The Functional Results of Posterior Chamber Intraocular Lens with Scleral-Fixation: A One-Year Follow Up Analysis

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Planned extracapsular cataract extraction with posterior chamber intraocular lens implantation is the “gold standard” procedure for managing cataracts. Posterior chamber intraocular lenses have several distinct advantages which include a lower rate of retinal detachment, cystoid macular oedema, a proven track record especially when implanted in eyes with co-existing ocular diseases such as diabetic retinopathy, uveitis and glaucoma 1,2,3.

Long term follow-up of anterior chamber intraocular lens implants (ACIOLs) have been associated with complications like pseudophakic bullous keratopathy, uveitis, glaucoma, hyphaema and cystoid macular oedema 4,5. Although the newer designs of open loop flexible AC IOLs are associated with fewer complications, their use is limited in the presence of uveitis, glaucoma and in eyes with compromised anterior chamber angle anatomy 6.

The essential prerequisite for posterior chamber intraocular lens implantation (PCIOL) is the presence of adequate capsulozonular support. However in the absence of adequate support for a posterior chamber implant, intraocular lenses fixated to the sclera or iris has been described. Hu and Cowden 7, Agapitos and Lindstorm 8 have described various techniques for suture fixation of PC IOL implants to the sclera in the absence of adequate capsulozonular support.

Transsclerally sutured lenses are stabilised by the fixation sutures and the presumed placement of haptics in the ciliary sulcus. Increased clinical experience with these IOLS have shown that they are well tolerated in the eye although a variety of associated complications have been described. These include (1) intraocular haemorrhage during needle passage through the ciliary body, (2) persistent suture track and higher risk of endophthalmitis, (3) suture erosion through scleral flap and gaint papillary conjunctivitis, (4) suture slippage from haptic causing subluxation, tilt or dislocation of IOL, (5) difficult IOL power calculation, (6) episcleritis, (7) secondary glaucoma etc 9,10,11.

This prospective non-randomized interventional study was undertaken to assess the functional results and complications in a consecutive series of 25 eyes with surgical aphakia who underwent scleral fixation of PC IOL implant by the ab-externo four point scleral fixation technique.

Materials and Methods

This trial enrolled 25 eyes of 25 patients with surgical aphakia due to various causes, in whom adequate capsulozonular support for a PC IOL implantation was absent. Out of the 25 eyes, 16 patients had undergone congenital cataract removal, 6 had been operated on for traumatic cataracts and 7 had undergone extracapsular cataract extraction for senile cataracts. The time interval between the primary cataract
procedure and the surgical implantation of the secondary PC IOL implant was also noted.

All patients underwent a thorough preoperative evaluation which included a best corrected visual acuity with aphakic correction, applanation tonometry, slit lamp evaluation, dilated evaluation of fundus periphery, and biomicroscopic evaluation of the macula with a 78 D / 90 D lens. During slit lamp evaluation special care was taken to evaluate corneal clarity, gonioscopy of angles, presence of vitreous in the anterior chamber and for evidence of epithelialisation etc. All preoperative findings were recorded and the patient counseled on the options for IOL implants and the pros and cons of each procedure. An informed consent to undergo scleral fixation and to participate in the follow-up evaluation was taken.

An ab - externo four point scleral fixation technique described below was performed on all 25 patients under local anesthesia. After adequate peritomy two partial thickness scleral flaps hinged at the limbus was fashioned at the 3 o’clock and 9 o’ clock meridians. Doubled arm 10° prolene sutures with straight needle was used. The scleral entry point was 0.50 mm to 0.75mm from the surgical limbus in the bed of the scleral flap avoiding the major arterial circle, and the entire ciliary body and providing true ciliary sulcus placement of the IOL. The needles were rail-roaded out of the eye through the bed of the opposite scleral flap using a bent 25g needle introduced through the scleral bed (Fig:1a&b).

A limbal section was fashioned and the sutures were drawn out of the eye, and cut into two halves (Fig 1 c and d). Each half of the sutures were passed through the fixation eyelet on the superior and inferior haptic of the IOL at the point of maximum haptic spread. A single piece, all PMMA, large optic IOL (Aurolab equiconvex 6.5mm optic, 13mm overall length) was used for scleral fixation (Fig 2 a-c).

The IOL was introduced into the posterior chamber, and the sutures were tightened and tied (Fig 3).

Fig 1. (a-d) a & b showing the passage of 10° Prolene double armed suture through the bed of the scleral flap.(c) limbal section is performed (d) The sutures are grasped in the pupillary area with forceps and brought out through the limbal section.
Fig. 2. The cut ends of the 100 prolone suture is tied and anchored to the fixation eyelets on the haptics of the PC IOL at the point of maximum haptic spread.

Fig. 3. The IOL is introduced into the posterior chamber and the sutures tightened and tied.

Fig: 4 a & b Stable well centered PC IOL implant under air bubble in anterior chamber.

The suture knots were buried in the scleral bed and the scleral flap sutured. The section was closed with 10’ Nylon sutures (Fig 4a & b).

Subconjunctival garamycin and decadron was given at the conclusion of the procedure. All the surgeries were performed by a single surgeon and no major intraoperative complications were encountered.

