

Clinical results of vitrectomy with the fixation of the intraocular lenses akreos AO60 to the sclera

Abstract

The weakness or absence of the ventricular apparatus of the lens leads to complications of cataract surgery, both during surgery and in the long term after the successful implantation of the intraocular lens (IOL) in the capsular bag.¹⁻³ The fixation of the posterior chamber intraocular lens to the sclera is used to correct aphakia in case of damage or absence of the ventricular lens apparatus. In combination with the posterior closed subtotal vitrectomy, the suture fixation of the IOL to the sclera has fundamentally different complications compared to other methods (IOL stitching to the iris, "iris-clip" lens, implantation of anterior chamber IOLs with fixation in the corner of the anterior chamber, pupillary fixation, anterior vitrectomy with fixation IOL into the ciliary furrow).²⁻⁷ Many methods of fixing the IOL to the sclera have been developed, and IOLs have been created with various designs of haptics for the convenience of these procedures.^{2,4,5,8} In our opinion, the most convenient way for attaching to the sclera is the Akreos AO60 IOL (B&L, USA). The presence of four haptic elements in the form of a loop, provides a stable position when locked in two opposing edges. A spherical optics allows the IOL to be decentralized within the pupil without distorting the image.

Keywords: dislocation of a lens, vitrectomy, suturing of IOL, phakofragmentation, cataract

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Aim and objective

The aim of our study was to analyse the clinical results of vitrectomy with the fixation of the intraocular lens Akreos AO60 to the sclera in the absence of a ventricular lens apparatus for the correction of aphakia.

Material and methods

Eyes of 45 people were observed when lining of the intraocular lenses Akreos AO60 (USA) to the sclera after a closed subtotal vitrectomy was performed. Indications for surgery were as follows: dislocation of a part of the lens nucleus during phacoemulsification of the cataract of 10 eyes, absence of capsular support for aphakia-15 eyes, disposition of the IOL (Akreos AO60)-9 eyes, lens dislocation in the vitreous body- 11 eyes (of which traumatic etiology-6 eye and dislocation due to pseudo exfoliative syndrome-5 eyes). In the case of the dislocation of lens fragments, the operation was performed immediately. With dislocation of the lens or IOL in the vitreous humor the operations were carried out at the time from 1 week to 3 months (median 2 weeks). The follow-up period averaged 9 months (from 2 months to 3 years). Calculation of the planned IOL was performed optically on the Lenstar ophthalmometer (Haag Strait, Switzerland), if transparency of optical media allowed, or A-scan (Quantel Medical, France) using an immersion chamber using standard IOL calculation schemes. The operations were performed on the Stellaris PC surgical system (USA), the instrument caliber-25G, under the operating microscope Carl Zeiss (Germany) using a contactless wide-angle system for visualization of the funds of BIOM3.

The course of the operation. After retro bulbar anaesthesia, the conjunctiva and submucosal were cut off from the limbus from 13 to 17 hours and from 20 to 23 hours. The irrigation cannula 25G was placed in the anterior chamber through paracentesis at 17 (left eye) or at 20 hours (right eye), sclerotomy 20G at 3 and 9 hours 2.5-3mm from the limbus. Subtotal vitrectomy was performed with the addition of phaco fragmentation of the lens if it was deemed necessary. Implantation of the IOL was carried out through a corneal tunnel incision of 2.0mm using a disposable injector. Through sclerotomy with tweezers 23G, alternating haptic elements were removed and tied to the proline 10-0 alternately and then submerged back into the vitreous cavity. Fixation of the IOL was carried out in the episclerian by performing a serpentine suture and forming nodes at its end. Sclerotomy was sutured with an 8-0-ring V-neck by an X-shaped suture, and immersion sutures on conjunctival incisions. The corneal incisions were hydro-adapted until a moderate hypertonia was obtained. Sub conjunctival injection of gentamicin and dexamethasone, ofloxacin ointment 0.3% and aseptic dressing were performed. In the postoperative period, patients received standard antibacterial and anti-inflammatory therapy for 1 month.

Results and discussion

There were no complications during the operations. In the early postoperative period, we observed the following: hypertension, hypotension, corneal edema and transient hemophthalmus. Data on the incidence of early postoperative complications are illustrated in Table 1. Intraocular pressure was compensated medically for all eyes by monotherapy with brimonidine-3 eyes (6.6%) or brimonidine in combination with timolol-2 eyes (4.4%). Transient hemophthalmus

resorbed within a week, and without any changes to the treatment regimen, visual functions were restored to normal. Ophthalmic hypertension was observed in 1 case-33.3% and hypotension in 2 cases-66.6%, $p>0.05$. Among the risk factors are diabetes, hypertension and long-term antiplatelet therapy. Hypotension was associated with the filtration of intraocular fluid through the main corneal incision however, this was corrected after the corneal incision was sutured. There was a decrease in endothelial cell density by 7% (2176 ± 59 cells/mm² before surgery, 2023 ± 69 cells/mm²-after surgery, $p0.05$), which corresponds to a loss after standard phacoemulsification. The two eyes which developed corneal edema had a low density of endothelial cells (1569 cells/mm² and 1647 cells/mm²) and cell loss was 15% (up to 1334 cells/mm²) and 16% (up to 1387 cells/mm²). Such a large loss of cells can be explained by aggressive parameters in the anterior chamber during the phacoemulsification of a very dense core, which also led to the rupture of the posterior capsule and the dislocation of fragments of the nucleus into the vitreous cavity. Data on complications observed late in the postoperative period (more than 1 year) are presented in Table 2.

