Original Article

Evaluation of pars plana sclera fixation of posterior chamber intraocular lens

Fangju Han, Wei Liu, Xiangwei Shu, Ruili Tan, Qiang Ji, Xiangjuan Zhai

Purpose: The purpose of this study was to evaluate the clinical efficacy and safety of modified posterior chamber intraocular lens (PCIOL) implantation with transscleral fixation. **Design and Setting:** This is a study, which is conducted at Department of Ophthalmology, Jinan Eye Hospital, Jinan Second People's Hospital. **Materials and Methods:** A total of 82 patients who were scheduled for sutured PCIOL were divided randomly into modified and conventional groups. The former underwent PCIOL through pars plana fixation with knot buried and without scleral flap and the latter underwent transscleral fixation of PCIOL in the ciliary sulcus. The main outcome measures included operative time, postoperative visual acuity, and postoperative complications. **Results:** The mean operative time of the modified group was 39.95 ± 5.87 min, which was significantly less than that of the conventional group (45.77 ± 5.21 min; $P < 0.05$). No difference was found in postoperative visual acuity between the two groups. There were no significant postoperative complications, including knot exposure, endophthalmitis, and retinal detachment in either group. The optical clamping of PCIOL was prone to occur in the conventional group. **Conclusion:** Modified sutured PCIOL implantation is a safe, effective, and feasible technique for the correction of aphakia in eyes without adequate posterior capsular support.

Access this article online

Website: www.ijo.in

DOI: 10.4103/0301-4738.126987

Quick Response Code:

Key words: Intraocular lens, non-sclera flap, transscleral pars plana suture fixation

Lack of capsular support and loss of zonules in some special cases can lead to the failure of posterior chamber intraocular lens (PCIOL) implantation. The PCIOL implantation with the suture fixation remains the first choice for most surgeons.[1] Usually, a scleral flap is made and the IOL is fixed through ciliary sulcus. We modified the operation for conventional PCIOL implantation through ciliary sulcus fixation by simplifying the operation steps, burying the knot of pars plana-fixed PCIOL, and removing the scleral flap.

Materials and Methods

Patients

A total of −82 patients who were scheduled for sutured PCIOL in the Department of Ophthalmology of Jinan Eye Hospital from January 2006 to January 2011 were enrolled in the study and divided randomly into two groups. Forty-four patients including 24 males and 20 females with a mean age of 48.2 ± 16.5 years old were in the modified group, and 38 patients including 21 males and 17 females with a mean age of 50.1 ± 14.7 years old were in the conventional group.

Methods

Patients with complete or partial peripheral posterior capsular defects which are hard to support IOL were enrolled in this study. The inclusion criteria included no retinal detachment, and the best corrected vision acuity (BCVA) above 0.1. Patients in the modified group underwent PCIOL through pars plana fixation with knot buried and without scleral flap.

Department of Ophthalmology, Jinan Eye Hospital, Jinan Second People's Hospital, Shandong Province, China

Correspondence to: Prof. Ji Qiang, Department of Ophthalmology, Jinan Eye Hospital, Jinan Second People's Hospital, No. 148, Jing 1 Road, Jinan 250 001, Shandong Province, China. E-mail: jiqiang2005@hotmail.com

Manuscript received: 13.03.13; Revision accepted: 15.09.13

Mydriasis was performed with 0.5% tropicamide 1 h prior to surgery. After retrobulbar anesthesia, conjunctival incision was performed, and then a scleral tunnel was made 1.5 mm posterior to the limbus at 12 o'clock position, extending 1 mm into clear cornea. The scleral puncture, 3 mm from the corneal limbus, was made with a 20° needle knife (size 1.5 mm) at the 3 and 9 o'clock position, respectively, after conjunctival incision was performed. A 1-mL syringe needle was then administered to the pupillary area through a puncture at the 3 o'clock position, the suture needle (suspensory IOL double-armed needles with 10-0 polypropylene suture, needle 1/4 Circle Side Cutting, IOL CZ70BB, USA, Alcon) was inserted into the syringe needle from the top limbus tunnel, and exited the 1-mL syringe needle at the same time the suture needle was then guided through the scleral puncture. The same method was used to derive another suture needle at the 9 o'clock position. To prevent future stretch or proliferation caused by IOL eccentric transposition or peripheral retinal breaks, we performed the anterior vitrectomy before placing the IOL in all cases. A 10-0 polypropylene suture was fixed in the two holes of IOL haptics, and the IOL was then implanted from the top scleral tunnel, with particular attention to adjusting the IOL in the center. When IOL was fixed, the suture needle was passed from the scleral puncture and the incision depth remained one-half the thickness of the sclera. When the needle was away from the sclera by 1 mm, the suture needle was removed. The needle was then passed 1 mm from the scleral incision on the opposite side at 1/2 depth of the sclera, and removed from the scleral incision. The suture was adjusted to the proper position and tied in a knot. In short, the needle entered into the sclera from the inner surface of scleral incision and left the sclera from the offside of the incision. The whole suture knot was buried into the inner incision. The same sutures were used on the other side [Fig. 1].

