Original Article

Scleral fixation of one piece intraocular lens by injector implantation

Ertuğrul Can, Reşat Başaran, Adem Gül, Hakkı Birinci

Aim of Study: With an ab-interno technique of transscleral suturing of current one-piece posterior chamber intraocular lenses (PC IOLs) by injector implantation in the absence of capsular support, we aimed to demonstrate the possibility of the implantation of one-piece acrylic PC IOLs that might be produced in the future for only scleral fixation through small clear corneal incision. **Materials and Methods:** Case report and literature review. **Results:** This procedure has been performed in eight aphakic eyes with four different types of IOLs. Good centration was achieved with minimal technical effort. All patients had well-centered and stable lenses postoperatively during 9-18 months follow-up. **Conclusion:** We managed to decrease the risks of surgical trauma and intricate surgical maneuvers requirement. With this technique, excessive fluid leakage and consecutive hypotony can be minimized.

Key words: Capsular, dehiscence, foldable intraocular lens, injector implantation, scleral fixation

Video available on www.ijo.in

Access this article online

Website: www.ijo.in

DOI: 10.4103/0301-4738.141042

Quick Response Code:

Introduction

In case of contact lens or spectacle correction is not tolerated in aphakic patients, implantation of a secondary intraocular lens (IOL) would be the best choice available. Currently, open-loop anterior chamber, iris-sutured posterior chamber (PC) and scleral sutured PC IOLs are favored options in the literature.[1] There several three-piece and one-piece PC IOLs which are designed for implantation in PC or ciliary sulcus in case of the existence of anterior and posterior capsular support. These IOLs are fixated to the sclera with various surgical techniques although they are not indicated for scleral fixation. Currently, there is not any one-piece foldable scleral PC IOL designed only for scleral fixation.

We describe an ab interno technique of secondary PC IOL implantation with scleral fixation in the absence of capsular support. A one-piece acrylic hydrophilic PC IOL was implanted through 2, 4 mm clear corneal incision. Although there are several techniques to fixate the three-piece PC IOL, which are not produced for scleral fixation, we aimed to demonstrate the possibility of the scleral fixation of one-piece PC IOL through a small clear corneal incision in a simple way. Considering the absence of such a PC IOL, we hope that this study would create an idea for designing a new one-piece acrylic foldable PC IOL for scleral fixation.

Materials and Methods

After a 10/0 looped polypropylene suture (PC-9; Alcon) end was grasped with a micro forceps and threaded into the IOL cartridge, suture end was tied to the leading haptic of one-piece acrylic IOL with a hitch-cow knot by threading the needle and the cartridge into the end of the suture. The IOL was then inserted into the cartridge with leading haptic tied with the suture extending through the cartridge. The needle was passed through the tip of injector and then IOL was loaded [Fig. 1]. After two conjunctival peritomies were created 180° apart (from 2 to 4 o'clock and from 8 to 10 o'clock), the needle introduced into the anterior chamber through the main incision and then passed through the sclera (from inside to outside) 1-1, 5 mm posterior to the corneal limbus at the 9-0'clock position parallel to the back side of the iris. Then the leading haptic and the optic were inserted into the eye through the 2, 4 mm clear corneal incision site using the injector. Trailing haptic was left outside the eye intentionally and secured with the other 10/0 looped polypropylene suture with hitch-cow knot. The needle was passed through the sclera 1-1, 5 mm posterior to the corneal limbus at the 3-0'clock position parallel to the back side of the iris and IOL was inserted into the PC [Fig. 2; Video 1]. After IOL centration and tension were adjusted, each polypropylene suture was tied to the sclera. Suture knots were left long and were buried under the conjunctiva.