Table 1 Early postoperative complications

No	Complications	Number of eyes and percentage
1	Hypertension	5(11,1%)
2	Transitional hemophthalmos	3(6,6%)
3	Hypotension	3(6,6%)
4	Corneal edema	2(4,4%)
5	Hyphema	1(2,2%)

Table 2 Late postoperative complications

No	Complications	Number of eyes and percentage
1	Regmatogenic retinal detachment	2(4,4%)
2	Cystic macular edema	4(8,8%)
3	Epiretinal fibrosis	2(4,4%)

In 1 year after the operation, IOP was stabilized in all eyes. In two eyes, a rheumatogenic detachment of the retina developed in view of the insufficiently complete removal of the vitreous on the

periphery of the retina and insufficient laser coagulation of peripheral degenerations during vitrectomy. It should be noted that one of the eyes had a dislocation of the capsule-IOL complex in the vitreous body due to trauma. On the second eye which had corneal edema. The operation performed after phacoemulsification made it difficult to work at the periphery, despite the de-epithelialization of the cornea. These patients underwent a revision of the vitreous cavity with a tamponade with silicone oil of 5700 cSt. Six months after the removal of the silicone oil, the visual functions of the eye had been restored. Cystic macular edema (Irvine-Gass syndrome) was observed in 4 eyes, which appeared 3-6 months after the operation (on average 3.7 ± 0.8). It was stopped by anti-inflammatory therapy with nepafenac (1 drop 3 times a day for 1 month). In one eye, the edema had remained. Intravitreal administration of triamcinolone 0.05ml was carried out, after which within 1 month the retina architecture had returned to its normal thickness value (from $345\mu\text{m}$ to $214\mu\text{m}$). The development of the epiretinal membrane was observed in 2 eyes. These patients have type 2 diabetes. Since the visual acuity remained stable, there was no indication for surgical treatment. Patients underwent monthly monitoring of the vitreomacular interface status using optical coherence tomography. The position of the IOL remained stable during the entire follow-up period, the optical part of the lens was within the normal pupil, but on medial mydriasis, we noted some IOL-based decentralization in 5 eyes (11.1%), which did not affect the functional results. The functional and refractive result was assessed separately by groups. Data for the maximum correlated visual acuity (ICD) and corneal astigmatism before and 1 year after surgery are shown in Table 3.

For all eyes, there was a significant increase in the maximum corrected visual acuity a month after the operation. One year after the operation, these functions remained stable or somewhat improved. Changes in corneal astigmatism tended to strengthen the vertical meridian, but they did not have statistical significance ($p>0.05$). However in the group where phacofragmentation of the lens dislocated into the vitreous was performed, a 37% increase in horizontal meridian refraction was statistically significant ($p<0.05$). In our opinion, this is due to the protracted work of the fragmatome and the heating of the sclerotomy, which required a stronger tension of the scleral suture to seal the sclerotomy. At 40 eyes (88.9%) visual acuity without correction was more than 0.8, visual acuity without correction 1.0- was observed in 36 eyes (80%).

Table 3 Functional and refractive results 1 year after surgery

No	Group	Number of eyes, n	MKO ₃ before surgery	MKO3 one year after surgery	Corneal astigmatism before surgery, dioptr	Corneal astigmatism after surgery, dioptr
1	Nucleus dislocation during FEC	10	$0,13\pm 0,04$	$0,94\pm 0,05$	$0,67\pm 0,12$	$0,7\pm 0,06$
2	Aphakia	15	$0,81\pm 0,08$	$0,91\pm 0,09$	$0,65\pm 0,09$	$0,69\pm 0,06$
3	Lens dislocation	9	$0,53\pm 0,15$	$0,84\pm 0,13$	$0,59\pm 0,11$	$0,81\pm 0,07$
4	IOL dislocation	11	$0,57\pm 0,23$	$0,83\pm 0,11$	$0,71\pm 0,14$	$0,72\pm 0,03$

Conclusion

Vitrectomy with the fixation of the intraocular lens Akreos AO60 to the sclera is an effective and relatively safe technique for correcting aphakia in the absence of capsular support or weakness of the ventricular lens apparatus. It is necessary to take into account the nature of early and late postoperative complications. Prevention of such complications should also be taken into consideration. High functional results make it possible to recommend a posterior closed vitreo-/vitrolensectomy with the suture fixation of the Akreos AO60 IOL in case of severe lens subluxations as primary to prevent damage to the endothelium of the cornea by high-energy parameters in the anterior chamber. Visual control and the maximum possible elimination of vitreoretinal tracts during surgery reduces the risk of severe postoperative complications which are characteristic of other methods used to correct aphakia.

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Conflict of interest

The author declares no conflict of interest.

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