

Visual Acuity After Trans-scleral Sutured Posterior Chamber Intraocular Lens

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ABSTRACT

Objective: To determine the changes in visual acuity in patients undergoing Trans-Scleral Sutured Posterior Chamber Intra-Ocular Lens (TSSPCIOL) implantation at a tertiary care hospital in Karachi, Pakistan.

Study Design: Case series.

Place and Duration of Study: LRBT Tertiary Eye Hospital, Karachi, from January 2006 to December 2010.

Methodology: Records of all patients undergoing implantation of TSSPCIOL were reviewed. Patients with diagnosed glaucoma, diabetic retinopathy, macular degeneration, history of recurrent uveitis, corneal haze or central corneal scars were excluded. For the final analysis, 70 eyes out of a total of 75 were selected. Main outcomes of interest were pre and postoperative visual acuities and surgical complications. SPSS 21 was used for data analysis.

Results: Pre-operatively, the average Best Spectacle-Corrected Visual Acuity (BSCVA) was 6/36 on the Snellen chart. This improved to 6/12 postoperatively. The mean improvement seen was 2.4 lines on the Snellen chart ($p < 0.05$). Complications include transient intraocular pressure elevation in 25 eyes (36%), IOL tilt in 4 eyes (7.1%), Cystoid Macular Edema (CME) in 4 eyes (5.7%), vitreous haemorrhage in 2 eyes (2.9%), hyphema in 2 eyes (2.9%), uveitis in 1 eye (1.4%), and retinal detachment 1 eye (1.4%). No IOL subluxation, suture erosion, iris capture, choroidal effusion or endophthalmitis was encountered and no re-operations were needed.

Conclusion: TSSPCIOLs are a good management option for patients with aphakia in whom PC IOLs cannot be placed.

Key Words: Aphakia. Ectopia lentis. Trans-scleral sutured posterior chamber intraocular lens. Traumatic lens subluxation.

INTRODUCTION

Since the last few decades, placement of a Posterior Chamber Intra-Ocular Lens (PC-IOL) has become the standard procedure in ocular surgeries involving cataract extraction or lensectomy.¹ However, this requires the presence of an intact posterior capsule and reasonable zonular support. This may not be present in some patients, which could be due to a congenital abnormality, secondary to trauma, due to chronic uveitis, or iatrogenically; and therefore, a PC-IOL cannot be placed.² For such patients, other methods of lens implantation are employed or alternatively, the patient may be left aphakic. Though, for over two decades, it has been generally agreed that IOLs offer a more practical solution for aphakia than refractive correction.

Surgical options in common use for correction of aphakia in eyes with no capsular support include hyperopic LASIK, iris supported IOLs, angle supported IOLs and scleral supported IOLs. Hyperopic LASIK is not suitable for most patients due to wavefront aberrations associated with high refractive corrections.³

Therefore, the surgeon generally has to choose between implanting an Anterior Chamber Intraocular Lens (AC IOL) and fixating a Posterior Chamber Intraocular Lens (PC-IOL) in the sclera. This is determined by patient factors and surgeon preference or expertise with each method.

A report by the American Academy of Ophthalmology in 2003 compared open-loop anterior chamber, scleral-sutured posterior chamber, and iris-sutured posterior chamber IOLs and concluded each to be effective and safe in eyes lacking capsular support, but the superiority of any one method over the rest could not be proven.⁴ While visual outcomes of AC-IOLs and sutured PC-IOLs are comparable, the latter are preferred in patients with glaucoma, corneal guttata, or cystoid macular edema.^{5,6} AC-IOLs are linked to high corneal endothelial cell loss on long-term follow-up.^{1,5} In contrast, the anatomical location of the sutured PC-IOLs helps maintain the integrity of the corneal epithelium and minimize the movement of the IOL within the eye. They are also preferred in young patients with a relatively long life expectancy and the safety and efficacy of scleral fixated IOLs in children and young adults has been demonstrated in various studies over time.^{7,8} Furthermore, a scleral sutured PC IOL has been shown to give better visual outcomes and fewer complications than an AC IOL in complicated cataract cases with inadequate capsule and zonular support.⁹

The objective of this study was to report the outcomes of Trans-Scleral Sutured Posterior Chamber Intra-Ocular

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Lens (TSSPCIOL) implantation in terms of postoperative visual acuity achieved and complications encountered.

METHODOLOGY

This was an interventional case series where a total of 65 patients (75 eyes) presenting at the Layton Rehmatullah Benevolent Trust (LRBT) Eye Hospital, Karachi, from January 2006 to December 2010 were enrolled. Of these, 5 eyes were excluded based on the criteria and data was analysed from 61 patients (70 eyes). Data from follow-up visits up to December 2012 was included for analysis.

