Trans-scleral Fixation of Posterior Chamber Intraocular Lens Combined with Vitreoretinal Surgery

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Purpose: To report the outcomes of trans-scleral fixation of posterior chamber intraocular lens (PCIOL) combined with complete vitrectomy and prophylactic band placement.

Methods: Hospital records of 18 patients who underwent the procedure were reviewed. Indications for vitreoretinal surgery included previous penetrating ocular trauma, complicated cataract surgery and vitreous incarceration, and chronic cystoid macular edema. All patients had iris and angle damage with inadequate lens capsular support. Age, sex, surgical technique, follow up duration and pre- and postoperative best corrected visual acuity (BCVA) were evaluated.

Results: Overall 18 eyes of 18 patients (14 men and 4 women) with mean age of 34.8±23 (range 5-76) years were operated. Mean follow up duration was 36±32.4 (range 6-96) months. Of the 18 operated eyes 7 were aphakic, 6 had complete IOL dislocation into the vitreous cavity, 4 had subluxated cataractous lens and one had a subluxated IOL. The number of eyes with BCVA ≥ 20/40 increased from 3 (16.7%) preoperatively to 9 (50%) postoperatively (P<0.01). Postoperative complications were encountered in 9 eyes and included uveitis, vitreous hemorrhage, repeat IOL dislocation and retinal detachment.

Conclusion: In the absence of adequate capsular support, trans-scleral fixation of a PCIOL combined with vitreoretinal surgery seems to be effective for visual rehabilitation in selected patients with complicated cataracts or previous cataract surgery. Application of this technique in children deserves caution. Larger studies and a randomized clinical trial with long-term follow up are required to confirm these results.


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INTRODUCTION

The surgical management of vitreoretinal disorders with concomitant cataract has been a matter of controversy.1,2 Significant lens opacity impending visualization should be removed during vitreoretinal surgery.3-5 Furthermore, cataract progression is often noted after vitrectomy. Post-vitrectomy cataract has been reported in 68% of patients after 2 years.2 Therefore it seems reasonable to remove the lens during vitrectomy, especially in eyes with significant opacity.

Rehabilitation of unilateral aphakia following successful cataract extraction and vitrectomy, particularly in young patients is difficult. One option is to leave the eye aphakic and prescribe spectacles or contact lenses. Regarding the drawbacks of aphakic correction, intraocular lens (IOL) implantation at the time of vitrectomy has attracted a lot of attention in recent years and is universally preferred over aphakic
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spectacles or contact lenses as a method for visual rehabilitation in aphakic eyes.6

IOL implantation in traumatized eyes is a surgical challenge due to lack of adequate capsular support. Anterior chamber intraocular lens (ACIOL) implantation is contraindicated in the presence of extensive damage to the iris and anterior chamber angle, pre-existing glaucoma, peripheral anterior synechia (PAS), low endothelial cell count and shallow anterior chamber.7 Posterior chamber intraocular lens (PCIOL) offers several advantages and many authors recommend it even in eyes lacking capsular or zonular support.8 Scleral fixation of PCIOL is a method to overcome lack of capsular support but is technically more difficult and time-consuming compared to ACIOL implantation. Due to its anatomic location in the eye, PCIOL is appropriate for patients with glaucoma, diabetes, low endothelial cell counts, PAS and cystoid macular edema (CME).6

A recent study with long-term follow up has shown that scleral-fixated PCIOLs may be associated with high rates of postoperative complications and reoperation.9 There are few reports about trans-scleral IOL fixation at the time of pars plana vitrectomy. The aim of this study was to determine the outcomes of scleral fixation of a PCIOL at the time of deep vitrectomy and placement of an encircling band.

METHODS

We retrospectively reviewed hospital records of patients undergoing pars plana vitrectomy with placement of an encircling band and simultaneous trans-scleral fixation of PCIOL from 1993 to 2001 at Labbafinejad Medical Center, Tehran-Iran. Inclusion criteria were: existence of an indication for deep vitrectomy, iris and anterior chamber angle damage and/or PAS precluding ACIOL implantation together with lack of adequate lens capsular support for PCIOL implantation. Data included age, sex, visual acuity, intraocular pressure (IOP), diagnosis and indication for surgery, history of previous ocular surgery, reason for scleral fixation of the IOL, results of keratometry and biometry of the operated eye, condition of the fellow eye, method of previous cataract surgery, IOL type, refractive error, slit lamp and funduscopic examination findings, length of follow up, IOL position and factors limiting final visual acuity.

Surgical Technique

After performing a 360 degree peritomy under general anesthesia, the rectus muscles were secured with silk 2-0 and a prophylactic encircling band (240) was placed. An inflow was sutured to the sclera 3 mm posterior to limbus, inferotemporally. Standard three-port pars plana deep vitrectomy and induction of posterior vitreous detachment was performed before scleral fixation of a PCIOL. Retinal membrane peeling, cryopexy and endolaser were also performed, if needed. The retina was attached before trans-scleral PCIOL fixation in all eyes.

