

Intrascleral-fixated intraocular lenses for aphakic correction in the absence of capsular support

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PURPOSE. *To present results of experience with the authors' technique for intrascleral fixation of intraocular lenses for the correction of aphakia in the absence of capsular support.*

METHODS. *Eleven patients (four children and seven adults) underwent surgery with the use of the method proposed by the authors (11 operations). The patients ranged in age from 11 to 75 years. The equatorial remnants in the lower segment of the capsular bag were revealed in 5 patients (45.5%). Absence of the capsular bag was observed in 6 patients (54.5%).*

RESULTS. *During long-term follow-up evaluation, visual acuity without correction (mean 0.33 ± 0.05) corresponded to the preoperative corrected one. Better visual acuity outcome of 0.41 ± 0.06 was achieved with added correction. With intrascleral fixation, a mean refractive error of 1.48 ± 0.39 D should be taken into account when calculating intraocular lens power with use of the SRK II formula.*

CONCLUSIONS. *The results indicate that posterior chamber intraocular lens implantation with intrascleral fixation of haptics is a safe and effective technique for aphakic correction in the absence of capsular support and the presence of its defects. The technique used in the present study offers safety and stability of the intraocular lens position. (Eur J Ophthalmol 2007; 17: 714-9)*

KEY WORDS. *Aphakia, Intrascleral fixation, Intraocular lens*

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INTRODUCTION

The most widely used method of intraocular lens (IOL) implantation in the absence of the lens capsule or the presence of lenticular defects is scleral fixation. To perform this procedure, a variety of surgical modifications are applied. They differ in several aspects, including the method of suture use, IOL fixation meridian, various lens types, foldable IOLs, and number of fixation sites (1-10).

Scleral fixated IOLs are associated with specific complications, including vitreous and anterior chamber hemorrhages, tilt and decentration of the IOL, suture protruding through the conjunctiva, and late endophthalmitis. IOL dislocation during long-term follow-up is one of the most serious complications caused by transscleral suture con-

dition due to its loosening or shifting off the haptic, natural biodestruction of the sutures, suture protruding through the sclera, or trauma (11-14).

The aim of the current study was to evaluate results of the authors' technique for IOL intrascleral fixation for the correction of aphakia in the absence of capsular support (RF Patent invention no. 2268690 of 27.01.2006).

PATIENTS AND METHODS

Data were obtained from 11 patients (4 children and 7 adults) aged 11 to 75 years. Two patients had a history of scleral-fixated posterior chamber IOL implantation. However, long-term follow-up study showed IOL dislocation (Tab. I).

TABLE I - VISUAL ACUITY DYNAMICS

Patient		Preoperative visual acuity		Visual acuity at discharge		Long-term results of visual acuity	
		Without correction	With correction	Without correction	With correction	Without correction	With correction
1	II IOL	0.02	0.4	0.5	0.5	0.6	0.7
2	II IOL	0.01	0.6	0.2	0.3	0.3	0.6
3	II IOL	0.01	0.1	0.2	0.2	0.2	0.3
4	DE IOL	0.04	0.1	0.1	0.1	0.1	0.2
5	II IOL	0.02	0.5	0.2	0.3	0.4	0.5
6	DE IOL	0.15	0.15	0.2	0.3	0.3	0.3
7	II IOL	0.04	0.5	0.2	0.2	0.5	0.6
8	II IOL	0.02	0.1	0.1	0.2	0.2	0.2
9	II IOL	0.01	0.2	0.1	0.1	0.2	0.3
10	II IOL	0.04	0.3	0.3	0.4	0.3	0.4
11	II IOL	0.01	0.5	0.4	0.5	0.5	0.5
Mean ± SD		0.03±0.01	0.34±0.05	0.23±0.04	0.28±0.04	0.33±0.05	0.41±0.05

II IOL = Secondary intraocular lens implantation in aphakic eye; DE IOL = IOL Dislocation elimination with scleral fixation

Equatorial remnants in the lower segment of the capsular bag were revealed in 5 patients (45.5%). Capsular bag absence was seen in 6 patients (54%). Accompanying ocular pathology was observed in 6 patients. Iridocorneal fusion due to prior injury or cataract extraction surgery was revealed in 3 cases (27.3%). One patient (9.1%) had iridovitreal synechia. Vitreous body destruction was detected in one case. One female patient had undergone surgery for primary open-angle glaucoma prior to cataract extraction. Her intraocular pressure returned to the normal range. In one child with IOL dislocation, secondary glaucoma was compensated after topical hypotensive therapy.

