversible angular synechiae, as suggested by Holladay et al (10).

As a first measure in our patient, it was decided to undertake laser iridotomies to disrupt any possible blocking component (11) although this was not the physiopathologic mechanism suspected a priori. The non response to these iridotomies left us with two therapeutic options: trabeculectomy and/or explant of the anterior IOL. This latter measure was ruled out due to the existing angular synechiae, which could have led to irreversible angular damage (2, 7). In the first operation, the anterior IOL was observed to be firmly anchored. This finding along with the compromised anterior chamber size (that practically failed to expand using viscoelastic) and the existing endothelial damage led us to preclude the explant option and we subjected the eye to a trabeculectomy alone (12, 13). The ensuing failure of this surgery obliged us to consider further therapeutic options. Valve implant is a good option for the treatment of complex glaucoma (14), although in our patient the shallowness of the anterior chamber resulting from the displacement of the entire iridal plane induced by the second IOL prevented tube placement in the anterior chamber since this would have meant continuous contact between the tube and the corneal endothelium (15). UBM (16-18) allowed us to measure available space between the two IOLs, so we were able to consider the possibility of placing the tube in this space. This previously unreported option was in effect successful at controlling IOP with no considerable effects on the refraction or endothelial count of the eye. Our experience with this patient suggests that when confronted with severe anterior chamber overcrowding due to piggybacked posterior chamber IOLs, the first action should always be the timely removal of the second lens. Patients with piggyback implants should be regularly followed to avoid serious complications in the long term.

Proprietary interest: None.

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