



Secondary Implantation of Scleral Fixated Intraocular Lenses without Scleral Flap Technique

การผ่าตัดใส่เลนส์แก้วตาเทียมในช่องหลังม่านตาโดยเทคนิค Scleral Fixated Intraocular Lenses without Scleral Flap

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Abstract

The purposes of this study was to evaluate the outcome of secondary implantation of scleral fixated posterior chamber intraocular lenses (PC IOL) without scleral flap technique. This retrospective study comprised 10 consecutive patients: 5 intraocular lens (IOL) dislocation, 2 trauma with posterior capsule injury, 1 subluxated crystalline lens and 2 posterior capsular rupture during cataract. All patients had secondary implantation of a PC IOL with scleral fixated PC IOL without scleral flap technique between 2012 – 2015. The surgical technique was performed according to the described procedure. The postoperative outcomes, safety, and complication rates were analyzed, and the preoperative and postoperative best corrected visual acuities (BCVAs) were compared.

The results of this study included 10 eyes of 10 patients. There were 6 male and 4 female patients. The patients' age ranged from 43 to 86 years, with a mean of 69.3 years. The preoperative best corrected visual acuity (BCVA) ranged from 20/50 to counting fingers 1 ft, and the postoperative BCVA ranged from 20/20 to 5/200. The length of follow-up period ranged from 8 to 50 months, with a mean of 24.3 months. The scleral suture fixation-related early and late complications included 1 transient raise of intraocular pressure, 1 uveitis, 1 tilted IOL and 1 epiretinal membrane.

A scleral fixated posterior chamber intraocular lens without scleral flap technique is an easy, safe and effective way to achieve secondary IOL implantation with good visual outcomes.

Keywords : scleral fixation, scleral flap, posterior chamber intraocular lens, sclerotomy

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บทคัดย่อ

การศึกษานี้มีวัตถุประสงค์เพื่อนำเสนอวิธีการผ่าตัดและศึกษาผลของการผ่าตัดใส่เลนส์แก้วตาเทียมในช่องหลังม่านตาโดยเทคนิค scleral fixated intraocular lenses without scleral flap โดยเป็นการศึกษาย้อนหลังจากเวชระเบียนและประวัติการผ่าตัดของผู้ป่วย ซึ่งได้รับการผ่าตัดใส่เลนส์แก้วตาเทียมในช่องหลังม่านตาโดยวิธีดังกล่าว จำนวน 10 ราย โดยมีสาเหตุต่างๆ ดังนี้ เลนส์แก้วตาเทียมเคลื่อน 5 ราย อุบัติเหตุ 2 ราย เลนส์แก้วตาเคลื่อน 1 ราย และข้อแทรกซ้อนจากการผ่าตัดต้อกระจกและไม่สามารถใส่เลนส์แก้วตาเทียมได้ 2 ราย โดยเก็บข้อมูลในช่วงปี ค.ศ.2012-2015 ผู้ป่วยได้รับการประเมินระดับสายตาทั้งก่อนและหลังผ่าตัด ความปลอดภัย และข้อแทรกซ้อนจากการผ่าตัด

ผลการศึกษา พบว่า ผู้ป่วยจำนวน 10 ราย เป็นชาย 6 ราย หญิง 4 ราย ได้รับการผ่าตัดด้วยวิธีดังกล่าว อยู่ในช่วงอายุ 43-86 ปี (ค่าเฉลี่ย 69.3 ปี) ระดับสายตา ก่อนผ่าตัดที่เห็นดีที่สุดอยู่ในช่วง 20/50 ถึงนับนิ้วมีระยะ 1 ฟุต และหลังผ่าตัดอยู่ในช่วง 20/20 ถึง 5/200 ระยะเวลาดิตตามการรักษาอยู่ในช่วง 8-50 เดือน (ค่าเฉลี่ย 24.3 เดือน) ภาวะแทรกซ้อนที่พบทั้งระยะแรกและระยะหลังผ่าตัด ได้แก่ transient raise of intraocular pressure (1 ตา) uveitis (1 ตา) tilted IOL (1 ตา) และ epiretinal membrane (1 ตา)

