

A RETROSPECTIVE STUDY ON CORRECTION OF REFRACTIVE STATUS AND VISUAL OUTCOMES AFTER TORIC IOL IMPLANTATION IN PRE-EXISTING CORNEAL ASTIGMATISM

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Abstract: The objective of this study was to evaluate the outcome and correction of pre-existing corneal astigmatism after Toric IOL implantation in patients undergoing cataract surgery ^[4].

Design: Retrospective case study ^[22]

Material And Method: In this retrospective study, we included 150 eyes of 150 patients; with cataract and regular corneal astigmatism between 1.50 to 3.50 D. Phacoemulsification was performed with Toric IOL implantation through 2.8mm clear corneal temporal incision ^[4].

Studied parameters before and after surgery included uncorrected visual acuity (UCVA), best corrected visual acuity (BCVA) & residual refractive astigmatism ^[6].

Results: Preoperatively UCVA was 20/200 or less in 80 eyes (53.33%), 20/125 to 20/80 in 50 eyes (33.33%), 20/63 to 20/40 in 20 eyes (13.33%). Postoperatively UCVA was 20/80 in 12 eyes (8.00%), 20/63 to 20/40 in 103 eyes (68.66%), 20/32 to 20/25 in 35 eyes (23.33%). All eyes had 20/20 BCVA (100%). Preoperatively, 30 eyes have -1.50 to -1.75D. Astigmatism (20%), 50 eyes had -2.00 to -2.50D. Astigmatism (33.33%), 70 eyes had -3.00 to -3.50D. Astigmatism (46.66%). Postoperatively, 90 eyes had -0.50D. Astigmatism (60%), 40 eyes had -0.75D. Astigmatism (26.66%) and 20 eyes had -1.00D. Astigmatism (13.33%) ^[8].

Conclusion: Toric IOL's allow correction of astigmatism without compromising the integrity of the cornea. They provide predictable results and can reduce healing times as there is less surgical impact on the cornea. Toric IOL implantation is an effective and safe surgical option to manage pre-existing corneal astigmatism during cataract surgery ^[4].

Keywords: Corneal astigmatism, Cataract, Toric Intraocular Lens.

1. INTRODUCTION

This study evaluated the results after implantation of Toric intraocular lenses to correct pre-existing corneal astigmatism in patients undergoing cataract surgery ^[12].

Pre-existing corneal astigmatism is an important limiting factor for optimal results of cataract surgery in a number of patients. It has been estimated that 15% to 29% of patients with cataract have more than 1.50D of pre-existing

astigmatism^[10]. Currently methods of correcting corneal astigmatism include incisional approaches such as limbal relaxing incision (LRI) and arcuate keratotomy (AK), laser in situ keratomileusis (LASIK) and use of Toric intraocular lenses (IOL) in the posterior chamber^[18]. Incisional methods are unpredictable and allow limited correction, and the disadvantages of laser approaches include higher costs and a frequent need for reoperation^[13].

Treatment of astigmatism with Toric IOL implantation has theoretic advantages over that of keratectomy refractive procedures, as it does not require additional corneal manipulation and are free from complications like pain, flap complication^[30].

Spectacle and contact lenses can correct astigmatism but are associated with cosmetic and lifestyle issues^[25]. However Toric IOL'S can be used in cataract surgery and a number of studies have evaluated the outcomes of using different types of Toric IOL'S^[29].

It is first discovered by "Shimizu et al" in 1994^[9]

Cataract is worldwide developing disease. It is a leading cause of blindness

The project includes cataract surgery in phaco foldable in which astigmatic refractive error is compared before and after cataract surgery^[7].