Results

This procedure has been performed in eight aphakic eyes with the lack of anterior or posterior capsular support resulting from with four different types of IOLs. Eyes having anterior capsular support or partially posterior capsular support which are sufficient to support the PC IOL were operated with different surgical techniques and they were not included in this study. Two were AcrySof SA60T (Alcon, Fort Worth, TX, USA), one was Acriva UD 613 IOL (VSY Biotechnologies, İstanbul, Turkey,), three were Acriva UDB 625 IOLs (VSY Biotechnologies, İstanbul, Turkey) and two were Acriva Reviol MFB 625 multifocal IOL (VSY Biotechnologies, İstanbul,

Department of Ophthalmology, Faculty of Medicine, Ondokuz Mayıs University, Samsun, Turkey

Correspondence to: Dr. Ertuğrul Can, Department of Ophthalmology, Faculty of Medicine, Ondokuz Mayıs University 55139, Samsun, Turkey. E-mail: ertugrulcan73@hotmail.com

Manuscript received: 01.02.14; Revision accepted: 23.06.14

Turkey). One eye had partial aniridia, one eye had traumatic iris sphincter damage with partial iris loss and one eye had total aniridia due to previous traumas and surgeries [Fig. 3]. Except one vitreous hemorrhage, intraoperative course was uneventful. There was no significant postoperative inflammation or severe postoperative complications such as retinal detachment or endophthalmitis during the 9-16 months follow-up period. Vitreous hemorrhage was resolved in the following weeks. Good centralization was obtained in all but one eye (Acriva UD 613) in which decentralization was observed 2 months after surgery [Fig. 4]. Visual recovery was limited in all patients with underlying amblyopia and vitreoretinal diseases. Two Acriva Reviol MFB 625 multifocal IOLs were implanted in eyes of a 9-year-old girl who had undergone bilateral pars plana lensectomy 2 years before. Her preoperative uncorrected distance visual acuity of 20/400 for both right and left eyes improved to uncorrected distance visual acuity of 20/25 for right eye and 20/40 for left eye. Her postoperative near visual acuity was 20/20 [Fig. 5].

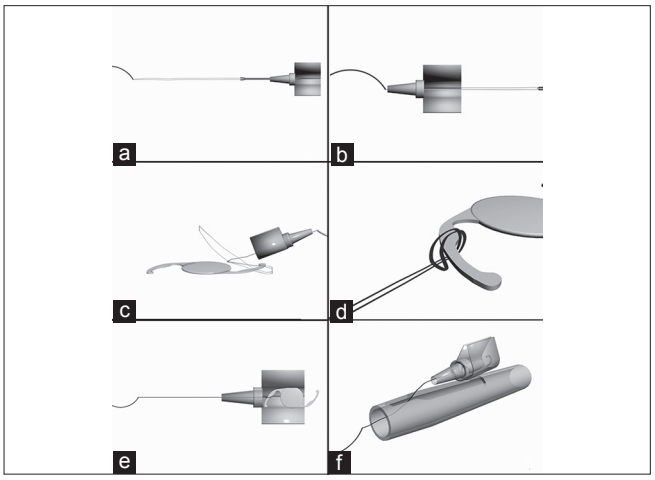

Figure 1: Illustration of preparation and loading of the intraocular lense (IOL). (a and b) A 10/0 looped polypropylene suture end was grasped with a micro forceps and threaded into the IOL cartridge. (c and d) The needle and the cartridge together were threaded into the end of the suture and thus a hitch-cow knot was formed at the leading haptic of IOL. (e and f) The IOL was inserted into the cartridge and the needle was passed through the tip of injector and then IOL was loaded

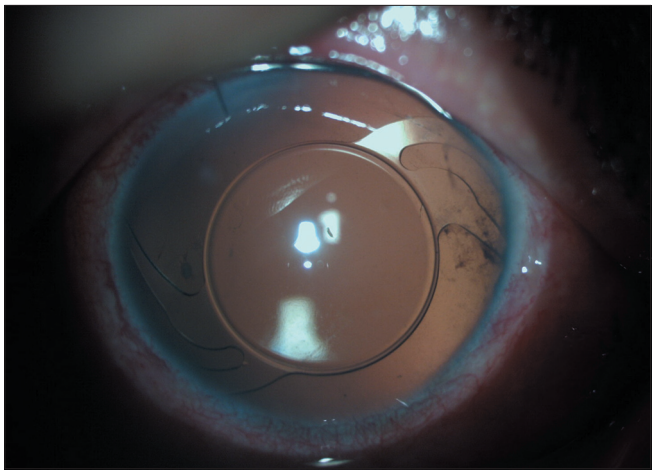

Figure 3: Perfect centralization and stability was achieved after scleral fixation of the intraocular lense in a patient with total aniridia due to previous trauma