Approval from the hospital ethical review committee was acquired prior to start of this study. All aphakic patients aged between 10-65 years with no capsular support were short-listed. The purpose, risks and benefits of the study were explained to the patient and a written informed consent was obtained. Patients with diagnosed glaucoma, diabetic retinopathy, macular degeneration, history of recurrent uveitis, corneal haze or central corneal scars were screened out. In addition, all patients who had a follow-up of less than 6 months or had incomplete records were also excluded from the analysis.

Pre-operatively, all the patients underwent the following evaluation: clinical history, measurement of Visual Acuity (VA), Best Spectacle-Corrected Visual Acuity (BSCVA), anterior segment examination with emphasis on the state of the cornea and posterior capsule, posterior segment examination, Intraocular Pressure (IOP) measurement via applanation tonometry, assessment of pupil reaction and synechiae, and the state of the fellow

eye. K-readings were taken manually using a Bausch and Lomb-style keratometer while an Alcon Ocuscan RXP ophthalmic ultrasound system was used for biometry. SRK-II formula was used to calculate the power of the lens implant. In all the cases, a Cirrus IOL with a loop in haptic was used with 6.5 mm optical diameter, 12.5 mm over all diameter, a constant of 118.2 and one hole per haptic.

Surgery was carried out by one of the three surgeons (SZ, SFR, MS) at LRBT under local anaesthesia and general anaesthesia. Local anaesthesia consisted of 3 - 5 ml peribulbar injection of 1:1 mixture of 0.5% bupivacaine and 2% lignocaine administered about 30 minutes before surgery.

Limited conjunctival peritomy was carried out and 2 scleral flaps, 2/3rd of the scleral thickness, were made at 5 and 11 O'clock. A corneal incision with 3.2 mm knife at 12 O'clock was given. In cases of aphakia, anterior vitrectomy was performed through the corneal incision, and an ophthalmic viscosurgical device (methylcellulose 2%) was injected into the anterior chamber. All those cases in which lens was subluxated and visible through the pupillary border (Figure 1), lensectomy was performed using 23 gauge system via pars plana approach (Figure 2). A 10 - 0 polypropylene blue monofilament with ¼ circle side cutting single ended needle was used in all cases for lens fixation. The suture was passed from the loop of one haptic and tied (Figure 3). The other haptic was prepared similarly. The IOL was introduced into its place through the clear corneal section. Finally, the sutures were pulled through the scleral bed and tied (Figure 4). 10 - 0 nylon suture was used for the scleral flap and corneal incision while conjunctiva was closed with 6 - 0 vicryl.

Postoperatively, all eyes received topical drops containing moxifloxacin 0.5% and dexamethasone 0.1% (q 2h) for first week and then tapered off over 8 weeks. In addition, ciprofloxacin 500 mg (q 12h) and ibuprofen 200 mg (q 8h) was given for the first 3 postoperative days. Patients were examined at first postoperative day, third postoperative day, at the end of first week, then weekly for the first month, and then monthly for the next 5 months. Examination included VA, BSCVA, IOP

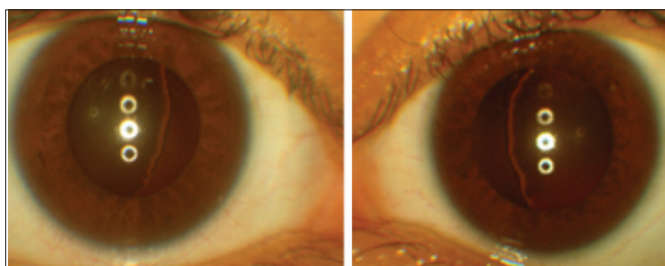


Figure 1: Pre-operative photograph showing bilateral dislocation of lens with margin visible within the pupil.

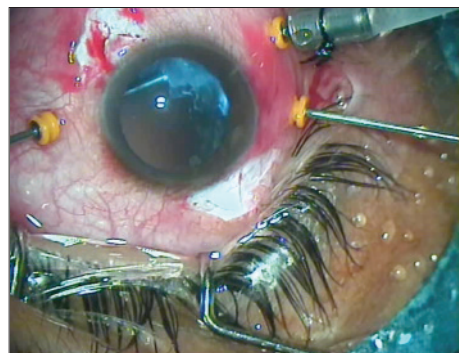


Figure 2: Lensectomy being performed.

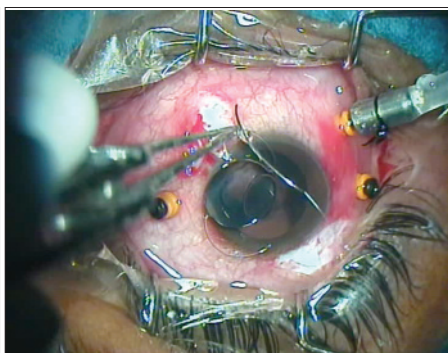


Figure 3: IOL being prepared.

