STUDY ON VISUAL OUTCOME FOLLOWING TORIC IOL IMPLANTATION IN CATARACT PATIENTS WITH ASTIGMATISM

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ABSTRACT

BACKGROUND
The aim of this study was to determine the efficacy of toric IOL placement in astigmatic patients with immature cataract.

MATERIALS AND METHODS
This prospective study included 20 eyes of 20 patients with a visually significant cataract and corneal astigmatism ≥1.00 D. All patients underwent phacoemulsification and implantation of SP TORIC IOL. The unaided visual acuity and best corrected visual acuity were evaluated. Toric IOL axis and alignment was measured with slit lamp examination. The IOL manufacturer’s web-based toric calculator was used to determine the required cylinder power and axis for the IOL that was going to be implanted.

RESULTS
Post-operative examination was conducted at day 1, day 3, after 1st week, and 1 month later. The average cylinder in IOL plane is 3.04D±0.66SD. and average cylinder in corneal plane is 2.14D±0.38. The average pre op LOG MAR was 0.8±0.2SD. One month postoperatively, the average Log MAR is 0.2±0.21SD. And the difference LOG MAR is 0.61±0.31SD. Inference: A significant improvement was noted after surgery in Log MAR values. Among 20 patients, 18 (90%) patients had improved visual acuity, 2 (10%) patients didn’t show any visual improvement due to misalignment of IOL axis. There were no significant intraoperative complications among the study population.

CONCLUSION
Implantation of SPTORIC IOL is an effective and safe method to correct corneal astigmatism during cataract surgery.

KEYWORDS
Toric IOL, Astigmatism, Cataract Patients.


BACKGROUND
Incidence of preoperative astigmatism of 1.5 diopters (D) or greater is present in 20% of patients undergoing surgery for age-related cataracts.1 Approximately 60% of patients undergoing cataract surgery have more than 0.75 D of corneal astigmatism.2 Residual postoperative astigmatism is an important cause for ametropia after cataract surgery.3 If uncorrected, this astigmatism results in reduced visual acuity and increased spectacle dependence in pseudophakic eyes.4 The correction of corneal astigmatism in cataract surgery can be achieved using different surgical techniques like corneal or limbal relaxing incisions, modification in the placement of the incision site,5,6 or by implanting a toric intraocular lens (IOL).6 Several studies have reported successful visual and refractive outcomes after implantation of different model soft toric IOL.7-21 The purpose of the current study is to report our clinical and visual outcomes at 1 month after uncomplicated cataract surgery with toric IOL implantation (SupraPhob).

MATERIALS AND METHODS
This prospective study was conducted in 20 eyes of 20 patients with a visually significant cataract and corneal astigmatism ≥1.00 D. The study conducted in a tertiary care centre over a period of 3 months.

Inclusion Criteria
Patients included were in the age 18 yrs. and above, with regular corneal astigmatism of 1-3 D and visually significant cataract (Immature cataract of grade I to IV).
Exclusion Criteria
The exclusion criteria includes patients with Irregular astigmatism, corneal oedema, corneal dystrophy, systemic or ocular medication that could affect vision, H/o previous ocular surgery, post refractive surgery, amblyopia, strabismus, forme frusta or clinical keratoconus, pupil abnormalities, capsular or zonular abnormalities with the potential of inducing IOL decentration or tilting etc.

Preoperative Evaluation
Pre-operative evaluation includes objective and subjective refraction, measurement of LogMAR, uncorrected (UDVA), corrected distance visual acuity (CDVA), slit lamp examination, Fundus examination, intra ocular pressure, axial length measurement, keratometry, IOL power, B scan etc for all the study population.

The IOL manufacturer’s web-based toric calculator was used to determine the required cylinder power and axis for the IOL to be implanted. TORIC IOL calculation was based on patient input data includes eye laterality, keratometry values with axis, IOL power, incision location, surgeon induced astigmatism. Following output data were obtained from toric calculator, they are optimal location of IOL, anticipated residual astigmatism, spherical equivalent lens power.

SUPRA PHOB TORIC IOL Properties
SupraPhob is a new hydrophobic toric intraocular lens. Its overall diameter is 13 mm and IOL lens spherical power range is available from 7 to 30 D. In our study, we determine the efficacy and visual outcome of SP TORIC IOL for correcting preexisting corneal astigmatism in cataract patients. Series of SP TORIC IOL models were used, namely SPTORIC T4, T5, T6 and T7 which corrects 1.55D, 2.06D, 2.57D, and 3.08 D respectively.

Follow Up
Postoperatively, patients were followed up in the outpatient department on day 1, day 3, after 1st week, and 1 month later. Unaided visual acuity (UCVA) at day 1,3,7, and 30 and best corrected visual acuity (BCVA) at day 30 were assessed by a single observer. Slit lamp examination was done on all postoperative visits to check for the anterior chamber reaction. The achieved IOL alignment was analysed with slit lamp by a single masked observer. This was compared with preoperative photographs showing reference marks.