Surgical technique

In children, surgery was performed under general anesthesia; in the adult population, local anesthesia was used. A corneal tunnel incision was made in the upper segment. A 7-mm conjunctival incision was made in the upper and lower segments along the limbus and was then separated towards the equator. After coagulation of episcleral vessels, scleral flaps of approximately 6 × 3 mm with their base in the limbus direction were prepared on ½ of scleral thickness (Fig. 1).

The consecutive 2.0-2.5 mm incisions of sclera and vascular membrane in the ciliary sulcus projection parallel to the limbus were performed in the scleral bed

1 mm from the posterior surgical limbus and 0.5-1.0 mm from the left wall of the scleral bed in the upper segment and from the right wall in the lower segment (Fig. 2).

Two polypropylene sutures at the V-shaped pusher tip were passed through the scleral and vascular membrane incisions parallel to the iris posterior portion until they reached the pupillary space. Using forceps, the sutures were then pulled out through the corneal tunnel incision and tied to the IOL haptics. The IOL was placed into the posterior chamber and while pulling the loop, haptics were in turn withdrawn on the scleral bed surface and fixated to the proper sclera with two 8-0 sutures. A 8-0 suture was placed on the scleral incisions in the ciliary sulcus projection (Fig. 3). The surface scleral flaps were inserted into their proper position and fixed using three 8-0 sutures. The sutures were placed on the conjunctiva. The corneal tunnel incision was closed with a single 10-0 nylon suture (Figs. 4-8).

RESULTS

In two patients (2 eyes), both haptics were pulled out on the scleral bed surface and fixated in scleral layers. In nine patients (9 eyes), intrascleral fixation of one haptic was performed. In seven cases, the second haptic was fixated in iridociliary sulcus using transscleral suture. In two cases, it was placed on equatorial remnants in the lower segment of the capsular bag. The postoperative fol-

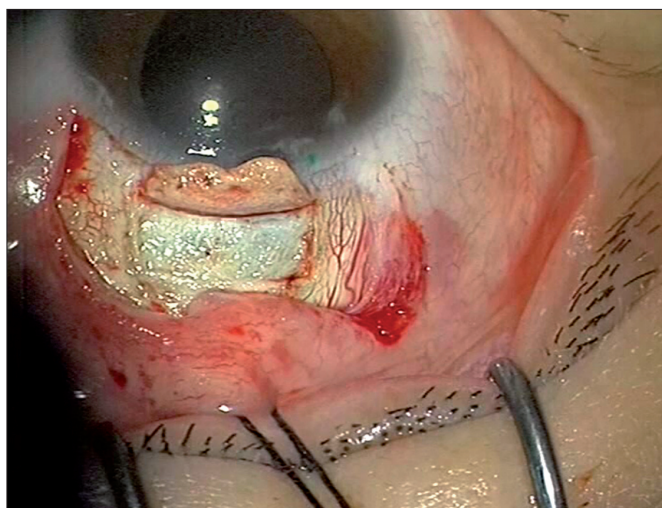


Fig. 1 - Formation of the superficial scleral flap.

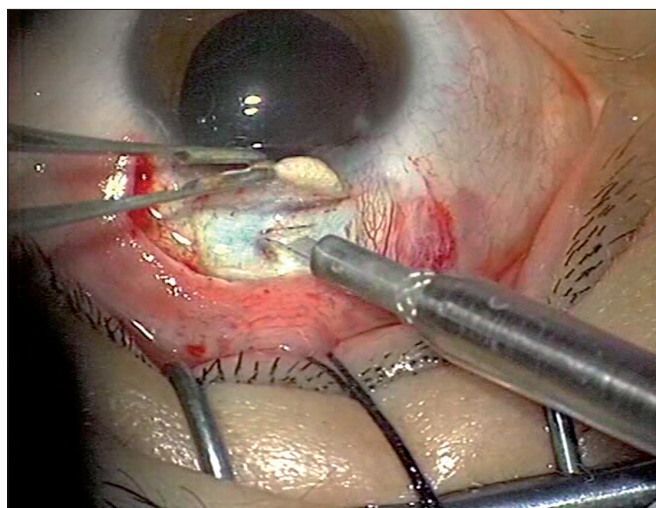


Fig. 2 - Incision of sclera and vascular membrane in ciliary sulcus projection.

