

## Transscleral fixation of closed loop haptic acrylic posterior chamber intraocular lens in aphakic nonvitrectomized eyes

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**Purpose:** To evaluate the outcome of transscleral fixation of closed loop haptic acrylic posterior chamber intraocular lens (PCIOL) in aphakia in nonvitrectomized eyes. **Materials and Methods:** Patients with postcataract surgery aphakia, trauma with posterior capsule injury, subluxated crystalline lens, and per operative complications where sulcus implantation was not possible were included over a 1-year period. Scleral fixation of acrylic hydrophilic PCIOL was performed according to the described technique, and the patients were evaluated on the day 1, 3, 14, and at 3 and 12 months postoperatively for IOL centration, pseudophakodonesis, change in best-corrected visual acuity (BCVA), and any other complications. **Results:** Out of twenty-nine eyes of 24 patients, who completed the study, 25 (86.2%) eyes had improved, 2 (6.9%) eyes showed no change, and 2 (6.9%) eyes had worsening of BCVA. Three (10.3%) eyes developed postoperative complications. A significant improvement in mean BCVA ( $P < 0.0001$ ) was observed after the procedure. Mean duration of follow-up was 26.2 months (range 22–35 months). **Conclusion:** The use of closed loop haptic acrylic IOL for scleral fixation appears to be safe and effective alternative to conventional scleral fixated polymethyl methacrylate intraocular lenses.

**Key words:** Acrylic posterior chamber intraocular lens, aphakia, scleral-fixated intraocular lens, transscleral fixation

Scleral fixated intraocular lens (SFIOL) provides the most physiological placement of IOL where standard in the bag or sulcus implantation is not possible.<sup>[1]</sup> Various techniques have been described for the same each with its own merits and demerits.<sup>[2-6]</sup> Monteiro *et al.* evaluated the outcome of acrylic foldable IOL with conventional SFIOL and since then various modifications for inserting and anchoring these foldable IOLs have been tried including the glued fixation of acrylic foldable IOLs.<sup>[7-9]</sup>

In the present study, for the 1<sup>st</sup> time, transscleral fixation of closed loop haptic hydrophilic acrylic posterior chamber IOL (PCIOL) (C-Flex 570C, Rayner Intraocular Lenses Ltd., UK) with 10-0 polypropylene suture has been described. We were encouraged by a satisfactory outcome in a single patient in whom this procedure was performed because of unavailability of SFIOL. Besides the obvious advantages of an acrylic foldable IOL over polymethyl methacrylate (PMMA) IOLs, closed loop acrylic provides for comfortable intraoperative suture management compared to PMMA SFIOLs (with eyes on haptics) and single piece "C" looped acrylic foldable IOLs.<sup>[7]</sup> In addition, we also believed that softer and more flexible haptic material should lead to lesser possibilities of long-term ciliary body erosion and retinal detachment as seen in rigid haptic SFIOLs.<sup>[10]</sup>

### Materials and Methods

Our study was performed in accordance to the tenets of the Helsinki Declaration. A written informed voluntary

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consent was taken from all the study subjects. All consecutive patients planned for SFIOL over a 1 year period from August 2010 to July 2011 were included. The usual indications for SFIOL in our clinical settings were postcataract surgery aphakia without adequate capsular support, trauma with posterior capsule injury, subluxated crystalline lens, and per operative complications during cataract surgery where sulcus implantation was not possible. Patients below 18 years, having any other ocular disease or irreversible visual damage to the other eye were excluded. Furthermore, excluded were patients requiring pars plana vitrectomy as a part of primary procedure. All the study subjects underwent detailed anterior and posterior segment evaluation using stereoscopic slit lamp biomicroscopy and indirect ophthalmoscopy. The best-corrected visual acuity (BCVA) was recorded on logarithm of the minimum angle of resolution scale. Measurements included IOL power calculation by Sanders-Retzlaff-Kraff II formula and white-to-white (WTW) horizontal corneal diameter by Castroviejo calipers.<sup>[11,12]</sup>

Scleral fixation of the acrylic IOL was done in a manner similar to the standard described technique.<sup>[1]</sup> Under peribulbar anesthesia (1:1 mixture of 2% lignocaine and 0.5% bupivacaine), partial thickness scleral flaps were fashioned 180° apart followed by the primary procedure (where