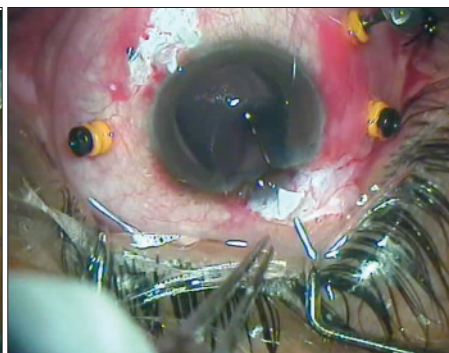


Figure 4: IOL is being secured in place.

measurement and screening for any postoperative complications.

Charts were pulled out in the year 2012 to record data from the most recent clinic follow-up visits. Data recorded included demographic data, pre-operative diagnosis, pre-operative and postoperative VA and BSCVA, postoperative complications, BSCVA at 1 month, 6 months and 1 year postoperatively, and at the last follow-up visit. Data was recorded manually on a structured questionnaire and was analysed using IBM SPSS Statistics 21 by two of the authors (SAM, SZ). The main outcome of this study was improvement in Best Spectacle-Corrected Visual Acuity (BSCVA) after surgery. Paired t-test was run on the pre-operative and postoperative BSCVA and the p-value was calculated (p-value of < 0.05 considered as significant).

RESULTS

Data was analysed from 61 patients (70 eyes), 32 males and 29 females, aged between 11 and 57 years (mean 28.3 ± 13.9). Visual acuity and BSCVA had been assessed using Snellen charts via subjective refraction by optometrists. The reasons for undergoing TSSPC IOL surgery are summarized in Table I. Patients with large posterior capsular rupture during a complicated surgery as well as patients in whom IOL could not be implanted due to lack of capsular support were classified under aphakia.

Pre- and postoperative BSCVA are given in Table II. The mean follow-up duration was 20.8 (±12.3) months. However, for consistency, data was analysed from the initial 6 months' follow-up visits.

The mean (±SD) pre-operative BSCVA was 4.66 (±2.75) lines on the Snellen chart; equivalent to 6/36. This improved to 7.09 (±2.17) lines, or 6/12, after the surgery. A mean improvement of 2.43 (±2.7) lines was seen at

Table I: Indications for undergoing surgery.

Indication	Number of patients	Percentage
Posterior capsule rupture	24	34
Aphakia	14	20
Ectopia lentis (idiopathic)	11	16
Marfan syndrome	10	14
Trauma	9	13
Weill Marchesani	2	3
Total	70	100

Table II: Comparison of pre-operative and postoperative Best Spectacle Corrected Visual Acuities (BSCVA).

BSCVA	Pre-operative (number of patients)	Postoperative (number of patients)
6/6 - 6/9P	8	44
6/12 - 6/18P	25	17
6/24 - 6/60 P	26	5
CF 0.5 M - CF 3M	11	2
HM - PL+	-	2

CF = Counting fingers; HM = Hand movement; PL = Perception of light

the follow-up at 6 months postoperatively. Paired t-test comparing pre-operative and postoperative BSCVA generated a p-value of < 0.001.

Forty seven out of 70 eyes (67%) achieved postoperative BSCVA of 6/12 or better. Sixty four eyes (91%) had a BSCVA of atleast 6/24. At the end of 6 months of follow-up, 2 patients had postoperative BSCVAs of hand movement and light perception due to vitreous haemorrhage and retinal detachment respectively.

Complications observed included transient intraocular pressure elevation in 25 eyes (36%), IOL tilt in 4 eyes (7.1%), Cystoid Macular Edema (CME) in 4 eyes (5.7%), vitreous haemorrhage in 2 eyes (2.9%), hyphema in 2 eyes (2.9%), uveitis in 1 eye (1.4%), and retinal detachment 1 eye (1.4%). No IOL subluxation, suture erosion, iris capture, choroidal effusion or endophthalmitis was encountered and no reoperations were needed.

DISCUSSION

The main goal of management for eyes which are not suitable for PC-IOL implantation is to restore vision as near to normal as possible with minimum side effects. In this study, the main outcome of interest was improvement in BSCVA following surgery. Sixty (85.7%) eyes experienced an improvement in the BSCVA post-operatively by at least one line on the Snellen chart. There was an overall improvement in the BSCVA of 2.4 lines on the Snellen chart. The average BSCVA prior to surgery was 6/36 and it improved to 6/12 after surgery. Postoperatively 41 (58.5%) eyes had a visual acuity of 6/9 or better, 47 (67.1%) eyes were 6/12 or better and 60 (85.7%) eyes had a BSCVA of at least 6/24.