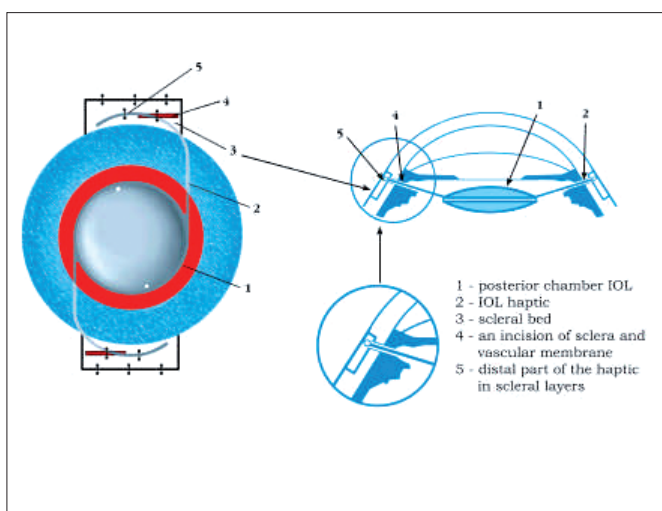


Fig. 3 - Intraocular lens implantation with intrascleral fixation of both haptics.

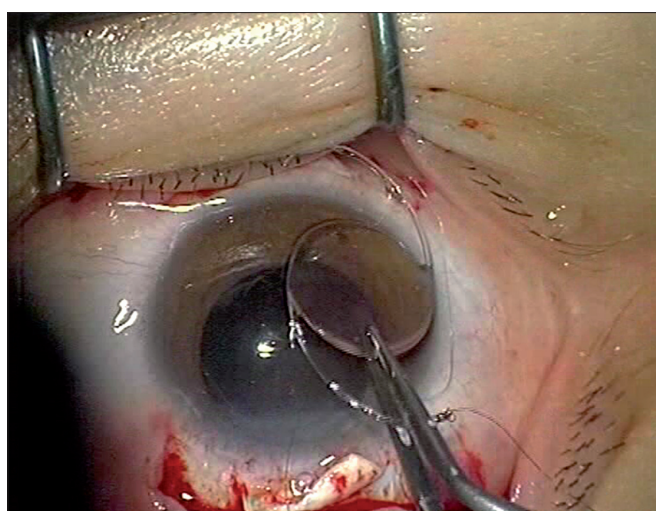


Fig. 4 - Using forceps, the sutures are pulled out from the eye and tied to the intraocular lens haptic.

low-up showed that intrascleral fixation of one haptic alone offers IOL fixation stability.

Intrascleral fixation of IOL haptic like scleral fixation evidently can be performed not only in vertical but horizontal and oblique meridians. However, vertical meridian surgery is the preferred technique (Fig. 9).

Complications

With surgical intervention, vitreous body prolapse into the anterior chamber was observed in two patients (18.2%). The complication was eliminated using anterior vitrectomy

and did not affect the duration of postoperative course. In two cases (18.2%), blood leakage from scleral vessels into the eyeball cavity through incisions of deep scleral layers and vascular membrane occurred. Seven to 10 days postoperatively, there was evidence of complete resorption of blood after conservative treatment. In the early postoperative period, inflammatory reaction is the most common complication. In four cases (36.4%), inflammatory reaction in the form of moderately marked eyeball irritation, corneal edema, slight hyperemia and iris edema, and poor light perception of the pupil was observed.

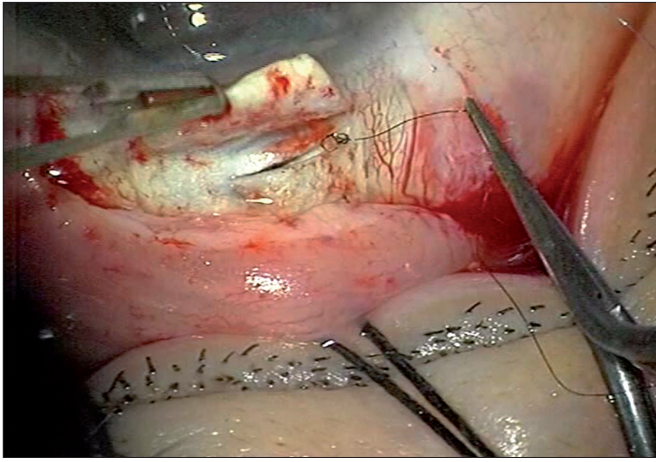


Fig. 5 - Pulling the loop, the haptic was withdrawn on the scleral bed.