เทคนิคการผ่าตัดนี้ มีข้อดีคือ ทำง่าย ปลอดภัย และช่วยให้การผ่าตัด scleral fixation of the IOL บรรลุเป้าหมายพร้อมกับได้ระดับการมองเห็นที่ดี

คำสำคัญ : การผ่าตัด เลนส์แก้วตาเทียม ช่องหลังม่านตา

Introduction

The lens is a nearly transparent structure that sits behind the iris, which is the colored part of the eye that expands and contracts depending on the amount of light that reaches it.¹ The absence of the lens of the eye is known as *aphakia*. Usually it is due to surgical removal of a cataract, rarely traumatic (total dislocation of crystalline lens), or very rarely congenital.²

Aphakia can be corrected with glasses, contact lens, or intraocular lens implantation. Aphakic glasses can only be used if the condition affects both eyes, and there are several disadvantages for those who use them, most notably a higher than normal magnification, a considerable decrease in field of vision, and the cosmetically unacceptable appearance of the thick lenses, which magnify the eyes.



Intraocular lens implantation has been accepted as the standard of care for the treatment of aphakia. In the absence of capsular support, anterior chamber lenses have been used in the past. Unfortunately, these lenses result in complications such as uveitis-glaucoma-hyphaema (UGH) syndrome which is commonly reported following intraocular lens (IOL) implantation in the anterior chamber.³ The other options for secondary intraocular lens implantation in aphakic eye was reported since 1988, Hu⁴ and Stark⁵ raised the technique of implantation of PC IOL by suture fixation in the absence of zonular and capsular support that is the conventional technique for scleral fixated IOL implantation and is a safe procedure^{6,7,8}

Techniques for scleral fixation include *ab interno* methods,^{7,9} in which the suture is passed from the inside of the eye to the external surface, and *ab externo* methods, in which the suture is initially passed from the external surface.^{10,11} All techniques need to cover, or rotate the knot created for fixation so epithelial downgrowth¹² or infection¹³ are less likely to develop.

The researcher describes a variation of scleral fixation PC IOL technique that uses a scleral incision that can be completed in less time than a conventional scleral flap technique and prevents unnecessary trauma to the eye. A double-armed, 10-0 Polyethylene terephthalate (MERSILENE[®]) suture loop is introduced into the eye through sclerotomies using a 17 mm, 1/2 circle taper point needle (Ethicon[®]). The free ends of the 10-0 polyethylene suture are buried between the 2 edges of the scleral incision

Objective of This Study

To evaluate the outcome of secondary implantation of scleral fixated posterior chamber intraocular lenses (PC IOL) without scleral flap technique.

Materials and Methods

This retrospective study was conducted on 10 eyes of 10 patients who underwent scleral fixation of PC IOL in the absence of capsular support by a single surgeon between January 2012 and December 2015 at the department of ophthalmology, Police General Hospital. The outpatient medical records and operative notes of all patients were reviewed according to age, gender, preoperative best corrected visual acuity (BCVA), postoperative BCVA, follow-up period and reported complications.

Prior to the operation, the power of PC IOL of all patients to be implanted was calculated with SRK formula aiming for emmetropia.

Surgical Technique

A fornix-based conjunctival flap was made from the 2:00 to the 9:00 position, along with another small limbal peritomies overlying the region for scleral incision at the 5:00 position. Bleeding was checked and applied light bipolar cautery to achieve hemostasis. The superior scleral tunnel was created with a 2.3 mm, angled, bevel up crescent knife (#8065990002 Alcon®) from the 10:00 to the 2:00 position and placed 2.0 mm posterior to the surgical limbus. The tunnel was extended to the limbus without penetrating the anterior chamber, and 1.00 mm paracentesis is made at the 7:00 position for placement of an anterior chamber maintainer, which was inserted and opened for infusion of balanced salt solution. Two sclerotomies was placed at the 11:00 and 5:00 position, 2.0 mm posterior to the limbus, using a 20G myringovitreoretinal (MVR) blade (Alcon®). The 2.75 mm. keratome was inserted in the tunnel at 12:00 position until it reached the clear cornea beyond the vascular arcade. The keratome was then slowly advanced in this posterior direction, creating an internal corneal lip as it entered the anterior chamber. Figure 1.