Patients in the conventional group underwent scleral-fixated PCIOL implantation by ciliary sulcus suture fixation. Two

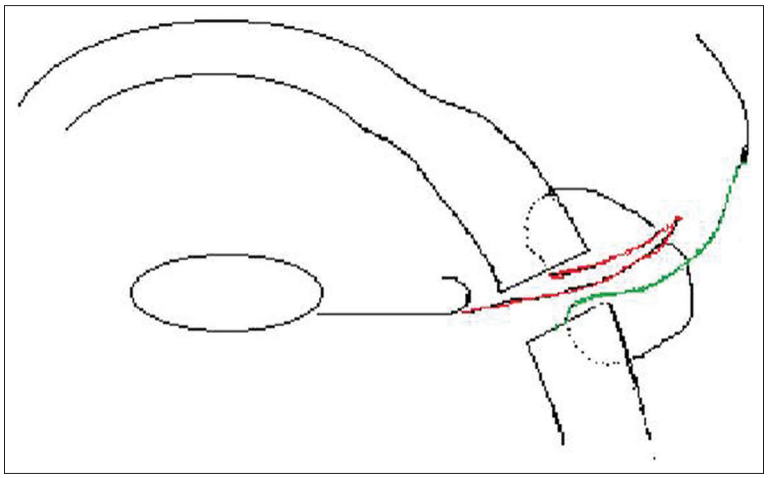

Figure 1: The suture was adjusted to the proper position and tied in a knot (red and green suture). The knot was buried into the inner incision

triangle scleral flaps with 3 mm bottom and the tip pointing the limbus were made at the 3 and 9 o'clock position, respectively. A 1-mL syringe needle was punctured into the pupillary area through the scleral bed under the lamellar scleral flap at the 3 o'clock position. The remaining procedures were performed according to the above-mentioned steps of the modified group. After making sure that the IOL was in the proper position, the suture needle was administered to the lamellar sclera. The knot was fixed under the scleral flap. Scleral flaps at the 3 and 9 o'clock positions were sutured and the knot was buried into the sclera.

We calculated the IOL degree using the SRK/T formula when the axial length was greater than 26 mm and using the SRKII formula when it was <26 mm. The IOL power was generally chosen much more than one diopter than that of the ciliary sulcus fixed IOL.

Statistical analyses

A comparison of posterior visual acuity between two groups was assessed using a Chi-square test. The comparison of operative time between the two groups was analyzed using an independent *t*-test. All data were analyzed using SPSS 11.5 statistical software.

Results

The patients in the modified group included 15 lens luxation patients (in which seven cases had a clear trauma history and two cases had Marfan syndrome), 12 traumatic patients who underwent cataract extraction and vitrectomy, 6 patients who had intracapsular cataract extraction and anterior vitrectomy, 6 patients who had intracapsular cataract extraction, and 5 patients of IOL dislocation. The patients in the conventional group included 11 cases of lens dislocation, 10 cases that had cataract extraction and vitrectomy, 8 cases that had intracapsular cataract extraction and anterior vitrectomy, 4 cases that had intracapsular cataract extraction, and 5 cases of IOL dislocation. All operations were performed by one surgeon. The general information of these patients was listed in Table 1.