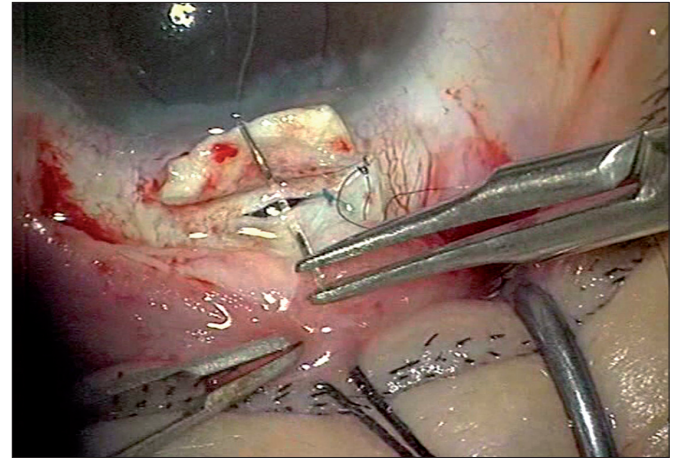


Fig. 6 - The haptic is fixated to the proper sclera with two sutures.

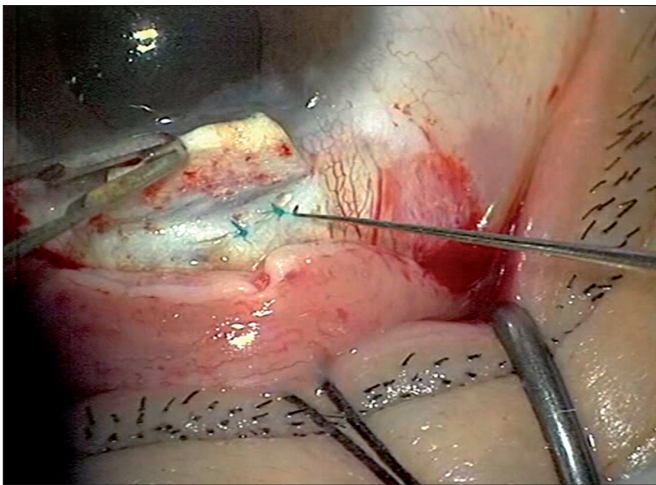


Fig. 7 - At close of the haptic fixation procedure.

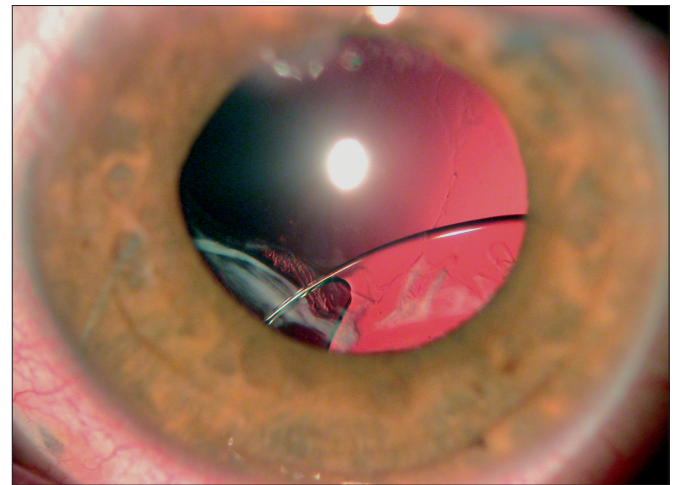


Fig. 8 - The eye of 25-year-old Patient Z. Dislocation of scleral-fixed posterior chamber intraocular lens.

