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A study of outcome of toric intraocular lens after cataract surgery

Ophthalmology

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ABSTRACT

AIM : To evaluate the clinical outcomes after uncomplicated cataract surgery with implantation of an aspheric toric intraocular lens (IOL)
MATERIAL AND METHODS : It was a retrospective study including 30 consecutive eyes of 22 patients with a visually significant cataract and corneal astigmatism ≥ 0.75 D and undergoing uncomplicated cataract surgery with implantation of the toric IOL . Visual, refractive, and keratometric outcomes as well as IOL rotation were evaluated during follow-up.
RESULTS : Postoperative UCVA of 6/9 or better was achieved in 86.67% of eyes. Post operative refraction of less than -0.5 d cyl was noted in 46.66% patients. For rotational stability of iol, accurate alignment of IOL was seen in 60% patients on 1st post operative day. Out of 30 patients, only 4 (13.33%) patients needed glasses for distance for better visual acuity, rest were not needed any glasses.
CONCLUSION : Cataract surgery with implantation of the toric IOL is an effective method of refractive correction in eyes with corneal astigmatism.

KEYWORDS:

Toric IOL, Astigmatism

Approximately 60% of patients undergoing cataract surgery have more than 0.75D of corneal astigmatism.[i] If uncorrected, this astigmatism results in reduced visual acuity and increased spectacle dependence in pseudophakic eyes.[ii]The correction of corneal astigmatism in cataract surgery can be achieved using different surgical techniques (corneal or limbal relaxing incisions, modification of the placement of the incision site)[iii] or by implanting a toric intraocular lens (IOL).Several studies have reported successful visual and refractive outcomes after implantation of different models of toric IOL. The purpose of the current study was to report our clinical outcomes after uncomplicated cataract surgery with implantation of the toric IOL.

MATERIAL AND METHODS.

This was a retrospective case series included 27 eyes of 18 patients undergoing cataract surgery with implantation of the toric IOL. Inclusion criteria were visually significant cataract, age of 18 years or older, and preoperative corneal astigmatism of 0.75D or higher. Patients were excluded from the study when the following conditions were present: previous ocular surgery, amblyopia, strabismus, retinal pathology, corneal pathology, pupil abnormalities, capsular or zonular abnormalities with the potential of inducing IOL decentration or tilting.

Before surgery, all patients underwent a complete ophthalmological examination that included the following: manifest refraction, measurement of uncorrected (UDVA), and corrected distance visual acuity (CDVA), biometry and keratometry with the IOLMaster, corneal topography to exclude irregular astigmatism, slit lamp examination, and dilated fundoscopy. 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. The preferred clear corneal incision location was the 10 degree superior to 0-180 degree axis on temporal side and the surgeon's estimated surgically induced corneal astigmatism was 0.4D.

Before surgery, after instilling topical anesthetic eye drops and with the patient in sitting position, the corneal limbus was marked at the 0°, 90°, and 180° meridian using the toric reference marker. Intraoperatively the required IOL axis was determined with the aid of the axis marker. After phacoemulsification, the IOL was inserted into the capsular bag through a 2.2mm corneal incision and rotated near final axis position. After the removal of the ophthalmic viscosurgical device from the capsular bag, the IOL was rotated, if necessary, to the correct axis position.

On the first day after surgery, the axis position of the implanted toric IOL was analyzed under pupil dilation (1.0% tropicamide) with the slit lamp by performing a thin coaxial slit rotation until it overlapped the axis margins on the IOL. In one cases of a rotation of the IOL axis of more than 5 degrees the IOL was repositioned in the operating room and were excluded from study. One month after surgery, manifest refraction, UDVA and CDVA, and corneal astigmatism were measured. Patients were asked about the incidence of postoperative optical/visual disturbances, such as arc of light, halos, ghosting, or glare, and about their satisfaction with the achieved visual outcome, using a scale from 0 to 10 (0 = not at all satisfied, 10 = very satisfied).

RESULTS

Out of 30 patients in whom toric IOL was implanted, 26 (86.67%) patients were having uncorrected visual acuity of 6/9 or better while 4(13.33%) patients were having UCVA less than 6/9. After one month refraction was done in all patients. Post operative refraction of toric power less than -0.5 d cyl was seen in 14(46.66%) patients, -0.5 to -1.0 cyl was seen in 13 (43.33%) patients and more than -1.0 d cyl was seen in 3 (10%) patients. On the first post operative day IOL alignment was checked, which was accurate in 18 (60%) patients, while rotation of less than 5 degrees was seen in was seen in 8(26.66%) of patients and between 5 to 10 degrees was seen in 4 (13.33%) of patiens. Most of the patients were happy without glass. Out of 30 patients, only 4 (13.33%) patients needed glasses for distance for better visual acuity, rest were not needed any glasses.