Ahmed *et al.* followed 13 eyes for 6 months and reported an average improvement of 1.7 lines in BCVA and 69% of patients at 6/12 or better.¹⁰ Mazhri and Qadri report similar improvement in BCVA from a pre-operative mean of 6/24 to a mean of 6/12 postoperatively.⁶ Studies carried out in Asia and Middle-East regions report 48% to 95% patients either maintaining or improving on their pre-operative visual status.¹¹⁻¹³ McAllister and Hirst report an average improvement of 1.6 Snellen chart lines in 82 eyes.⁸ International studies done over the last 5 years show postoperative BCVA of at least 6/12 is consistently achieved in majority of the patients.^{12,14-17}

Studies show that posterior capsule rupture during extra capsular cataract surgery remains the most common indication for scleral fixation of IOL.^{12,15,18} This was also the most common etiology encountered in this study. The incidence of other etiologies tend to vary among different studies.

The complications reported in literature varies even more in terms of frequency, possibly due to difference in the time of follow-up duration. The commonest

complication in this study was transient intraocular pressure elevation, which was managed medically, followed by IOL tilt and cystoid macular edema. Ahmed *et al.* reports complication rates of 7% for CME and 7% for IOL tilt in patients followed for 6 months.¹⁰ In a similar study carried out by Mazhri and Qadri, the commonest complications reported in patients followed for upto 36 months included vitreous hemorrhage (16%), hyphema (10%), IOL tilt (8%), suture erosion (6%), glaucoma (6%), retinal detachment (4%), and CME (4%).⁶

Filipovic *et al.* conducted a study to report the early and late complications encountered after TSSPCIOL surgery. Results showed vitreous hemorrhage (24.7%) to be the most frequent complication followed by CME (19.5%), corneal edema (14.3%), pupil distortion (11.7%), IOL decentration and tilt (10.4%) and ocular hypertension (9.1%).¹⁹ McAllister and Hirst followed 82 eyes in 72 patients for an average of 83 months and found ocular hypertension (30.5%) to be the most common postoperative complication; 53.7% eyes had at least one complication (36.4% occurred within the first postoperative week) and 15.8% eyes required one or more re-operations.⁸

Kumar *et al.* followed 41 eyes and reported optic capture in 2.4%, macular edema in 4.8%, and decentration in 4.8% after an average follow-up of 17 months.⁷ In another study, Ganesh *et al.* reports postoperative inflammation in 48% and glaucoma in 40% eyes among the 25 eyes followed for 6 months postoperatively.¹⁵ Asadi and Kheirkhah followed 25 paediatric eyes for 81 months and found transient intraocular hemorrhage in 52%, transient choroidal effusion in 8%, late endophthalmitis in 4%, retinal detachment in 4%, and suture breakage in 24%.¹³ Nottage *et al.* reports uveitis in 0.9%, glaucoma in 4.7%, cystoid macular edema in 5.6%, and retinal detachment in 1.9% eyes out of a total of 107 eyes.¹⁴

Operating microscope light-induced retinal phototoxic maculopathy has also been reported (about 8.5% cases in one study) especially with long duration of surgery although this complication was not encountered in this study.²⁰

A major limitation of this study was the short duration of follow-up. A significant number of patients who signed up for the study were unable to continue follow-up due to financial and/or domestic constraints which resulted in the data analysis to be restricted to 6 months, although a longer time frame was planned at the start of the study.

Long-term follow-ups are important with a detailed ocular examination to screen for any complications and to correct any residual refractive error. Over the years, studies conducted on the outcomes of surgical treatment report a gradually decreasing incidence of operative and postoperative complications.²¹⁻²³ One of the concerns in TSSPCIOLs is the spontaneous subluxation of scleral

sutured IOL due to suture degradation which has been implicated in upto 27% of cases followed for 7 years or more postoperatively.^{13,24,25} A polypropylene blue monofilament is the suture of choice due to higher tensile strength and non-absorbable nature of the suture. The average time taken for suture breakage to occur was observed to be 4.9 years.⁸ If the haptics are placed correctly in the ciliary sulcus, it lends stability to the lens by fibrosis with the surrounding structures, although as many as 50% of scleral-sutured haptics are inadvertently sewn outside the ciliary sulcus.¹⁰ In addition, fixation sutures buried under scleral flaps are less likely to undergo erosion than sutures placed under the conjunctiva.⁶

Another factor that has a significant impact on the outcome of the surgery is the surgeon's expertise, since TSSPCIOL implantation is a technically more difficult procedure than AC IOL implantation.⁹ In the absence of amblyopia and corneal or retinal pathologies, good visual outcomes have been reported with TSSPCIOLs.^{6,8,11}

CONCLUSION

TSSPCIOL implantation can be recommended as a safe and an effective option in the management of patients lacking capsular support for a PCIOL. It offers an alternative approach for restoring visual acuity when conservative measures are unsuccessful.

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