Data Analysis
Following data were analysed for all the patients-Age, Sex, laterality, Preoperative Cylinder power at corneal plane & IOL plane, Type of Toric IOL and Log MAR chart of pre op UVCA and post op UVCA and its comparison.

Statistical Analysis
Data relating to age, sex, laterality and type of toric intraocular lens implanted were analysed. Comparison of pre op LOG MAR and post op LOG MAR on 30th post op day was done.

RESULTS
Our study population includes, age group between 45 and 60 years. 50% of patients were male and 50% were female. In our study laterality included 55% left eye and 45% right eye.

The Mean age in our study was 52 years, with 20% of patients being in the age group of >55 years. 7 patients were <50 years. Mean axial length in our study 22.8 ±0.97SD. SPTORIC IOL models used in our study is T4 (25%), T5 (50%), T6 (20%) and T7 (5%) respectively.

Surgical Technique
Prior to surgery, eye to be operated was anesthetized with 0.5 % proparacaine. Patient seated in upright position, with the help of bubble marker, axis is marked on the cornea to act as per operative guide for toric IOL implantation. Sitting position is preferred to mark axis, so as to over come cyclo torsion which may occur in lying supine position.

Intra operatively the required IOL axis was determined with the help of axis marker. A temporal incision was made after phacoemulsification. The IOL was inserted into the capsular bag through the incision in the superior quadrant. After complete removal of OVD from capsular bag, the IOL was rotated to correct axis position.

Figure 4 (bar chart) shows pre-operative and 1 month post-operative visual outcome in the analysed sample. The mean LOGMAR UCVA at 30th post-operative day was 0.20, which was a significant improvement in LOGMAR UCVA, noted after surgery. After 1 month post-operative period, a LOGMAR UCVA of 0.15 was achieved in 18 eyes (90%).

**DISCUSSION**

Accurate positioning of a toric IOL is the most important factor determining the efficacy of the astigmatism correction. Although precise axis alignment is critical to good post-operative visual outcome following toric IOL implantation, misalignment of toric IOL axis remains a major barrier in the optimization of postoperative results.

Implantation of a toric intra ocular lens elicited a statistically significant change in UCVA on day 30. In our study visual improvement after toric IOL implantation was significant and comparable to other studies. Uncorrected visual acuity was checked on day 1, 3, 7, 30th post-operative day. The difference value (0.61) between mean pre-operative Log MAR value (0.81) and post-operative mean Log MAR value (0.20) was significant.

In our study 2 patients had IOL misalignment noted by slit lamp method, and the mean alignment error noted was 6 degrees.

The advanced IOL design of SupraPhob yields excellent stability, so that even after the shrinkage of the capsular bag, the IOL remains well centred. The advanced 360° Square Edge technology makes SupraPhob PCO free. The UV blocking Chromophores of SupraPhob protects the retina from UV rays.

Even the patients with more than 55 years of age prefers toric IOL implantation for better quality of vision.

In the studies done by Mendicute et al[2], Visser et al[3], Carey et al[4], Chang et al[5], BCVA and UCVA were better at 1 month post-operative period.

The mean BCVA of the study by Visser et al[6] was 0.81(SD = 0.21),7 and by Carey et al. was 0.01 (SD = 0.12).22 Several studies proved that the stability of toric IOL was better after one month. Hence the comparison of pre and post op UCVA was done after one month in our study.

Limitations in our study with respect to small sample size (20 eyes), can be overcome by long term prospective study with larger sample size in order to confirm the results and to study the long term post-operative complications.

Based on this prospective clinical study and on comparison with other clinical studies toric IOL corrective procedures are safe and effective for treatment of residual astigmatism following cataract surgery. Careful attention towards correct axis positioning of the IOL at the time of surgery and meticulous removal of residual viscoelastic material after IOL insertion will help reduce rate of post-operative rotation.

**CONCLUSION**

The key to accurate post-operative results and visual outcome following toric IOL implantation in patients with cataract and astigmatism, lies in proper patient selection, accurate biometry and right surgical technique.

**REFERENCES**


[7] Visser N, Bauer NJC, Nuijts RMMA. Toric intraocular lenses: historical overview, patient selection, IOL calculation, surgical techniques, clinical outcomes, and

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**Table 1. Shows Percentage of SPTORIC IOL Model Implanted in the Study Patients**

<table>
<thead>
<tr>
<th>Model</th>
<th>n</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPTORIC T4 (1.55 D)</td>
<td>5</td>
<td>25%</td>
</tr>
<tr>
<td>SPTORIC T5 (2.06 D)</td>
<td>10</td>
<td>50%</td>
</tr>
<tr>
<td>SPTORIC T6 (2.57 D)</td>
<td>4</td>
<td>20%</td>
</tr>
<tr>
<td>SPTORIC T7 (3.08 D)</td>
<td>1</td>
<td>5%</td>
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