All cases were followed up for 12-60 months. Tables 2 and 3 summarized the changes in preoperative and postoperative

Table 1: General inormation of patients recruited in this study

	Conventional group (*n*=38)	Modified group (*n*=44)
Mean age (years) at surgery	50.1±14.7	48.2±16.5
Male	21	24
Female	17	20
Cause of transscleral PCIOL fixation		
Aphakic	22	24
Dislocated IOL	5	5
Dislocation	11	15

PCIOL: Posterior chamber intraocular lens, IOL: Intraocular lens

Table 2: Comparison of preoperative and postoperative best corrected visual acuity of patients in the modified group

BCVA	Uncorrected visual acuity before surgery (*n*)	BCVA before surgery (*n*)	BCVA after surgery (*n*)
>0.6	0	6	6
0.4-0.6	3	22	25
0.1-0.3	18	16	13
<0.1	23	0	0

BCVA: Best corrected visual acuity

Table 3: Comparison of preoperative and postoperative best corrected visual acuity of patients in the conventional group

BCVA	Uncorrected visual acuity before surgery (*n*)	BCVA before surgery (*n*)	BCVA after surgery (*n*)
>0.6	0	5	5
0.4-0.6	2	20	19
0.1-0.3	16	13	14
<0.1	20	0	0

BCVA: Best corrected visual acuity

visual acuity. All patients except one patient in the conventional group had worsening of the BCVA improved in visual acuity following surgery. The Chi-square test showed that there was no significant difference in the rate of final visual acuity >0.3 between the two groups ($\chi^2 = 0.4916$, $P = 0.6379$).

The mean operation time was 39.95 ± 5.87 min in the modified group and 45.77 ± 5.21 min in the conventional group. There was a statistically significant difference in operation time between the two groups ($t = 3.48$, $P < 0.01$).

The postoperative mean spherical equivalent diopter was − 1.01 ± 0.76 D in the conventional group and − 1.24 ± 1.50 D in the modified group. The difference was not statistically significant between the two groups ($t = 0.8547$, $P > 0.05$).

No intraoperative complications were found in either group. Postoperative complications included hyphema (three cases in each group) which was completely absorbed following conservative treatment, corneal edema (five cases in the conventional group and six cases in the modified group) which was quickly transparent after medication, IOL mild eccentric transposition (mean decentration was 0.85 mm, three cases in the conventional group and two cases in the modified group), and IOL optic pupillary capture (three cases and subluxation in one case of the conventional group which performed the second operation to adjust the IOL position and no IOL optic pupillary capture and subluxation in the modified group). Corticosteroid therapy improved the cystoid macular edema in two cases in the conventional group and three cases in the modified group. No suture exposed, postoperative endophthalmitis or retinal detachment was found in either group.

Discussion

In the absence of capsular support, the IOL could be implanted into the anterior chamber or sewn into the posterior chamber sulcus. It was reported that the IOL position did not influence postoperative BCVA.[2] However, because of the significant long-term postoperative complications such as corneal endothelial decompensation, secondary glaucoma, and pupillary ectopia occurring in the patients who have undergone anterior chamber IOL implantation, PCIOL implantation is a more optimal choice in eyes without capsular support.[3-5] It has been shown that sulcus fixated IOL implantation is well tolerated and widely used.[6,7] However, because of the inconsistency of distance from the ciliary groove to the corneal limbus in each direction, in most cases, the surgeon cannot look straight into the ciliary sulcus for stitching. Therefore, it is difficult for suturing precisely at the ciliary sulcus.[1,8]

In this study, we found that pupillary capture of the IOL optic occurred more frequently in the conventional group, so we hypothesize that the ciliary sulcus might not be the optimal fixation position of PCIOL. In the modified group, we punctured the sclera at the pars plana, 3 mm behind the limbus, no scleral flap, and the knot was buried into the scleral puncture incision. The advantages of the modified fixation include the difficulty in damaging the ciliary crown and positioning is relatively easy. Therefore, the two loops in the PCIOL can be symmetrically fixed. The operation time will be shortened accordingly by reducing steps of making sclera flap and sutured scleral flap. Compared with fixation in the ciliary sulcus of PCIOL implantation, the location of PCIOL fixed in the pars plana is relatively behind, so the IOL power is generally chosen much more than one diopter than that of the ciliary sulcus fixed IOL. Another study also compared clinical efficacy between ciliary sulcus and pars plana fixation of PCIOL and showed that no significant difference of postoperative visual acuity and corneal endothelial counts between two operative techniques, but the spherical equivalent difference, IOL dislocation, and optical pupil capture were more common in the ciliary sulcus fixation group.[9] In summary, this modified operation simplified the procedures, reduced the operation time, and obtained satisfactory clinical efficacy.