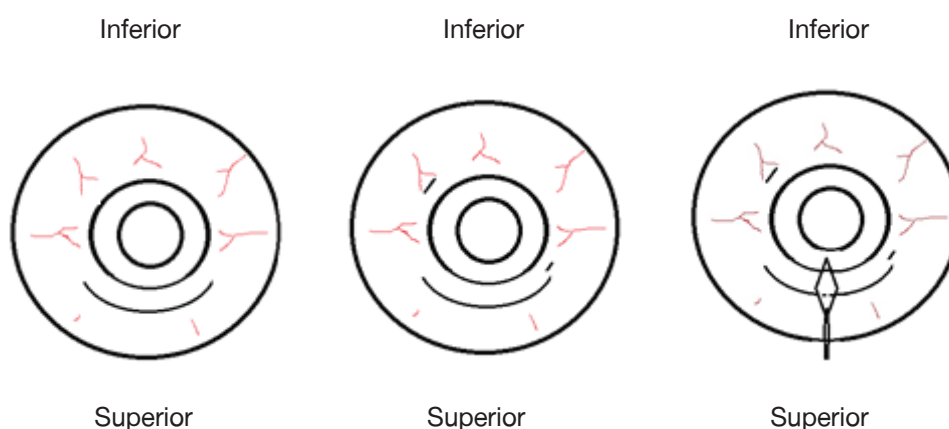


Figure 1. The superior scleral tunnel and two sclerotomy positions.

The 17 mm, $\frac{1}{2}$ circle taper point needle (Ethicon®) was grasped in the tip of the needle holder about $\frac{1}{3}$ of the way back from the point with the tip pointing upward. A double-armed, 10-0 Polyethylene terephthalate (MERSILENE®) suture loop was inserted into the hollow in a 17 mm, $\frac{1}{2}$ circle taper point needle (Ethicon®). Figure 2.



Figure 2. 10-0 polyethylene suture loop was inserted into the hollow in a 17 mm, $\frac{1}{2}$ circle taper point needle. Grasped in the tip of the needle holder about $\frac{1}{3}$ of the way back from the point with the tip pointing upward.

Swaged end of the needle attached with 10-0 polyethylene suture loop was introduced once through a sclerotomy at 5:00 position, behind the inferior iris, through the pupil. A sinskey hook was inserted through 12:00 keratotomy position to pull the loop of the suture from the eye. The looped 10-0 polyethylene suture was passed through and tied the inferior haptic eyelet of PC IOL. The opposite site sclerotomy was done in the same fashion. And the second 10-0 polyethylene suture was tied to the superior haptic eyelet of PC IOL. Figure 3

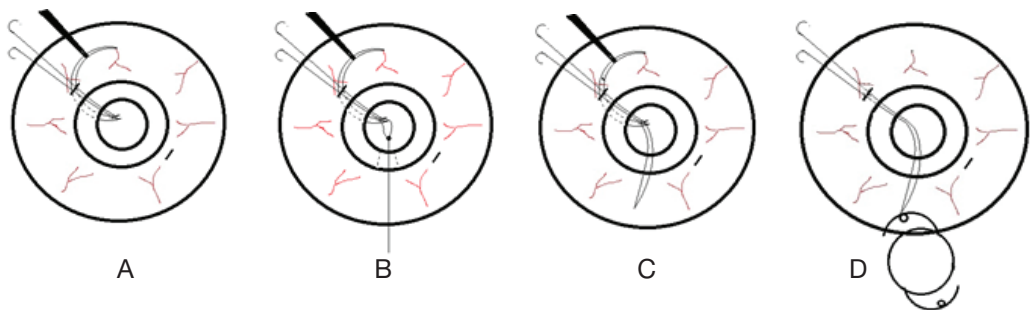


Figure 3. Swaged end of the needle was inserted through a sclerotomy at 5:00 position (A) and pull the 10-0 polyethylene suture with sinskey hook out of the eye (B,C) and tied the inferior haptic eyelet of PC IOL (D)