2. METHODS AND MATERIALS

- 1 6meters room
- 2 Snellen's chart
- 3 Slit lamp
- 4 Torch
- 5 Keratometer
- 6 Trial set
- 7 VERION (reference unit vision planner)
- 8 IOL master (Carl Zeiss advanced technology)

In this study we investigated 150 eyes of 150 patients undergoing cataract surgery. All patients received Toric IOL implantation during cataract surgery from June 2019 to May 2020^[5]

Inclusion criteria consisted of regular corneal astigmatism of 1.00 to 3.50D. Cataract age between 40 to 80 years

Exclusion criteria included history of glaucoma or retinal detachment, corneal disease

Previous corneal or intraocular surgery, abnormal iris, pupil, deformation macular

Degeneration or retinopathy, neuro ophthalmic disease and history of ocular inflammation

Corneal topography was done for all patients, based on routine criteria, none of them had keratoconus

An informed written consent was obtained from each patient prior to the surgery.

Ophthalmologic examinations included uncorrected visual acuity (UCVA), best corrected visual acuity (BCVA), the slit-lamp examination, intraocular pressure (IOP) measurement, keratometry, Topography (Eyesys 3000 corneal analysis system), VERION(reference units Vision planner)^[27].

Intra ocular lenses cylinder power and alignment axis were calculated using VERION (reference units Vision planner) which has inbuilt IOL calculator program^[13].

Preoperative preparation of patient :-

With the patient in an upright position, the corneal limbus was marked at the 90 degree and 180 degree positions with a sterile marker^[5].

On the surgical table, the steepest corneal meridian was marked using a Marquez gauge with the aid of the preplaced reference points.

All patients underwent Phacoemulsification surgery through clear corneal 2.8 mm temporal incision ^[4]. The IOL axis aligned with the marked steep corneal meridian^[21].

3. RESULTS

The purpose of this study was to improve postoperative visual quality of patients and to evaluate effect of Toric IOL implantation in the reduction of pre-existing corneal astigmatism ^[29].

Visual Acuity:-

Preoperatively :- Pre operatively UCVA was 20/200 or less (1.7 to 1.0 log Mar) in 80 eyes (53.33%). UCVA 20/125 to 20/80 (0.8 to 0.6 log Mar) in 50 eyes (33.33%). UCVA 20/63 to 20/40 (0.5 to 0.3 log Mar) in 20 eyes (13.33%)

Postoperatively :- Post operatively, UCVA was 20/63 to 20/40 (0.5 to 0.3 log Mar) in 103 eyes (68.66%). UCVA 20/32 to 20/25 (0.2 to 0.1 log Mar) in 35 eyes (23.33%). UCVA was 20/80 (0.6 log Mar) in 12 eyes (8.00%). Post operatively, all eyes had BCVA 20/20 (100%)

Refractive outcomes :- It was measured in terms of residual postoperative astigmatism.

There was significant reduction in refractive astigmatism after Toric IOL implantation^[15].

Preoperatively :- Preoperatively, 30 eyes had -1.50 to -1.75 D. Astigmatism (20%). Preoperatively, 50 eyes had -2.00 to -2.50 D. Astigmatism (33.33%). Preoperatively, 70 eyes had -3.00 to -3.50D. Astigmatism (46.66%).

Postoperatively :- 90 eyes had -0.50 D. astigmatism (60%) 40 eyes had -0.75 D. astigmatism (26.66%) and 20 eyes had -1.00 D. astigmatism (13.13%)

Table 1: Preoperative Visual Acuity

Parameters	Numbers	Percentage
VA = 1.7 to 1.0 log Mar (20/200 or less)	80	53.33%
VA = 0.8 to 0.6 log Mar (20/125 to 20/80)	50	33.33%
VA = 0.5 to 0.3 log Mar (20/63 to 20/40)	20	13.33%

Table 2: Postoperative Visual Acuity

Parameters	Numbers	Percentage
VA= 0.6 log Mar (20/80)	12	8.00%
VA = 0.5 to 0.3 log Mar (20/63 to 20/40)	103	68.66%
VA = 0.2 to 0.1 log Mar (20/32 to 20/25)	35	23.33%

Table 3: Pre- operative Astigmatism

Parameters	Numbers	Percentage
-1.50 to -1.75 D Astigmatism	30	20%
-2.00 to -2.50 D Astigmatism	50	33.33%
-3.00to - 3.50 D Astigmatism	70	46.66%