Discussion

Since scleral fixation of polymethyl methacrylate (PMMA) IOLs in the absence of capsule support requires large incisions (at least 6.0 mm), foldable IOLs for suture fixation through a small incision have recently been used by many surgeons.[2-8] Although it is possible to insert foldable IOL through small incision, one can hardly insert it under 4 mm incision using folding forceps. However, implantation with folding forceps may cause suture tangling, wrinkling of the cornea or endothelial damage during implantation because simultaneous insertion of forceps and IOL is not as easy as it is pronounced unless the incision is not widened.

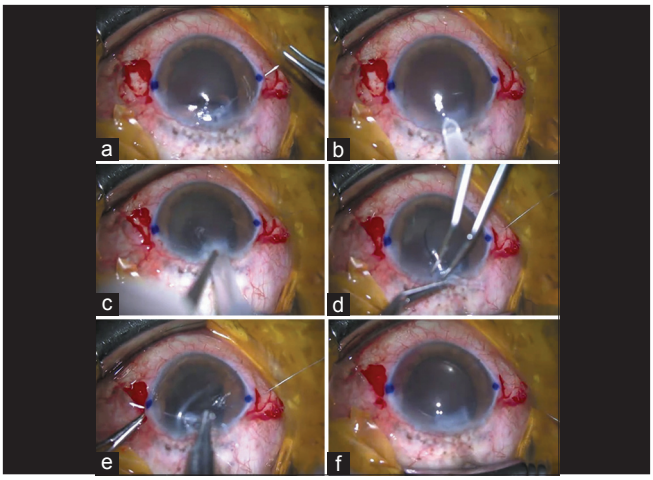

Figure 2: Injection and implantation of the intraocular lense (IOL). (a-c): The needle was passed through the sclera 1-1, 5 mm posterior to the limbus at the 3-0'clock position and the leading haptic and the optic were inserted into the eye through the 2, 4 mm clear corneal incision site. (d) Trailing haptic was left outside intentionally and tied with the other 10/0 looped polypropylene suture with hitch-cow knot. (e and f) The needle was passed through the sclera 1-1, 5 mm posterior to the corneal limbus at the 9-0'clock position parallel to the back side of the iris and IOL was inserted into the posterior chamber

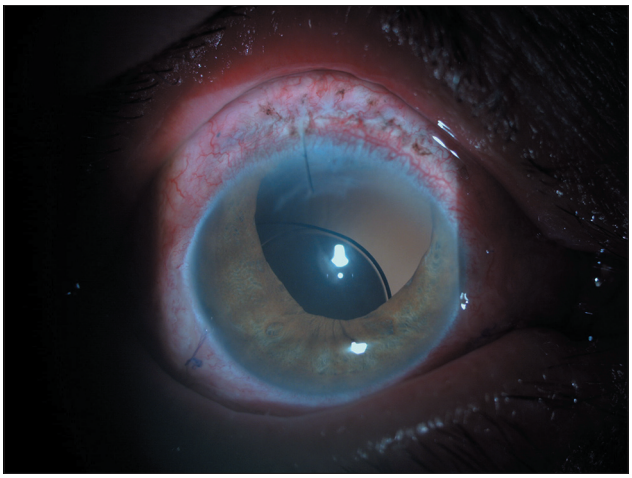

Figure 4: Intraocular lense decentralization was observed in one eye (Acriva UD 613) 2 months after surgery due to its haptic configuration

