



CLINICAL OUTCOME OF TORIC IOL IMPLANTATION FOR CORRECTION OF PRE-EXISTING CORNEAL ASTIGMATISM

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ABSTRACT

According to numerous estimations, 15% to 29% of patients with cataract have visually significant (≥ 1.5 D) corneal astigmatism. Cataract surgery has now become a refractive procedure and emmetropia is the expected outcome of surgeons and most patients. To achieve emmetropia, these patients may have combined corneal refractive surgery and spherical intraocular lens (IOL) implantation or toric IOL implantation alone. The aim of this study is to report the

clinical results of toric IOLs implantation for preexisting corneal astigmatism correction and compare post-operative rotation of the IOL's to detect long-term stability. The results from our study show that micro-incision cataract surgery with implantation of toric IOL is a safe, predictable and effective option for correcting pre-existing corneal astigmatism during cataract surgery with long term rotational stability for good visual outcome.

KEYWORDS: Cataract; corneal astigmatism; emmetropia; Toric IOL implantation.

INTRODUCTION

According to numerous estimations, 15% to 29% of patients with cataract have visually significant (≥ 1.5 D) corneal astigmatism.^[1,2] Reducing this pre-existing astigmatism may further improve the visual outcome of cataract surgery. Cataract surgery has now become a refractive procedure and emmetropia is the expected outcome of surgeons and most patients.

To achieve emmetropia, these patients may have combined corneal refractive surgery and spherical intraocular lens (IOL) implantation or toric IOL implantation alone.^[3] Corneal refractive surgeries included corneal incision (astigmatic keratotomy) and limbal relaxing incisions (PCRIs). The main drawbacks of these approaches are that the outcome depends on multiple factors as the patient's age, the depth and length of the incision, complications related to wound healing, epithelial defects, or induction of dry-eye symptoms.^[4] These parameters affect the visual outcome in an unpredictable way so the corneal incisions are not considered a reliable method for astigmatism correction.

Toric intraocular lens (IOLs) implantation was introduced as an option for astigmatism correction in cataract patients in the 1990's.^[1,2] Toric IOL has a toric component located on the posterior surface of the lens optic. Initially they presented the disadvantage of postoperative rotation that decreased the visual outcome.^[3,4] This rotation usually took place within the first 3 months after implantation. The most common cause of IOL rotation in uncomplicated cataract surgery was capsular bag shrinkage due to fibrosis. New toric IOL designs, approved at the end of 2005, have been found to be more stable and appear to be the preferred IOL.^[3] The aim of this study is to report the clinical results of toric IOLs implantation for preexisting corneal astigmatism correction and compare post-operative rotation of the IOL's to detect long-term stability.

MATERIALS & METHODS

This prospective study included 30 eyes from 18 consecutive patients with cataract & pre-existing regular corneal astigmatism (1-4D) who underwent implantation of a Toric intraocular lens with minimum 6 months follow-up from July 2012 to April 2013.

Inclusion criteria were: *cataract, pre-operative regular corneal astigmatism (1-4 Dioptres).*

Exclusion criteria included irregular corneal astigmatism, Corneal disease including corneal opacity, keratoconus, corneal dystrophy, pterygium encroaching on cornea, previous corneal or intraocular surgery, retinal pathology of any cause affecting vision, complicated cataract, history of intra-ocular inflammation, glaucoma and intra-op or post-operative complications affecting visual outcome.

Pre-operatively, patients had a complete ophthalmologic examination including measurement of uncorrected visual acuity (UCVA), best spectacle-corrected visual acuity (BCVA), manual

refraction, auto-refractometry, slit-lamp examination, intra-ocular pressure, funduscopy, manual keratometry.