Table 4: Postoperative Astigmatism

Parameters	Numbers	Percentage
-0.50 D . Astigmatism	90	60%
-0.75 D . Astigmatism	40	26.66%
-1.00 D . Astigmatism	20	13.33%

4. DISCUSSION

Corneal astigmatism is frequent in cataract patients and contributes significantly to the refractive outcomes of surgery [4]. The use of Toric IOL's is one of the many surgical options to correct corneal astigmatism and provide improved visual outcomes [23]. Because of the unpredictability of surgical methods that flatten the cornea, stable and effective Toric IOL's implanted in the capsular bag during routine cataract surgery (Requiring no modification of the cornea) are an important advancement in modern cataract surgery [30], precise measurements, IOL calculation, IOL placement, and IOL rotational stability are mandatory for success [5].

In this retrospective case study, we implanted foldable Toric IOL in 150 eyes of 150 patients, with pre-existing corneal astigmatism between 1.50 D to 3.50 D. In our study, after 1 month of follow up UCVA was 20/32 to 20/25 in 35 eyes (23.33%), 20/63 to 20/40 in 103 eyes (68.66%), and only 12 eyes had 20/80 UCVA (8.00%) [6].

5. CONCLUSION

Toric IOL'S allow correction of astigmatism without compromising the integrity of the cornea. They provide predictable results and can reduce healing times as there is less surgical impact on the cornea. In this study, we conclude that Toric IOL implantation is an effective, safe surgical option to manage pre-existing corneal astigmatism during cataract surgery [3].

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REFERENCES

- [1] Sahab Heidarian , MD Hassan Hashemi,MD, correcting astigmatism with acrysof Toric lenses (SN60T3 to SN60T9) in cataract surgery. IJO 2013;25(2)139-144.
- [2] Hoffer K.J. Biometry of 7500 cataractous eyes. Am J ophthalmology. 1980; 90:360-68; correction 890.
- [3] Novis C. Astigmatism and Toric intraocular lenses. Curropin ophthalmol . 2000; 11(1): 47-50.
- [4] Wang J, Zhang EK, Fan WY, Ma JX, Zhao PF. The effect of micro-incision and small-incision coaxial phacoemulsification on corneal astigmatism. Clin Experiment Ophthalmology. 2009; 37(7):664-69.
- [5] Till JS, Yoder PR jr, Wilcox TK, Spielman JL. Toric intraocular lens implantation: 100 consecutive cases. J cataract Refract Surg 2002;28:295-301.
- [6] Shimizu K, Misawa A, Suzuki Y. Toric intraocular lenses correcting astigmatism while controlling axis shift. J cataract Refract Surg 1994; 20:523-5266.
- [7] Grabow HB. Early results with foldable Toric IOL implantation. Eur J Implants Refract Surg 1995;11 (6):468-71.
- [8] Sun XY, Vicary D, Motongomery P , Griffiths M. Toric intraocular lenses for correcting astigmatism in 130 eyes. Ophthalmology 2000; 107 (9): 1776-81.
- [9] Ruhswurm I, Scholz U, Zehetmayer M, Hanselmayer G, Vass C, Skorpik C . Astigmatism correction with a fordable Toric intraocular lens in cataract patients. J Cataract refract Surg 2000;26 (7)1022-7.
- [10] Mendicute J, Irigoyen C, Aramberi J, Ondarra A, Montes micro R, Foldable Toric intraocular lens for astigmatism correction in cataract patients. J cataract Refract Surg 2008;34 (4): 601-7.
- [11] Kessel L. Andresen J, Tendal B, Erngaard D, Flesner P, Hjortdal J. Toric intraocular lenses in the correction of astigmatism during cataract surgery: A Systemic Review and Meta-analysis. Ophthalmology. 2016;123(2); 275-86.
- [12] Bachernegg A, Ruckl T, Riha W, Grabner G, Dexl AK. Rotational stability and visual outcome after implantation of a new Toric intraocular lens for the correction of corneal astigmatism during cataract surgery . J Cataract Refract Surg . 2013; 39(9): 1390-8.