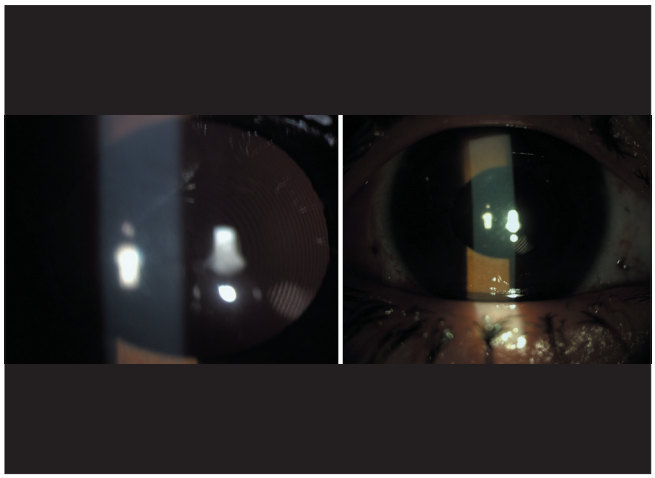

Figure 5: Scleral fixated multifocal intraocular lense in a 9-year-old girl. Maintenance of excellent centration was seen 14 months after the operation

Szurman *et al*. presented the first technique that introduces injector implantation in transscleral IOL suturing.[9] Then, transscleral fixation by injector implantation of foldable IOLs has been gaining popularity by other surgeons.[10-12] Since a significant part of the investigations in cataract surgery has been related to a decrease in incision size, minimizing the incision even in transscleral fixation of IOL is an important goal for surgeons.

Scleral fixation of a foldable IOL reduces operating time and maintains superior, anterior chamber stability. A smaller incision and lack of suture reduce postoperative astigmatism. Using a relatively closed system compared to the previous PMMA IOL method avoids intraoperative hypotony and minimizes the complications such as suprachoroidal hemorrhage and cystoids macular edema. Small incision also minimizes the postoperative inflammation and allows a rapid visual rehabilitation.

However, scleral fixated PC IOLs have some disadvantages. Incorrect placement of the suture may cause lens tilting, vitreous hemorrhage and retinal detachment.[13-15] Erosion of the suture through the conjunctiva may cause endophthalmitis and breakage of the suture may cause dislocation of the IOL.[16,17] Despite these disadvantages, current conditions do not present us a better choice. Other choices such as thick eye glasses (for bilateral aphakia) or contact lens use may be considered as alternative choices for the expectations of the patients.

We present herein our first experience with injector implantation of pre-tied foldable IOL for scleral fixation. This technique has been performed in eight aphakic eyes with four different IOLs. In one operation, Acriva UD 613 IOL (VSY Biotechnologies) was implanted. Although perfect centralization was achieved after surgery, lens decentralization had occurred 2 months later. The lack of eyelets or any haptic indentation or any specific haptic configuration leaded to suture slippage and IOL decentration. Then, we implanted two AcrySof SA60T (Alcon, Fort Worth, TX, USA), three Acriva UDB 625 IOLs (VSY Biotechnologies), and two Acriva Reviol MFB 625 multifocal IOL (VSY Biotechnologies) in other aphakic eyes. Acrysof SA60T IOL has a drop-shaped knob at each tip of the haptics that allows stable suture ties. Acriva UDB 625 and Acriva Reviol MFB 625 multifocal IOL have closed loop haptics and broad haptic-optic junctions that provide good stability for scleral fixation. The sutures were tied to distal ends of the haptics of both the IOLs. As the tension was adjusted to center the IOL, distal ends of the haptics did not allow suture slippage. Furthermore, soft haptics of the IOLs adjusted to the shape of the ciliary sulcus easily. Our personal experience showed that other foldable IOLs such as AF-1VA65BB IOL (Hoya Corp., Tokyo, Japan) and C-flex and Super-flex (Rayner, Hove, UK) are also suitable for this technique.