The superior keratotomy incision via scleral tunnel was then widened to its full extent using a 2.75 slit knife (#8065992745 ClearCut™SatinSlit®). Anterior chamber maintainer was clamped and 1.8% sodium hyaluronate (IAL-F®) was injected into the anterior chamber to push the vitreous posteriorly and coat the corneal endothelium. The inferior haptic of PC IOL was inserted into the posterior chamber by pulling on the 10-0 polyethylene suture at 5:00 position gently. The superior haptic was then grasped with forceps and placed beneath the superior iris using superior haptic compression technique. The superior polyethylene suture at 11:00 position was gently pulled again. Figure 4.

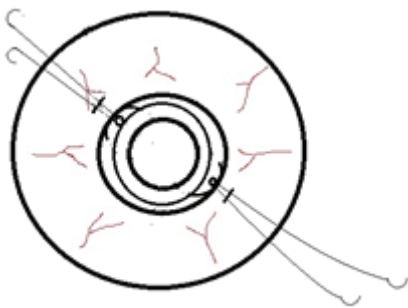


Figure 4. PC IOL was inserted into the eye and placed the haptics within the ciliary sulcus

The free double-armed of the 10-0 polyethylene suture was sutured and buried between the 2 edges of the scleral incision. Figure 5. Suturing the superior scleral tunnel was not necessary. After removal of 1.8% sodium hyaluronate, the conjunctival peritomies could be closed with bipolar cautery.

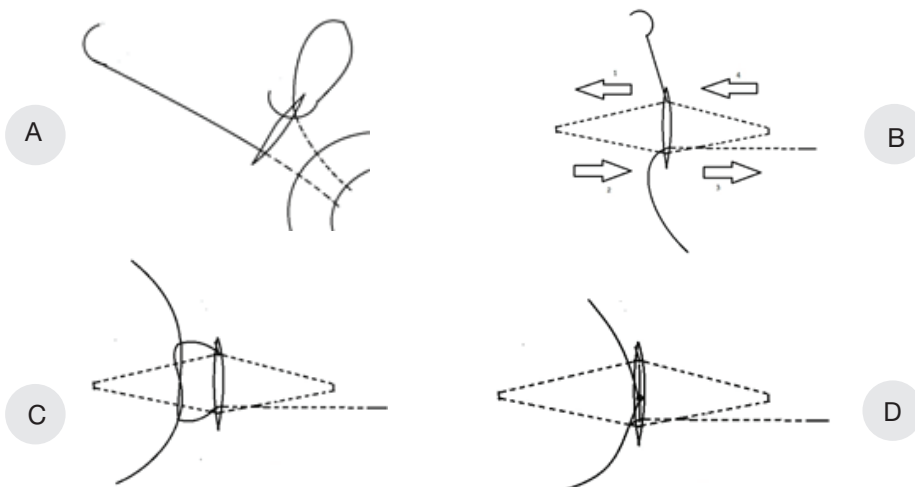


Figure 5. The double-armed of the 10-0 polyethylene suture was sutured and buried between 2 edges of the scleral incision



Results

Ten patients underwent scleral fixation of PC IOL without scleral flap technique. The patients' age ranged from 43 to 86 years, with a mean of 69.3 years. There were 6 male and 4 female patients. The preoperative BCVA ranged from 20/50 to counting fingers 1 ft, and the postoperative BCVA ranged from 20/20 to 5/200 (Table 1, 2). The length of follow-up period ranged from 8 to 50 months with a mean of 24.3 months.