We also found that scleral incisions located at the 3 and 9 o'clock positions were not an absolute contraindication, because it was easier to fix the loops of IOL at these two positions and no ciliary artery injury occurred when scleral incisions were performed at these two positions, with special emphasis on maintaining normal intraocular pressure during the operation. Some measurements should be taken to keep the normal intraocular pressure. For example, balanced salt solution could be injected into the anterior and posterior chamber. If ligating the sutures when intraocular pressure was too low, the ciliary blood supply would be influenced and the IOL loops-induced stimulation on ciliary body would be increased. As a result, it is necessary to clean up the anterior vitreous, exudative membrane, and organized membrane to prevent the future IOL dislocation induced by pulling.

In summary, modified sutured PCIOL implantation not only simplifies the operation steps, and reduces operation time and operation-related complications, but also makes PCIOL fixation more accurate and improves postoperative visual acuity. Modified sutured PCIOL implantation is a safe, effective, and feasible technique for correction in eyes without adequate posterior capsular support, which deserves widely clinical application.

What is known?

Posterior chamber is the ideal place for intraocular lens (IOL) implantation because of its rightness of the physical location of lens and the posterior chamber IOL implantation with the suture fixation remains the first choice for most operators. Usually, a sclera flap is made and the IOL is fixed through ciliary sulcus. When making the sclera flap, operating with the left hand is relatively difficult and time-consuming. An often time the thin scleral bed may be damaged by the knot and dislocation of IOL occurs. In addition, the two loops of IOL are hard to precisely fix in the ciliary sulcus due to the inconsistency of distance from ciliary groove to limbal.

What this paper adds

We modified the operation for conventional posterior chamber IOL implantation through ciliary sulcus fixation with knot buried and without sclera flap. The operative steps and postoperative compilations in the modified group were significantly less than those of the conventional group.

References

1. Pavlin CJ, Rootman D, Arshinoff S, Harasiewicz K, Foster FS. Determination of haptic position of transsclerally fixated posterior

chamber intraocular lenses by ultrasound biomicroscopy. J Cataract Refract Surg 1993;19:573-7.

2. Evereklioglu C, Er H, Bekir NA, Borazan M, Zorlu F. Comparison of secondary implantation of flexible open-loop anterior chamber and scleral-fixated posterior chamber intraocular lenses. J Cataract Refract Surg 2003;29:301-8.
3. Epley KD, Shainberg MJ, Lueder GT, Tychsen L. Pediatric secondary lens implantation in the absence of capsular support. J AAPOS 2001;5:301-6.
4. Mandal AK, Bagga H. Pupillary block glaucoma following implantation of a posterior chamber pseudophakos in the anterior chamber. Indian J Ophthalmol 2002;50:54-6.
5. Hiles DA. Peripheral iris erosions associated with pediatric intraocular lens implants. J Am Intraocul Implant Soc 1979;5:210-2.
6. Trivedi RH, Wilson ME Jr, Facciani J. Secondary intraocular lens implantation for pediatric aphakia. J AAPOS 2005;9:346-52.
7. DeVaro JM, Buckley EG, Awner S, Seaber J. Secondary posterior chamber intraocular lens implantation in pediatric patients. Am J Ophthalmol 1997;123:24-30.
8. Manabe S, Oh H, Amino K, Hata N, Yamakawa R. Ultrasound biomicroscopic analysis of posterior chamber intraocular lenses with transscleral sulcus suture. Ophthalmology 2000;107:2172-8.
9. Ma DJ, Choi HJ, Kim MK, Wee WR. Clinical comparison of ciliary sulcus and pars plana locations for posterior chamber intraocular lens transscleral fixation. J Cataract Refract Surg 2011;37:1439-46.

Cite this article as: Han F, Liu W, Shu X, Tan R, Ji Q, Zhai X. Evaluation of pars plana sclera fixation of posterior chamber intraocular lens. Indian J Ophthalmol 2014;62:688-91.

Source of Support: Nil. **Conflict of Interest:**None declared..