For trans-scleral PCIOL fixation, two triangular limbal-based half-thickness scleral flaps were made near the limbus 180° away from each other. After performing a superior limbal incision and opening the anterior chamber, a straight needle attached to a 10-0 prolene suture was introduced into the eye 1 mm posterior to the limbus under each scleral flap. The 10-0 prolene suture was brought through the limbal incision and tied to the PCIOL haptics. The PCIOL was implanted into the ciliary sulcus, the sutures were tied and the knot was buried under the scleral flap. Finally the surgical wounds were sutured and subconjunctival antibiotic and steroid was injected. Topical eye drops including atropine 1% (3 times a day), betamethasone 1% (4 times a day), sulfacetamide 10% (4 times a day) and
prednisolone tablets (1 mg/kg/day) were administered.

PCIOL power was calculated based on keratometry and biometry of the involved eye or based on the information from the fellow eye in cases in which examination of the involved eye was not possible. To compensate for the myopic effect of the encircling band, 1.5 to 2 diopters was decreased from the calculated IOL power.

**RESULTS**

Hospital records of 18 eyes (12 right and 6 left) of 18 patients (14 male and 4 female) were reviewed. Mean age was 34.8±23 (range 5-76) years and mean follow up duration was 36±32.4 (range 6-96) months. There was history of penetrating trauma in 12 eyes (surgical repair had been performed in 10 eyes), blunt trauma in 2 eyes and complicated cataract surgery in 4 eyes. Four eyes had history of post-traumatic endophthalmitis and one eye had previous branch retinal vein occlusions (BRVOs) and the IOL was dislocated during cataract surgery. Keratometry and biometry of the involved eye was possible in 12 cases.

Overall out of 18 eyes, 7 were aphakic, 6 had dislocated IOLs, 4 had a subluxated cataractous crystalline lens and one had a subluxated IOL. Reasons for scleral PCIOL fixation included lack of lens capsule or extensive iris and anterior chamber angle damage. Of the 7 pseudophakic eyes, 3 eyes had Perlens-2 type IOLs with an eyelet in the haptic and 4 eyes had an ordinary PCIOL. Eyes with a subluxated cataractous lens underwent pars plana lensectomy (3 eyes) or intracapsular cataract extraction (one eye).

BCVA ranged from light perception to 20/25 preoperatively which improved to 4/100 to 20/20 postoperatively. Preoperatively, 55.5% of the cases had BCVA <20/200 but postoperatively 50% had BCVA >20/40 (Fig. 1). Frequency of eyes with BCVA >20/40 increased significantly from 16.7% (3 eyes) before the operation to 50% (9 eyes) postoperatively (McNemar test, P<0.01) (table 1). Final visual acuity was less than 20/25 in 14 eyes (77.8%). The reasons for low final visual acuity included previous post-traumatic endophthalmitis (4 eyes), amblyopia (2 eyes), age-related macular degeneration (2 eyes), retinal detachment (RD), repeat IOL dislocation, advanced glaucoma, multiple BRVOs, high post-keratoplasty astigmatism and corneal opacity (each in one eye).

![Figure 1](image-url)  
*Figure 1 Best corrected visual acuity (BCVA) before and after the operation*

| Table 1 Pre- and postoperative best corrected visual acuity (BCVA) |
|-------------------|-------------------|-------------------|
|                   | Preoperative <20/40 | Preoperative ≥20/40 | Postoperative <20/40 | Postoperative ≥20/40 | Total <20/40 | Total ≥20/40 | Total |
|                   | 7                  | 2                  | 9                  | 9                  | 15 (83.3%)  | 3 (16.7%)   | 18    |

*McNemar test, P<0.01*

IOP ranged from 8 to 30 mmHg preoperatively. IOP was in normal range (10-16 mmHg) with medication postoperatively, except for one eye which developed advanced glaucoma due to extensive anterior chamber angle damage and PAS.

Clinical CME was present in 2 eyes with history of complicated cataract surgery; both of which resolved after vitrectomy.

At the final examination, the position of the scleral fixated PCIOL was good in 72.2% (13 eyes) and there was mild tilt in 16.7% (3 eyes). IOL sunset occurred after 2.5 years in one eye, due to breakage of one of the prolene sutures. The IOL was extracted after 8 years in another
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eye due to sunset position and re-operation was recommended to stabilize the IOL.