Scleral fixation of foldable IOL by injector implantation was recently reported with various modifications. Szurman *et al*. and Choi *et al*. used ab externo technique and tied 10/0 polypropylene suture to the leading haptic of foldable IOL after the leading haptic was exposed a few mm ahead from the tip of injector.[9,10] In their technique, adjusting the amount of haptic extension would sometimes be difficult, and implantation of the IOL can be challenging due to excessive extension when one-piece IOL is used. Kim *et al*. described their technique in which haptics were externalized through two adjacent corneal incisions and tied with 10/0 polypropylene suture with ab externo needle passing.[12] Their modified technique is a safe and effective but is time consuming. Furthermore, externalizing the haptics of one-piece acrylic IOLs can be technically challenging. The technique by Kim *et al*. has a lot in common with our technique.[11] They threaded 10/0 prolene suture through the injector and tied at the proximal portion of the leading haptic and loaded the IOL into the injector.

A few changes are observed in our procedure. First, we used hitch-cow knot to secure the haptics with 10/0 looped polypropylene suture. This knot can easily slip on the haptics at the time of tension adjusting after insertion of the IOL in PC and enables the sutures to be placed at opposite sides uniformly. Second, a looped suture can also serve to aid in tying the suture to the sclera with its two separate strands. Third, we used ab interno suturing technique unlike the techniques described before. Although ab externo suturing is more popular for its entry point with predictable sulcus positioning, it is still undertaken blindly because intraocular exit point of the needle is unseen. By dilating the pupil largely, passing the needle from inside to outside and predicting the exit point of the needle can be more predictable with ab interno technique. Furthermore, in ab externo technique, 26-gauge needle is generally used to pass the sclera that functions as a guide and its thickness (0, 404 mm) is approximately twice the thickness of the needle (0, 23 mm) used in our surgery. So, it is potentially more traumatic for sclera and ciliary sulcus. The ab interno technique is quicker and easier, and surgeon can decrease the likelihood of complications. But as ab interno is also a blind process, it has some potential risks due to the sharp tip of the needle when passing through the sclera. Transscleral IOL fixation has some risks and complications such as IOL decentration, tilt, suture breakage, vitreous hemorrhage and endophthalmitis. Except IOL decentration and tilt, our procedure has the same risk factors that can be seen in all sutured sclera fixated IOL surgeries, and these are the limitation of our procedure. With specific haptic configurations of the lenses we used, distal ends of the haptics did not allow suture slippage and the IOL is fixed uniformly

with sutered at the opposite sides. This situation enables the IOL to be safe in place without decentration and tilt.

We tied to the leading haptic of one-piece acrylic IOL with a hitch-cow suture by threading the needle and cartridge into the end of the suture. Leading haptic might be tied to the suture directly but in case of a closed loop haptic or haptic with eyelet is used, it is impossible to make a hitch-cow suture with looped polypropylene suture having a partially circle shape needle.

Surgical treatment of aphakia with one-piece IOL may be complicated by some factors caused by limited design of the lens such as lack of haptic angulation, bulky haptics and sharp square edges of both haptic and optic. This condition might increase the risk of posterior iris touch and consequently iris pigment dispersion glaucoma or iris atrophy. Even so, other implant types such as iris suturing or iris enclavation may also cause these complications.[1]

Based on our experience, we hope to provide ophthalmic surgeons a simple and effective technique for secondary implantation of one-piece IOL transsclerally through a small incision. This incision can be minimized to a length as smaller as 2, 0 even 1, 8 mm depending on the type of the lens. Complicated cataract surgery, where in-the-bag IOL implantation or sulcus fixation is impossible, can be converted to transscleral suturing of the lens without secondary enlargement of clear corneal incision. Currently, there is not any foldable PC IOL has been designed only for scleral fixation. We hope that this study will inspire the investigators to design a one-piece foldable PC IOL for the implantation in case of the absence of capsular support.