- [13] Visser N, Bauer NeJC, Nuijts RM. Toric intraocular lenses: historical overview, patient selection, IOL calculation, surgical techniques, clinical outcomes, and complications. *J cataract Refract Surg* 2013; 39(4): 624-37.
- [14] Zarranz-Ventura J, Moreno-Montanes J, Gonzalez - Jauregui JC, Fernandez- Yanez EdN , Sadaba-Echarri LM. Acrysof Toric intraocular lens implantation in cataract surgery. *Arch Soc Esp Oftalmol*. 2010; 85(8): 274-7 .
- [15] Bauer NJC, deVries NE, Webers CAB, Hendrikse F, Nuijts RM. Astigmatism management in cataract surgery with the Acrysof Toric intraocular lens. *J Cataract Refract Surg* 2008; 34(9): 1483-8.
- [16] Shrinivasan S, Ting DS, Lyall DA, Implantation of a customized Toric intraocular lens for correction post-keratoplasty astigmatism, *eye(Lond)* 2013;27:531-7.
- [17] Wade M, Steinert RF, Garg S, Farid M, Gaster R. Results of Toric intraocular lenses for post-penetrating keratoplasty astigmatism. *Ophthalmology* 2014;121:771-7.
- [18] Ruckl T, Dexl AK, Bachernegg A, Reischl V, Riha W, Ruckhofer J, et al. Femtosecond laser-assisted intrastromal arcuate keratotomy to reduce corneal astigmatism. *J Cataract Refract Surg* 2013;39:528-38.
- [19] Fernandez-Buenaga R, Alio JL, Perez Ardoy AL, Quesada AL, Pinilla-Cortes L, Barraquer RI, et al. Resolving refractive error after cataract surgery: IOL exchange, piggyback lens, or LASIK. *J Refract Surg* 2013;29:676-83.
- [20] Oshika T, Inamura M, Inoue Y, Ohashi T, Sugita T, Fujita Y, et al. Incidence and outcomes of repositioning surgery to correct misalignment of Toric intraocular lenses. *Ophthalmology* 2017 . [Epub ahead of print].
- [21] Chang DF. Repositioning technique and rate for Toric intraocular lenses. *J Cataract Refract Surg* 2009;35:1315-6.
- [22] Chang DF. Comparative rotational stability of single-piece open-loop acrylic and plate-haptic silicone Toric intraocular lenses. *J Cataract Refract Surg* 2008;34:1842-7.
- [23] Waltz KL, Featherstone K, Tsai L, Trentacost D. Clinical outcomes of TECNIS Toric intraocular lens implantation after cataract removal in patients with corneal astigmatism. *Ophthalmology* 2015;122:39-47 .
- [24] Lockwood JC, Randleman JB. Toric intraocular lens rotation to optimize refractive outcome despite appropriate intraoperative positioning. *J Cataract Refract Surg* 2015;41:878-83.
- [25] Berdahl JP, Hardten DR. Residual astigmatism after Toric intraocular lens implantation. *J Cataract Refract Surg* 2012;38:730-1.
- [26] Teichman JC, Baig K, Ahmed II. Simple technique to measure Toric intraocular lens alignment and stability using a smartphone. *J Cataract Refract Surg* 2014;40:1949-52.
- [27] Till JS, Yoder PR Jr., Wilcox TK, Spielman JL. Toric intraocular lens implantation: 100 consecutive cases. *J Cataract Refract Surg* 2002;28:295-301.
- [28] Ma JJ, Tseng SS. Simple method for accurate alignment in Toric phakic and aphakic intraocular lens implantation. *J Cataract Refract Surg* 2008;34:1631-6.
- [29] Ferreira TB, Marques EF, Rodrigues A, Montes-Mico R. Visual and optical outcomes of a diffractive multifocal toric intraocular lens. *J Cataract Refract Surg* 2013;39:1029-35.
- [30] Venter J, Pelouskova M. Outcomes and complications of a multifocal Toric intraocular lens with a surface-embedded near section. *J Cataract Refract Surg* 2013;39:859-66.