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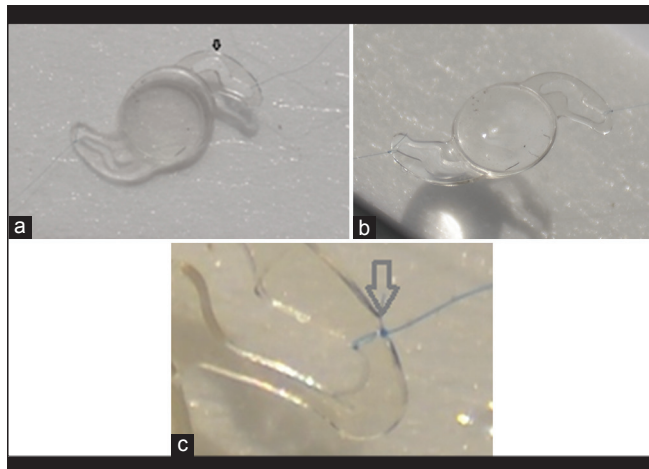
required) and anterior vitrectomy. Primary procedures included explantation of decentered or subluxated crystalline or IOL. A double armed 10-0 polypropylene suture was passed through the bed of the partial thickness flaps and retrieved through the main incision. The main incision if not already made in the primary procedure was made in the form of a 4.5 mm scleral tunnel prior to suture retrieval. The suture was cut and tied through the loops of both the haptics [Fig. 1]. The position of the anchoring of the haptics was modified according to the WTW corneal diameter. WTW measurements have been reported to correlate to the size of ciliary sulcus.<sup>[13]</sup> The position of tying the suture on the IOL haptic was modified according to the measurements. In eyes with WTW < 11.5 mm, the sutures were tied closer to the optic and placed further away in eyes with larger measurements [Fig. 1a]. The suture was pulled and the IOL pushed behind the iris. The sutures were tied and buried in the scleral bed. Closure of scleral flap and overlying conjunctiva was done with fibrin glue. The main incision was sutured if required with 10-0 nylon.

Patients were evaluated on the day 1, day 3, day 14, 3 months, and 12 months postoperatively. Besides the routine examination, a note was made of the IOL centration, pseudophakodonesis, and the BCVA. Nonvisibility of the optic edge in a mid-dilated pupil of 4 mm was considered as good centration. If optic edge was visible in the central 4 mm, the IOL was considered to be decentered.

Data were analyzed using paired *t*-test and Pearson's correlation analysis.

## Results

Twenty-nine eyes of 24 patients completed the study. Mean age at surgery was  $38 \pm 15.5$  years (range 18–59 years), with a mean follow-up of 26 months. Twenty-five (86.2%) eyes had improved the final postoperative visual acuity. Two (6.9%)



**Figure 1:** Demonstration of polypropylene suture knots on the acrylic intraocular lens. (a) Normal placement of knots on the haptics. The black arrow marks the area of suture placement in smaller eyes (white-to-white corneal diameter <11.5 mm). (b) Stretching of haptics would occur in larger eyes. (c) The soft acrylic allows the suture to cinch snugly. The depression created (gray arrow) by the suture in the haptic material minimizes slippage and prevents pseudophakodonesis

patients showed no change in visual acuity. Three (10.3%) had postoperative complications of which two had worsening of visual acuity attributed to secondary glaucoma and macular scarring. Detailed elaboration of the results of our study is done in Tables 1-3. Mean BCVA preoperatively was  $0.78 \pm 0.39$  and postoperatively at 3 months was  $0.41 \pm 0.52$ . On applying paired *t*-test on pre- and post-operative BCVA, we got a significant  $P < 0.0001$ . Pearson's correlation was used to verify the pairing which also yielded significant value  $r = 0.69$ ;  $P < 0.0001$ . The refraction at 3 months follow-up is depicted in Table 4.

## Discussion

SFIOL implantation is an effective management of aphakia with visual outcomes and complication rates comparable to other procedures.<sup>[4]</sup> It has been under critical scrutiny due to the associated surgical skill requirement and postoperative complications. With passing years, scleral fixation surgery has evolved not only in its technique but also in the type of IOL use. Surgeries with foldable acrylic IOLs have been found to be more safe and effective compared to convention SFIOL

**Table 1: Clinical profile, mean change in visual acuity, and mean follow-up of patients undergoing transscleral fixation of closed loop haptic acrylic posterior chamber intraocular lens**

Patients particulars	Data
Number of patients	24
Bilateral	5
Total number of eyes	29
Mean age (in years)	$38 \pm 15.5$
Mean preoperative BCVA (logMAR)	$0.78 \pm 0.39$
Mean postoperative BCVA (3 months)	$0.41 \pm 0.52$
<i>r</i>	0.694
<i>P</i>	<0.0001
Mean follow-up (months)	26.2
Range	22-35

BCVA: Best-corrected visual acuity, logMAR: Logarithm of the minimum angle of resolution