DISCUSSION:

Recently, the correction of corneal astigmatism in cataract surgery by implanting toric IOLs has gained popularity due to the increased patient demands and the excellent clinical outcomes reported with these IOLs. In the current study we evaluated a specific modality of aspheric toric IOL, allowing the correction of a great variety of corneal astigmatism as it is available in cylinder powers of 1.00, 1.50, 2.25, 3.00, and 4.00D (equivalent to 0.69, 1.03, 1.54, 2.06, and 2.74D at the corneal plane, resp.). Some cases of higher corneal astigmatism which cannot be completely controlled with the available cylinder powers of this IOL model have nevertheless been included in our series. In general, good visual and refractive outcomes have been obtained with the toric IOL, mainly due to its good positional stability.

Our results confirmed the results of previous studies evaluating the same IOL and demonstrating its ability as an effective method of corneal astigmatism reduction[vi] .At 1 month after surgery, refractive astigmatism ranged from 0.00 to −2.25D, with a mean value of −1.23 ± 0.88D. Lower postoperative refractive cylinder values have been reported by other authors evaluating the same type of toric IOL. Waltz et al. [vii]found a mean percentage of refractive cylinder reduction of 76.27 ± 33.09% at 6 months after cataract surgery with implantation of the toric IOL, but in a group of eyes only requiring cylinder correction of 0.75 to 1.50D. Cervantes-Coste et al.[viii] found a residual refractive cylinder of 0.55 ± 0.60D at 3 months after cataract surgery with implantation of a toric IOL in 19 eyes with symmetric corneal astigmatism of more than 2.25D. Ouchi and Kinoshita found similar results in another sample of eyes undergoing cataract surgery with implantation of a toric IOL for the correction of corneal astigmatism of more than 2.50D (mean postoperative refractive cylinder: 1.07 ± 0.60D). Some authors have even reported the necessity of implanting two IOLs in piggyback for achieving an acceptable refractive outcome in eyes with high corneal astigmatism. All eyes (100%) had a mean

postoperative spherical equivalent within ±1.00 D. This is consistent with the results of previous studies evaluating the same toric IOL and also other modalities of toric IOLs.[ix]

In agreement with the good refractive outcomes, excellent UDVA results were obtained which was the main reason for the high levels of postoperative patient satisfaction. Out of 30 patients in whom toric IOL was implanted, 26 (86.67%) patients were having uncorrected visual acuity of 6/9 or better while 4(13.33%) patients were having UCVA less than 6/9. Sheppard et al. [x]reported that 88% of eyes achieved a UDVA of 20/40 or better after implantation of the same toric IOL as evaluated in our series. Similarly, Ferreira and Almeida [xi]found a postoperative UDVA of 0.3logMAR or better in 100% of eyes implanted with the same toric IOL. Alió et al. reported a postoperative UDVA of at least 20/40 in 76% of eyes implanted with a specific modality of micro incision toric IOL. Kersey et al. reported a mean postoperative UDVA value of 0.1LogMAR in a sample of eyes implanted with a specific type of toric IOL, with 93% of eyes achieving a value of 0.3 LogMAR or better.

Postoperative rotational stability of a toric IOL has a crucial influence on the final visual outcome. An undesirable postoperative IOL rotation may be the result of several factors, such as an incomplete removal of viscoelastics from the eye (reduced friction between the haptics and capsular bag with postoperative intraocular pressure changes) or a postoperative significant capsule shrinkage. In the current study, IOL misalignment from the target axis was very small which is consistent with the good visual and refractive outcomes obtained. Other studies evaluating the same IOL have reported similar or slightly higher levels of IOL misalignment. Ferreira and Almeida found a mean toric IOL axis misalignment of 3.15° in 20 eyes at 2 months after the implantation of the same toric IOL as used in our study, with no IOL rotating more than 10°. Similarly, Sheppard et al. obtained 2 months postoperatively a mean IOL axis misalignment of 3.40° in a sample of 67 eyes, with only one eye showing a rotation of more than 10°. At 6 months after surgery, Mazzini found a mean IOL misalignment of 3.33° in a sample of 19 consecutive eyes, with none of the eyes showing an IOL rotation of more than 7°. Hirnschall et al. and Waltz et al. [xiv]obtained mean IOL misalignments of 3.6° and 1.89 ± 2.27° for the same toric IOL, respectively. Compared to other models of toric IOLs, our results were similar or better . A mean IOL misalignment of 7.67 ± 4.04° was reported by Lam et al. in a study evaluating a group of eyes implanted with a specific type of toric IOL. Miyake and coauthors observed a mean IOL rotation of 4.5 ± 4.9° within 1 day postoperatively in a group of eyes implanted with a specific modality of aspheric toric IOL. These authors found that the rotation was more than 20° in 6 eyes, all of which had an axial length of more than 25.0mm, with all rotations occurring within 10 days postoperatively . Therefore, the aspheric toric IOL evaluated in the current study provided an excellent rotational stability.

In conclusion, cataract surgery with implantation of the toric IOL provides an effective and predictable refractive correction in eyes with low to high levels of preexisting corneal astigmatism, providing high levels of visual quality and patient satisfaction. This might be due to the excellent rotational behavior of the IOL. Future studies should be conducted in order to evaluate the long term clinical outcomes with this modality of aspheric toric IOL.[ix]

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