References

1. Wagoner MD, Cox TA, Ariyasu RG, Jacobs DS, Karp CL, American Academy of Ophthalmology. Intraocular lens implantation in the absence of capsular support: A report by the American Academy of Ophthalmology. Ophthalmology 2003;110:840-59.
2. Regillo CD, Tidwell J. A small-incision technique for suturing a posterior chamber intraocular lens. Ophthalmic Surg Lasers 1996;27:473-5.
3. Ahn JK, Yu HG, Chung H, Wee WR, Lee JH. Transscleral fixation of a foldable intraocular lens in aphakic vitrectomized eyes. J Cataract Refract Surg 2003;29:2390-6.
4. Kaynak S, Ozbek Z, Pasa E, Oner FH, Cingil G. Transscleral fixation of foldable intraocular lenses. J Cataract Refract Surg 2004;30:854-7.
5. Michaeli-Cohen A, Rootman DS. Scleral fixation of a foldable intraocular lens. Ophthalmic Surg Lasers 2002;33:257-9.
6. Yaguchi S, Yaguchi S, Noda Y, Taguchi Y, Negishi K, Tsubota K. Foldable acrylic intraocular lens with distended haptics for transscleral fixation. J Cataract Refract Surg 2009;35:2047-50.
7. Mutoh T, Matsumoto Y, Chikuda M. Scleral fixation of foldable acrylic intraocular lenses in aphakic post-vitrectomy eyes. Clin Ophthalmol 2010;5:17-21.
8. Jacobi PC, Dietlein TS, Jacobi FK. Scleral fixation of secondary foldable multifocal intraocular lens implants in children and young adults. Ophthalmology 2002;109:2315-24.
9. Szurman P, Petermeier K, Jaissle GB, Bartz-Schmidt KU. A new small-incision technique for injector implantation of transsclerally sutured foldable lenses. Ophthalmic Surg Lasers Imaging 2007;38:76-80.
10. Choi KS, Park SY, Sun HJ. Transscleral fixation by injector implantation of a foldable intraocular lens. Ophthalmic Surg Lasers Imaging 2010;41:272-5.
11. Kim SJ, Lee SJ, Park CH, Jung GY, Park SH. Long-term stability and visual outcomes of a single-piece, foldable, acrylic intraocular lens for scleral fixation. Retina 2009;29:91-7.
12. Kim DH, Heo JW, Hwang SW, Lee JH, Chung H. Modified transscleral fixation using combined temporary haptic externalization and injector intraocular lens implantation. J Cataract Refract Surg 2010;36:707-11.
13. Loya N, Lichter H, Barash D, Goldenberg-Cohen N, Strassmann E, Weinberger D. Posterior chamber intraocular lens implantation after capsular tear: Ultrasound biomicroscopy evaluation. J Cataract Refract Surg 2001;27:1423-7.
14. Durak A, Oner HF, Koçak N, Kaynak S. Tilt and decentration after primary and secondary transsclerally sutured posterior chamber intraocular lens implantation. J Cataract Refract Surg 2001;27:227-32.
15. Lee JG, Lee JH, Chung H. Factors contributing to retinal detachment after transscleral fixation of posterior chamber intraocular lenses. J Cataract Refract Surg 1998;24:697-702.
16. Cahane M, Chen V, Avni I. Dislocation of a scleral-fixated, posterior chamber intraocular lens after fixation suture removal. J Cataract Refract Surg 1994;20:186-7.
17. Heilskov T, Joondeph BC, Olsen KR, Blankenship GW. Late endophthalmitis after transscleral fixation of a posterior chamber intraocular lens. Arch Ophthalmol 1989;107:1427.

Cite this article as: Can E, Basaran R, Gul A, Birinci H. Scleral fixation of one piece intraocular lens by injector implantation. Indian J Ophthalmol 2014;62:857-60.

Source of Support: Nil. **Conflict of Interest:** No author has a financial or proprietary interest in any material or method mentioned.