**Table 2: Indications for scleral fixation of acrylic posterior chamber intraocular lenses and change in BCVA after surgery**

Indications	<i>n</i> =29 (eyes)	Change in BCVA after surgery		
		Improvement <i>n</i> =25 (86.2%)	No change <i>n</i> =2 (6.9%)	Worsening <i>n</i> =2 (6.9%)
Trauma	9	7	1	1
Preexisting aphakia/ decentration of PCIOL	7	6	1	
Per operative zonulardialysis or large posterior capsular tear	5	4		1
Marfans	8	8		

BCVA: Best-corrected visual acuity

surgeries.<sup>[7]</sup> A recent addition to this approach is the sutureless glued SFIOLs with promising results.<sup>[9]</sup>

The present study has described the efficacy of this technique with use of transscleral fixation of standard closed loop haptic acrylic PCIOL (C-Flex 570C, Rayner Intraocular Lenses Ltd., UK) with 10-0 prolene suture. Use of hydrophilic acrylic showed several unprecedented advantages over the PMMA SFIOL intraoperatively as well as with postoperative outcomes.<sup>[7]</sup>

The presumed advantages of the acrylic looped haptic PCIOL for scleral fixation vis a vis standard SFIOL (with eyes on haptics) are inherent to its design and material. Its flexibility allows insertion of a 5.75 mm optic through a 4.5 mm incision thus has all the advantages of a smaller incision.<sup>[7]</sup> The larger size of the “eyes” on the haptics which is the basic part of its normal lens design allows placement of suture knots closer to the optic in a small eye and toward the edge of haptic in a larger eye [Fig. 1a and b]. Besides being easier to thread, it

allows comfortable intraoperative suture management and thus saves some surgical time.

Pseudophakodonesis with the sutured SFIOL has been time and again pointed out to be one of the major problems resulting in poor visual quality.<sup>[10]</sup> We did not observe this in any of our patients. This in part could be due to existent vitreous support (nonvitrectomized eyes) and greater inertia of close looped haptics IOLs. Elasticity of the haptics of the acrylic SF IOL used in our study allows stretching or compression according to the size of the sulcus, unlike the unyielding, fixed dimensions in conventional SFIOLs.<sup>[12]</sup> Furthermore, the tight knot of prolene on the elastic acrylic material cinches and prevents slippage and rotational movement [Figs. 1c and 2].

Eighty-six percentage of our eyes showed a statistically significant improvement in the eventual BCVA, which was comparable to another study with scleral fixation of foldable acrylic IOLs.<sup>[9]</sup> This highlights the fact that after in the bag

**Table 3: Details of individual patients (including pre- and post-operative visual acuity and indication for surgery)**

Age	Dx	logMAR		Remarks
		BCVA preoperative	BCVA postoperative	
18	Tr subluxation	1.5	0.1	
20	Marfans	0.5	0	Both eyes of same patient
20	Marfans	0.6	0.4	
52	Post-ICCE	0.4	0.4	
23	Marfans	0.3	0.2	Both eyes of same patient
23	Marfans	0.3	0	
56	Per operative zonulardialysis	0.7	0.2	
31	Tr Ant dislocation	2	2.7	Glaucoma resolved over 2 months. Visual worsening attributed to disc damage
55	Post-ICCE	0.6	0.3	Both eyes of same patient
55	Post-ICCE	0.4	0.3	
19	Tr zonulodialysis	1	0.4	
37	Tr zonulodialysis	1.2	0.6	
59	Per operative PCR	0.9	1.2	Cystoid macular edema persisted for about 3 months. Visual worsening attributed to macular scar formation
48	Post-ICCE	0.4	0	Both eyes of same patient
48	Post-ICCE	0.5	-0.1	
57	Per operative zonulardialysis	1	0.4	
55	Per operative zonulardialysis	1.2	0.4	Vitreous hemorrhage resolved in 2 months
42	Tr subluxation	1.1	0.8	
56	IOL decentration + PCR	1	0.2	
18	Tr subluxation	0.8	0.6	
29	Marfans	0.7	0.2	Both eyes of the same patient
29	Marfans	0.4	-0.1	
53	IOL decentration + zonulardialysis	1	0.3	
19	Tr zonulardialysis	0.9	0.8	
44	Tr subluxation	0.4	0.3	
59	Per operative PCR	0.8	0.3	
24	Tr zonulodialysis	0.9	0.4	
24	Marfans	0.4	0	