Table 1 Patients profiles

Patient No	Gender	Age	Lesion	Cause	Preop BCVA	Postop BCVA (3 rd month)	Follow-up (months)
1	M	43	OD	Trauma	20/60	20/60	16
2	F	60	OS	IOL dislocation	20/50	20/50	50
3	F	84	OD	IOL dislocation	15/200	20/80	46
4	M	81	OS	Crystalline lens dislocation	CF 1 ft	20/40	10
5	F	86	OD	Posterior capsular rupture during cataract surgery	5/200	20/200	30
6	M	66	OD	IOL dislocation	20/100	20/40	31
7	F	79	OS	Posterior capsular rupture during cataract surgery	CF 1 ft	20/100	8
8	M	60	OS	IOL dislocation	5/200	5/200	22
9	M	79	OS	Trauma	5/200	20/20	17
10	M	55	OS	IOL dislocation	5/200	20/20	13

Abbreviations: OD: *oculus dexter*, OS: *oculus sinister*, BCVA: *best-corrected visual acuity*, CF: *counting finger*, ft: *foot*

Table 2 Visual results of the patients

	Postop 1 week	Postop 1 month	Postop 3 month
20/20 – 20/40	0	1	4
20/50 – 20/100	5	7	4
≤ 20/200	5	2	2

Two early postoperative complications developed in 2 eyes (Table 3). One developed uveitis in patient no.3 which was managed with topical steroid and one developed transient increase intraocular pressure in patient no.5 which was managed with antiglaucoma agent and the intraocular pressure became normal finally. We had 2 cases of late postoperative complications (Table 4). One developed epiretinal membrane in patient no.7 and one had a tilted intraocular lens in patient no.3.

During the postoperative follow-up period, there were no observed cases of hypotony, wound leakage, hyphaema, vitreous hemorrhage, choroidal hemorrhage, retinal tear/detachment, suture erosion or endophthalmitis.

Table 3 Early postoperative complication

	No.	BCVA at 3 month
Transient increase of intraocular pressure	1	20/20
Uveitis	1	5/200

Table 4 Late postoperative complication

	No.	BCVA at 3 month
Epiretinal membrane	1	20/100
Tilted intraocular lens	1	20/80

Discussion

Scleral fixated PC IOL techniques have undergone many modifications^{14,15,16,17} and have been reported a favorable visual outcome of the secondary IOL implantation and safety in many studies.^{4,5,6,7} All techniques need to cover, or rotate the knot created for fixation so epithelial downgrowth¹² or infection¹³ are less likely to develop. However the technique uses standardized maneuvers to fixate the PC IOL, the end of a scleral fixation suture may erode through the conjunctiva and become exposed. To manage this problem, a scleral flap, autologous scleral graft, autologous corneal graft, dura mater, or fascia lata patches have been used to cover the ends, and rotation of the suture knot into the tissue.¹⁷

However, a number of cases with suture erosion is reported despite scleral flap protection and has been criticized for increasing the risk of endophthalmitis. The track formed by an exposed suture allows an infectious agent to pass from the external eye to the supported intraocular lens (IOL).¹⁸

In another report, James S. Lewis studied about sulcus fixation without flap and reported that 40 patients in whom knots were buried and no scleral flap was used, no (0%) erosion was observed.¹⁹ So in the present report the author use burying the knot within the scleral incision to avoid erosion and consequent endophthalmitis.

In this study, there are several other advantages of the scleral fixated PC IOL without scleral flap. It is not necessary to create scleral flap, and then minimized intraocular operative manipulations. In addition the risk of endophthalmitis is decreased from buried knot into the sclerotomy site. This technique uses a scleral incision that can be completed in less time than a conventional scleral flap and prevents unnecessary trauma to the eye.

The author inserts the PC IOL into the eye through the scleral tunnel because the clear corneal incision induces significantly more regular as well as irregular astigmatism than the scleral tunnel incision.²⁰ This technique produces good visual results. The post-operative BCVA ranged from 20/20 to 5/200. Best corrected visual acuity improves in 80% and remains unchanged in 20% of eyes. No one have decrease in vision.

Both early and late postoperative complications are minor. Possible long-term complications of the scleral fixation of PC IOL are corneal decompensation, severe uveitis, retinal break / detachment, suture knot erosion but during the follow-up period over 12 months, we have not observed any of them in our cases.

The major limitation of this study is the small sample size. For more accurate conclusions, the study should have more sample size

Conclusion

A scleral fixated posterior chamber intraocular lens without scleral flap technique is an easy, safe and effective way to achieve secondary IOL implantation with good visual outcomes.

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