Biometry was performed with optical coherence biometry using the **SRK-T** formula for the IOL power calculation and the A-constant of 118.7 for the toric IOL. Intra-ocular lens cylindrical (toric) power and alignment axis were calculated using a *toric-calculator programme* available from the respective toric IOL manufacturer. Data including keratometric readings and spherical IOL power obtained from manual keratometry & optical coherence biometry respectively were entered in the programme. SIA of 0.5D and temporal incision site was used for all cases. Preoperatively, with the patient sitting upright on a slit-lamp, the toric reference corneal marker was used to place 3 limbal reference marks at 3, 6, and 9 o'clock positions to correct for recumbent cyclotorsion. Intraoperatively, the actual implantation axis was marked using a ring and an intra-op toric axis marker. Cataract surgery was performed by one experienced surgeon under local peribulbar anesthesia. Each patient underwent phacoemulsification cataract extraction with a 2.2 mm temporal clear corneal incision. The toric IOL was injected and dialed approximately 10-15 degrees off axis before the ophthalmic viscosurgical device (OVD) was removed. After OVD removal, the IOL is rotated to its final position by exactly aligning the toric reference marks with the limbal implantation axis marks. Follow-up examinations were performed postoperatively on 1st day, 7th day, 1 month and 6 months after surgery.

On each occasion, all patients underwent UCVA, BCVA, manual refraction, autorefractometry and slit lamp examination. Digital retro-illuminated slit-lamp photographs were taken of each eye at every visit. Before slit lamp photography, eyes were dilated to a pupil diameter of at least 6.5 mm with a drop of 0.5% tropicamide/d. Outcomes of interest included uncorrected distant VA, cylindrical astigmatism power (mean refractive astigmatism) & the possible rotation of the IOL on each follow-up visit.

RESULTS

Thirty eyes of eighteen patients were enrolled in this study. Twenty-six eyes (86%) out of thirty had uncorrected distant visual acuity 6/9 or better. Patient demographics were as given in Table 1. There was significant reduction in refractive astigmatism from -1.58 ± 0.48 to -0.28 ± 0.38 (graph 1).

There was no significant change in corneal astigmatism following surgery. One month post-op, the mean Toric IOL axis rotation was 2.2 ± 1.5 (0.6-4.1). Six months post-op the mean

toric IOL rotation was 2.7 +/- 1.5 (0.9-5.9). The later rotation occurred between one and six months and was found to be more than 3 degree in two eyes only.

No eye had secondary surgery to reposition the IOL axis within the six month post-op period. No significant IOL rotation (>10 degrees) in any patient.(Graph 2)

Table 1 Comparison of post operative uncorrected distance visual acuity between the two iol groups

Visual acuity	Multifocal IOL group(N=40)		Monofocal IOL group (N=40)		Fisher exact value = 0.5000 p value = 1.0000
	No. of patients	Percent	No. of patients	Percent	
Less than 6/6	3	7.50%	2	5%	
6/6	37	92.50%	38	95%	

Table 2: Comparison of post operative uncorrected near visual acuity between the two iol group

Visual acuity	Multifocal IOL group (N=40)		Monofocal IOL group (N=40)	
	No. of patients	Percent	No. of patients	percent
N 36	0	0%	32	80%
N 18	0	0%	8	20%
N 12	0	0%	0	0%
N 10	3	7.5%	0	0%
N 8	7	17.5%	0	0%
N 6	30	75%	0	0%

DISCUSSION AND CONCLUSION

In our study, 86% eyes showed uncorrected visual acuity (UCVA) 6/9 or better at final follow-up thus allowing spectacle independence for the patients. It is important to obtain accurate corneal astigmatism via manual keratometry to determine the actual amount of cylinder requiring correction.^[1,2,3] Three eyes showed significant residual astigmatism. The major requirement for toric IOL's is rotational stability.^[4,5,6] The post-operative rotation of toric IOL's mostly occurred in the early post-operative period (<1 month) and minimally from 1-6 months. Only two eyes showed significant rotation in the period from 1 to 6 months (> 3 degrees). It is known that one degree of deviation causes 3.3% reduction of IOL cylindrical power.^[6,7,8]

The results from our study show that micro-incision cataract surgery with implantation of toric IOL is a safe, predictable and effective option for correcting pre-existing corneal astigmatism during cataract surgery with long term rotational stability for good visual outcome.

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