Postoperatively the patient was evaluated on 1st and 7th postoperative day, every fortnightly for 2 months and monthly for a year. The total duration of follow up was 12 months. At each postoperative visit, a slit lamp evaluation and tonometry was performed. The best corrected visual acuity was checked on the 5th postoperative day and monthly thereafter. Corneoscleral sutures were removed after 45 days in 21 eyes and at 3 months postoperatively in 4 patients.
Indirect ophthalmoscopic evaluation and biomicroscopic assessment of macula was performed monthly during the follow-up period. A careful note of IOL stability and centration, suture related complications, postoperative reaction and cystoid macular oedema was made and the compiled pre and postoperative data analysed. The results were compared with previously published studies.

Results

This study enrolled 25 consecutive patients with surgical aphakia who underwent suture fixation of a secondary PC IOL implant by an ab-externo four point scleral fixation technique. The patients were of the age group ranging from 18 years - 57 years (Mean : 37.5 years). The study group had 16 males and 9 female patients. The cause for surgical aphakia was surgery for congenital cataract in 16 eyes (64 %); following traumatic cataract surgery in 6 eyes (24 %) and extra capsular extraction for senile cataract in 7 eyes (28 %). The time interval between the primary cataract procedure and 2° IOL procedure was between 5 – 10 years after the primary cataract surgery in 10 of the 25 eyes (40 %). Nine eyes had undergone parsplana lensectomy, and in 16 eyes extra capsular cataract surgery had been performed. The preoperative best corrected visual acuity ranged from 6/9 (21 eyes) to 6/18. Slit lamp evaluation showed aphakia with intact anterior hyaloid face and no vitreous herniation into anterior chamber in 9 eyes, ruptured anterior vitreous with strands in the anterior chamber, iris surface and section in 9 eyes, and preexisting corneal opacities in 7 eyes. The immediate postoperative complications included iritis (2 eyes), inflammatory cocoon membranes (2 eyes), striae keratopathy (1); IOL tilt (1); and vitreous in anterior chamber (1 eye). Majority of patients achieved a best corrected vision of 6/9 on the 5th postoperative day (20 eyes) and this number decreased to 17 eyes by the 1st month after surgery. By the end of 12 months 18 eyes had a best corrected visual acuity of 6/9 and 6 eyes had a vision of 6/12 (TABLE 2).

### TABLE 2 Distribution of visual acuity (BCVA) during follow-up

<table>
<thead>
<tr>
<th>VISION</th>
<th>5th POD</th>
<th>1 month</th>
<th>3 months</th>
<th>6 months</th>
<th>1 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/9</td>
<td>20</td>
<td>17</td>
<td>14</td>
<td>15</td>
<td>18</td>
</tr>
<tr>
<td>6/12</td>
<td>2</td>
<td>3</td>
<td>6</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>6/18</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>6/24</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Analysis of the post operative refractive error showed that 14 eyes had a cylindrical correction ranging from −1 D to −2.00D, spherical correction = −2.00 D in 14 eyes, and a correction of −2.00D to 3.50 D Cylinder or Sphere in 9 eyes each. Delayed postoperative complications included IOL tilt (1); and cystoid macular oedema (1 eye). There was no incidence of suture related complications, endophthalmitis, giant papillary conjunctivitis, retinal detachment etc at 12 months follow up.

Discussion

The current indications for scleral fixation of PC IOL include aphakic status after intracapsular cataract surgery with inability to tolerate contact lenses, partial or total absence of the posterior capsule after extracapsular cataract extraction, and subluxation or dislocation of crystalline lens 11. Also in those cases where iris atrophy, distortion or absence render iris fixation impossible, a scleral fixation remains the only viable alternative 12. Stability of the lens in scleral fixation is primarily the result of intact trans-scleral sutures and not fibrosis,
encapsulation or the presumed ciliary sulcus placement of haptics. Numerous techniques have been devised to increase the chances of correct positioning, although no surgical technique guarantees sulcus placement of the haptics.

Using eye bank eyes Duffey and co-authors defined the exact anatomic measurements and surgical techniques necessary for sulcus fixation of the IOL. A scleral entry point 0.50mm to 0.75mm from the surgical limbus avoids the major arterial circle and the entire ciliary body and may provide true ciliary sulcus placement of the IOL.

The use of a one piece all PMMA, large optic IOL with fixation eyelet in each haptic in the area of maximum haptic spread provides excellent centration and haptic stabilization when one trans-scleral suture pass per haptic is made.

Postmortem histological studies on the characteristics at the site of scleral suture fixation disclosed a thin fibrous capsule surrounding the haptic at their attachment and absence of inflammation around the trans-scleral portion of the suture. Intraocular tilt of the suture supported PCIOL has not been associated with significant astigmatism.

Analysis of the complications associated with sclerally sutured PC IOLS in our series of 25 cases showed minimal and acceptable rate of complications. IOL tilt in one patient resulted in a postoperative astigmatism of –1.5 D cylinder. Cystoid macular oedema in one patient, diagnosed in the second postoperative month resolved with medical treatment. Our series is notable for the absence of suture related complications, endophthalmitis and retinal detachment.

The main advantages of this technique are 1) easy placement of sutures 2) less chance of suture slippage 3) avoidance of difficult intraoperative maneuvers and possible injury to the ocular tissues. This method is simple and provide predictable placement of the sutures within the ciliary sulcus, proper haptic stabilisation, optic centration and decreases the risks of intraoperative bleeding during needle pass through the ciliary body. It requires minimal manipulation is relatively atraumatic to the delicate ocular structures, and facilitates safe IOL placement in the absence of capsulozonular support.

References