With surgical intervention for the ciliary body trauma, such reaction seems to be natural. Iridocyclitis signs disappeared shortly after anti-inflammatory therapy. At 7 and 8 postoperative days, the absence of clinical signs was noted in all patients. Slight injection of the eyeball was marked, corneal and vitreous transparency was restored. In one adolescent (9.1%) with posttraumatic aphakia, an increase in intraocular pressure was observed in the early postoperative period. At 2 weeks postoperatively, it returned to normal levels following hypotensive treatment. In two patients (18.2%) corneal edema was observed postop-

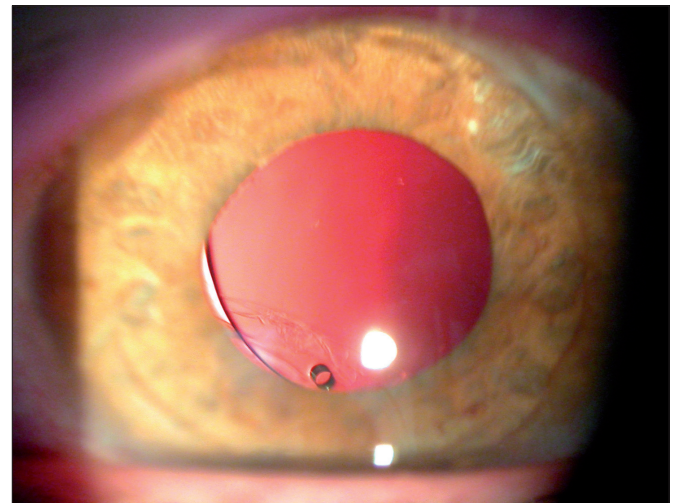


Fig. 9 - The same eye after 1 year and 3 months following intraocular lens dislocation elimination with intrascleral fixation of the upper haptic.

TABLE II - RESULTS OF REFRACTION MEASUREMENTS (D)

Patient	Parameter of research						Anisometropia level
	Operated eye refraction			Fellow eye refraction			
	Sphere	Cylinder	SE	Sphere	Cylinder	SE	
1	0.5	-2.5	-0.75	-2.0	-0.5	-2.25	1.5
2	-1.75	-2.0	-1.75	0.5	0	0.5	2.25
3	1.5	-5.0	-1	0.25	0.75	0.5	1.5
4	0.75	-5.0	-1.75	0.25	-1.5	-0.5	1.5
5	0.5	-3.5	-1.25	-0.75	-0.5	-1.0	0.25
6	1.25	0.75	1.5	1.75	0.5	2.0	0.5
7	-1.25	-3.25	-2.75	-1.5	-1.5	-2.25	0.5
8	-0.75	-2.5	-2.0	-0.5	-0.5	-0.75	1.25
9	-0.5	-4.5	-2.75	-0.25	-0.5	-0.5	2.25
10	-1.25	-3.5	-3.0	-4.0	-1.5	-4.75	1.75
11	1.0	-3.5	-0.75	-2.0	-0.5	-2.25	1.5

SE = Spherical equivalent of refraction

eratively. This complication might be attributable to previous operations and most likely to the surgical intervention duration. In both cases, corneal transparency was restored between the seventh and ninth postoperative days. Patients were followed up for 4 to 28 months (mean 18.6±2.8 months). The IOL position and visual acuity of all patients were stable.

Visual acuity

The dynamics of visual acuity in patients with IOL intrascleral fixation are presented in Table I. Preoperative corrected visual acuity ranged from 0.1 to 0.6 (mean 0.34±0.05). At the time of discharge, visual acuity with and without correction did not achieve its preoperative level with correction and was a mean of 0.23±0.04 and 0.28±0.04, respectively. Long-term results of all patients were studied over 4 to 28 months. The mean follow-up time was 18.6±2.8 months. Long-term follow-up showed that mean visual acuity without correction corresponded to the preoperative corrected one of 0.33±0.05. With added correction, visual acuity was better and achieved 0.41±0.06. With intrascleral fixation, IOL optic power for emmetropia was calculated using the SRK II formula. During long-term follow-up evaluation, refraction of the eyes operated on was compared to that of the fellow eyes. The refractive error was evaluated in terms of refraction spheric equivalent of the pseudophakic eye and anisometropia level (Tab. II).

Long-term follow-up evaluation showed that weak myopic refraction ranging from -0.75 to 3.0 D (mean -1.48±0.38 D) was obtained. Anisometropia level ranged from 0.5 to 2.25 D (mean 1.34±0.20 D).

Myopic refraction shift typical of various methods of iridociliary sulcus-fixated IOL implantation appears to be

appropriate for IOL intrascleral fixation. With intrascleral fixation, a mean refractive error of 1.48±0.38 D should be taken into account when calculating IOL power with the use of the SRK II formula.

CONCLUSIONS

From these data, the authors conclude that posterior chamber IOL implantation with intrascleral fixation of haptics is a safe and effective technique for aphakia correction in the absence of capsular support and the presence of its defects. The present technique offers safety and stability of the IOL position.

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