PCR: Polymerase chain reaction, IOL: Intraocular lens, ICCE: Intracapsular cataract extraction, BCVA: Best-corrected visual acuity, logMAR: Logarithm of the minimum angle of resolution

placement, SFIOL provides the most physiological position of IOL as it places the refractive surface close to the nodal point yielding better visual outcomes. Improvement in BCVA in aphakes with clear media supports this. The 3 months refraction with only eight eyes having moderate astigmatism and none having more than 3.25 diopters indicates the rotational stability (tilt) of the IOL.<sup>[14]</sup>

Suture-related problems intraoperatively and in follow-ups have been highlighted in the past studies.<sup>[2]</sup> The fear that the polypropylene would possibly cut through acrylic with time was overcome by a simple experiment of tightening the knot of polypropylene 7–0 suture over the haptic. This caused the suture to break before causing any damage to the haptic. Since we are using 10-0 suture it is unlikely to cut through acrylic haptics. Suture degradation leading to spontaneous dislocation has been found in about 6% of eyes in children undergoing SFIOL.<sup>[15]</sup> A study of SFIOL in adults did not report a single case of suture degradation or erosion over a mean follow-up of 36 months.<sup>[10]</sup> In our study too, we did not encounter any such case over a mean follow-up period of 26 months compared to about 3% IOL decentration and haptic extrusion rate reported by Kumar *et al.* with glued SFIOLs<sup>[9]</sup> highlighting the effectiveness of the described technique.

In our study, we had no case of retinal detachment as compared to previous studies where postoperative retinal detachment was a significant complication.<sup>[10,16]</sup> This along with absence of other major complications such as suprachoroidal hemorrhage and choroidal detachment could be due to smaller sclero-corneal incisions which provide a close system and

prevents intraoperative hypotony, vitreous loss, and excessive vitreous disturbance associated with larger incisions required for conventional SFIOL.<sup>[7]</sup>

A single patient developed postoperative vitreous hemorrhage which cleared spontaneously over 2 months with visual improvement. Another patient of trauma had a persistently raised intraocular pressure, advanced glaucomatous disc damage, and visual worsening after treatment. Another patient developed cystoid macular edema postoperatively which caused worsening of BCVA. The patient did not have any obvious vitreous traction and also refused any surgical intervention. He eventually developed a macular scar.

Though glued SFIOL has come up as a strong option, it has disadvantages.<sup>[9]</sup> Instrumentation associated with glued IOLs is costly, sophisticated, and it also has a steep learning curve. On the other hand, the acrylic sutured SFIOL is cheaper and requires minimal special instrumentation. One of its greatest advantages is its use in the cataract surgery where the capsular loss is not anticipated. The surgeon can use the same acrylic PCIOL which was planned for in the bag implantation. It may be advisable to keep this option in high-risk patients.

Mean follow-up period is about 26 months; however, it appears to be sufficient to comment on the safety of these IOLs for scleral fixation and recommend its usage. A bigger cohort and a longer follow-up are needed for concluding the advantages and long-term complications of acrylic SFIOLs.

## Conclusion

The use of closed loop haptic acrylic IOL for scleral fixation with easier intraoperative suture management and lesser postoperative complications appears to be a safe and effective alternative to conventional SFIOLs.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

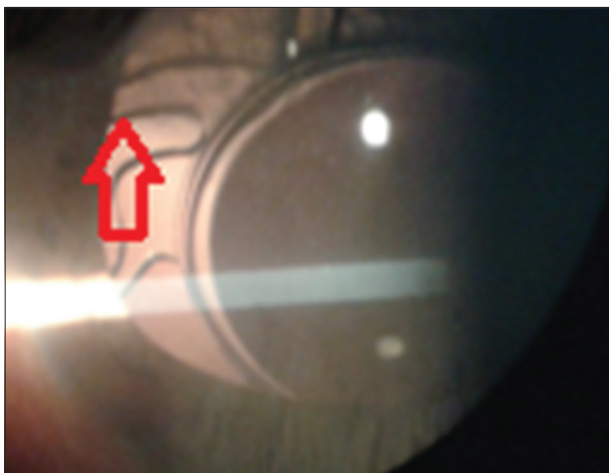
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**Table 4: Postoperative refraction at 3-month follow-up**

Postoperative refraction at 3 months				
Sphere (range +2.5 to -4.0 D) n=29 eyes		Cylinder (range +1.5 to -3.25 D) n=29 eyes		
<±1.0 D n=15	±1.0 to ±3.0 D n=11	>±3.0 D n=3	≤±2.0 D n=21	>±2.0 D n=8

D: Dioptres



**Figure 2:** Images showing posterior chamber intraocular lens fixated with the described technique. The stretched haptic (red arrow) in this myopic (large) eye can be made out through the dilated pupil

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