Postoperative complications occurred in 9 eyes (table 2). Early complications such as uveitis and fibrin formation over the IOL were seen in 3 young patients (16.7%), which improved gradually with steroids. Significant tilting of the IOL and vitreous hemorrhage occurred on the day after the operation in one eye. Re-operation was performed immediately and the IOL was sutured in the proper position. One eye experienced mild vitreous hemorrhage intraoperatively which resolved after a few weeks. One patient with previous history of corneal laceration underwent membranectomy due to formation of a thick membrane over the IOL 1.5 months postoperatively. This patient experienced subluxation of the IOL and underwent lens removal 2.5 years later. A 55 year-old patient developed RD 7 months postoperatively which progressed to proliferative vitreoretinopathy after unsuccessful scleral buckling. He refused reoperation. Iatrogenic retinal breaks occurred in one case during vitrectomy and underwent endolaser retinopexy.

Table 2 Postoperative complications

<table>
<thead>
<tr>
<th>Condition</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uveitis</td>
<td>3</td>
<td>16.7</td>
</tr>
<tr>
<td>Vitreous hemorrhage</td>
<td>2</td>
<td>11.1</td>
</tr>
<tr>
<td>Redislocation of IOL</td>
<td>2</td>
<td>11.1</td>
</tr>
<tr>
<td>Retinal detachment</td>
<td>1</td>
<td>5.6</td>
</tr>
<tr>
<td>Early significant IOL tilting</td>
<td>1</td>
<td>5.6</td>
</tr>
<tr>
<td>Total</td>
<td>9</td>
<td>50</td>
</tr>
</tbody>
</table>

DISCUSSION

Rehabilitation of aphakic eyes in the absence of adequate capsular support remains a major challenge. Lack of lens capsule support after complicated cataract surgery has been reported as an indication for scleral fixation of PCIOl in several studies.10-12 ACIOl implantation may also not be feasible due to extensive iris and anterior chamber angle damage in these eyes. The universally accepted indication for scleral-fixated PCIOls is aphakia in a patient who is not a good candidate for ACIOl implantation.

PCIOls offer some advantages over ACIOls and contact lenses: 1) a PCIOl is closer to the focal point of the eye, therefore image magnification is reduced; 2) there is no contact between the IOL and fine structures of the anterior chamber angle and corneal endothelium; and 3) the risk of CME, glaucoma and corneal edema is lower with PCIOls.6 It is also reported that PCIOls may provide better vision compared to ACIOls.13

The decision for trans-scleral PCIOl fixation should be individualized based on the risks and benefits. Trans-scleral PCIOl fixation is a rather difficult procedure which increases operative time. Furthermore, due to passage of the needle through the ciliary body, the risk of intraocular hemorrhage is increased.6 Other potential complications of this approach are: suture exposure through the conjunctiva,14 endophthalmitis,15 and IOL displacement or tilt due to breakage of the prolene suture.14 Long term follow up of these patients in a recent study showed that breakage of polypropylene sutures is the most common complication which occurs in 27.9% of eyes and was the main indication for reoperations (57% of the cases).9

The results of the present study revealed that 50% of patients undergoing deep vitrectomy and trans-scleral PCIOl fixation achieved final visual acuity of 20/40 or better. Three of 18 eyes had decreased final vision; only one was due to a surgical complication. Five patients required further interventions due to RD (one eye) and IOL displacement (4 eyes). The latter four eyes consisted of IOL tilting on the day after the operation, IOL sunset after 2.5 years due to breakage of one prolene suture, complete traumatic IOL dislocation after 4 years, and sunset IOL after 8 years.

Johnston et al6 retrospectively reviewed 63 eyes undergoing combined deep vitrectomy and sutured PCIOls with mean follow up of 20 months. They reported preoperative visual acuity of 20/40 or better in 36% (the corresponding figure in our study was 17%) which
increased to 76% postoperatively (50% in our series). Significant postoperative complications were reported in 4.7% of their cases compared to 22% in our study. The rate of RD was 3.2% which is comparable to the figure (5%) observed in our series. Scleral PCIOL fixation requires complete vitrectomy, otherwise vitreous strands will adhere to the IOL haptic leading to vitreoretinal traction. It should be stressed that ACIOL implantation was possible in many cases in Johnston’s study. In our patients, however it was impossible to implant an ACIOL because of extensive eye injuries. The reason for different results in these two series is probably different indications for vitrectomy.

IOL implantation may be performed after stabilization of the traumatized eye, but this requires a separate operation, which may not be acceptable for the majority of patients. Therefore, performing simultaneous operations on the posterior and anterior segments is recommended in order to decrease cost and inconvenience.

In conclusion, in eyes lacking capsular support and in which ACIOL implantation is contraindicated, trans-scleral PCIOL fixation is an efficient way for visual rehabilitation in selected cases. Considering the fact that this procedure is associated with a high rate of intra- and postoperative complications, long-term follow up is recommended.

REFERENCES

1- Tasman W. Are there any retinal contraindications to cataract extraction and posterior chamber lens implants? Arch Ophthalmol 1986;104:1767-1768.