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## Original Article

# A clinical study to evaluate the results after toric intraocular lens implantation in cases of corneal astigmatism

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## ABSTRACT

**Background:** Modern day cataract surgery aims at a spectacle free vision which becomes difficult in cases with pre-operative astigmatism more than 1.5 D. Implantation of toric intra-ocular lenses (IOL) after phacoemulsification in such eyes is one of the ways to counteract this problem.

**Methods:** Thirty eyes with pre-operative astigmatism between 1.5 D and 4.5 D were implanted with toric IOLs following uneventful phaco-emulsification. The estimation of the axis of implantation of this toric IOL included calculating the surgically induced astigmatism (SIA) of the surgeon.

**Results:** Post-operatively, 20 (66.67%) patients had a visual acuity 6/9 or better and 17 (57%) had a visual acuity of 6/6 at 12 weeks. The mean postoperative uncorrected visual acuity (UCVA) was  $0.12 \pm 0.15$  at 12 weeks. The difference between means of preoperative best corrected visual acuity (BCVA) LogMAR and postoperative UCVA at 12 wk LogMAR was found to be statistically significant at  $p = 0.001$ . Mean (SD) scores of pre-op astigmatism of study group was  $-2.20$  (0.67) and residual astigmatism was  $-0.32$  (0.44).

**Conclusions:** The difference between means of pre-op astigmatism and residual astigmatism in the study group was significant at  $p = 0.001$  with 95% CI  $-2.22$  to  $-1.50$ . This significant difference was because of the toric IOL implantation.

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## Introduction

The evolution of cataract surgery from crude methods such as couching and needling to modern day high precision phacoemulsification surgery has been a fascinating journey. The advent of phacoemulsification has transformed the simple surgery of removal of cataractous lens into a refractive surgery by providing the best possible visual recovery to the patient. This has been achieved by a shift to smaller incisions and the management of corneal astigmatism.<sup>1,2</sup>

The prevalence of astigmatism increases with age and it is estimated that approximately 50% of the population older than 60 years has astigmatism of more than 1.00 Diopter (D).<sup>3</sup> Up to 22% of patients undergoing cataract surgery have a preexisting astigmatism exceeding 1.50 D. To optimize visual outcomes and minimize spectacle dependence, this astigmatic component has to be addressed.<sup>4-7</sup>

The various modalities for correction of astigmatism in patients undergoing cataract surgery include prescription of glasses, contact lenses, corneal relaxing incisions, astigmatic keratotomies, limbal relaxing incisions, excimer laser ablation or toric IOL implantation.<sup>8</sup> Spectacle use causes meridional magnification and spatial distortion and thus surgical correction of astigmatism is preferred. Correction of astigmatism by surgical techniques on the cornea have several limitations including poor predictability in eyes with higher astigmatism due to variable tissue healing and long term mechanical instability.<sup>9,10</sup>

Toric intraocular lenses are foldable IOLs that neutralize the preoperative corneal astigmatism by providing a toric refracting surface on the IOL. They represent a stable and predictable method of regular astigmatism correction post phacoemulsification surgery.<sup>4</sup>

With such rapid advances in cataract surgery, it is important to study the final visual recovery following these techniques. A study was therefore conducted at a tertiary care centre to study the results of implantation of toric IOLs in eyes with preoperative corneal astigmatism.

## Material and methods

This was an interventional case series where cases of cataract with preexisting corneal astigmatism between 1.5 D and 4.5 D were enrolled in the study. Cases eligible for surgery under local anaesthesia were enrolled in the study. All patients were followed up for a period of 12 weeks (3 months) in the postoperative period.

### 1. Study protocol:

- a. A detailed history was taken regarding any ocular trauma, previous inflammations or drug intake. History regarding previous use of spectacles was used as an indicator for astigmatic case selection. Patient was also asked about any previous surgeries or any systemic diseases like diabetes mellitus, hypertension, chronic obstructive pulmonary disease and ischaemic heart disease.

### 2. Examination:

- a. Complete ocular examination was done as follows:

- i. Preoperative uncorrected visual acuity (UCVA) and best corrected visual acuity (BCVA) was recorded on an illuminated Snellen's chart at a distance of 6 m.
- ii. Ocular examination with torchlight including ocular muscle balance was done.
- iii. Detailed examination of each eye under slit lamp for keratic precipitates and lens examination for cataract as per Lens Opacification Classification System III criteria was done.
- iv. Distant direct ophthalmoscopy for evaluation of the density of lenticular opacification.
- v. Detailed fundus examination where possible with direct ophthalmoscopy/slit lamp biomicroscopy with 90 D/indirect ophthalmoscopy.
- vi. Intraocular pressure estimation with applanation tonometer.
- vii. Syringing of the naso-lacrimal duct.
- viii. Systemic investigations as required for cataract surgery were performed. Patients with underlying systemic diseases were evaluated and managed accordingly prior to surgery. Surgery was undertaken only after a pre anaesthetic evaluation.

### b. Inclusion criteria

Patients from either sex were included in the study

- i. Patients undergoing phacoemulsification surgery for cataract with preexisting regular corneal astigmatism of equal to or more than 1.50 D and less than 4.50 D were enrolled for the study.
- ii. Cases operated by the same surgeon with the same surgical technique, using the same incision site i.e. 90° were included in the study.

### c. Exclusion criteria

- i. Corneal abnormalities.
- ii. Irregular astigmatism.
- iii. Preoperative corneal astigmatism not meeting inclusion criteria.
- iv. Corneal opacities.
- v. Previous corneal/intraocular/refractive surgery.
- vi. Intraoperative cataract surgery complications.
- vii. Iris/pupillary abnormalities.
- viii. Eyes with glaucoma.
- ix. Eyes with amblyopia.
- x. Eyes with any vitreo retinal disorder.

### 3. Preoperative workup:

The selected patients were subjected to evaluation of the amount and axis of astigmatism with a keratometer. The manual keratometer readings were correlated with auto keratometer readings. IOL power calculation was done using SRK-T formulae with the help of IOL master.

The correct toric intraocular lens model spherical equivalent power was noted after feeding the A-constant of the lens (118.4) into the IOL master. Following this refractive procedure the postoperative spherocylinder was conceived as the sum of the preoperative and the surgically induced spherocylinder. (In other words the surgically induced spherocylinder is the difference between the postoperative and the preoperative spherocylinder).

Optimal axis placement was determined using the online toric IOL calculator after feeding in the keratometry

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