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Original Article

Prevalence of Corneal Astigmatism in Age Related Cataract Patient in a Tertiary Eye Hospital

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Abstract

Background: *To investigate the magnitude and pattern of pre-existing corneal astigmatism in age related cataract patient.* ***Method:*** *This prospective observational study was carried out in a tertiary eye hospital from January 2020 to June 2020. We examined 577 eyes of 532 patients who underwent cataract surgery. The mean age at the time of surgery was 61.2 ±7.1 (40 to 100) years. Corneal astigmatism was measured with Auto Refracto Keratometer at least two times for each patient. Astigmatism was calculated from dioptric difference of vertical reading from horizontal reading. With the rule (WTR) astigmatism was considered when steep meridian at 900±200. Against the rule (ATR) astigmatism was considered when steep meridian at 1800±200. Astigmatism is in other direction is defined as oblique.* ***Result:*** *The pattern of astigmatism was ATR astigmatism in 237 eyes (41%), WTR astigmatism in 165 eyes (28.6%) and Oblique in 175 eyes (30.4%). Prevalence of ATR astigmatism was more than WTR astigmatism and prevalence of ATR astigmatism axis significantly increased with the increase in age. Average corneal power was 45.23D. Corneal astigmatism was 0.0D to 0.5D in 274 eyes (47.5%), 0.51D to 1.0D in 175 eyes (30.3%), 1.01D to 2.0D in 98 eyes (17.0%) and more than 2D in 30 eyes (5.2%) cases. Corneal astigmatism of most cataract surgery candidates fell between 0.50D to 1.50 D in 360 eyes (62.4%) cases.* ***Conclusion:*** *Thirty five percent (35%) pre-operative patient had 1D or more corneal astigmatism and sixty five percent (65%) had less than 1Dcorneal astigmatism.*

Key words: *Cataract, Corneal Astigmatism, Keratometer, Prevalence, Bangladesh.*

Introduction: Cataract is the leading cause of reversible blindness in the world accounting for about three quarters of blindness. In absolute terms and numbers, it is estimated by World Health Organization that nearly 20 million persons in Asia are blind. And this is going to increase over the period of time.[1] Cataract surgery is one of the most commonly performed procedures in ophthalmology.[2] Post-operative astigmatism is one of the major causes of visual dissatisfaction of the patient. Recent progress in cataract surgical technique has heightened patient's expectation of visual outcome; good post-operative vision without spectacles is considered normal. Significant efforts are being undertaken to increase the output of vision through safe cataract services. Cataract surgery has undergone great refinement in recent years. Goal of cataract surgery is to achieve a desirable refractive outcome with minimal induction of astigmatism after surgery.[3] Some of the factors affecting the Surgically Induced Astigmatism (SIA) are the architecture and site of incision, surgical skill, and to a great extent of pre-existing corneal astigmatism.[4] However, for the patients with concomitant cataract and corneal astigmatism, both

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the spherical and the corneal astigmatic errors should be addressed at the time of cataract surgery.[5] This is especially important in low-income countries such as ours where simultaneous correction of spherical and corneal astigmatism saves health care resources while addressing highly demanding patients who expect the best refractive corrections.[5, 6] Regardless of the correction technique employed on the candidates of cataract surgery for refractive errors, the prevalence of corneal astigmatism provides useful information for both the cataract surgeons and lens manufacturers. It has been documented that approximately 15% of cataract patients have more than 1.5 diopter of preexisting keratometric astigmatims.[7] In cataract surgery, the corneal incision has a small flattening effect on the corneal curvature which can be used to reduce preexisting corneal astigmatism.[8] Post-operative astigmatism is one of the major causes of visual dissatisfaction of the patient. Astigmatic error of 1 to 2 diopter may reduce uncorrected visual acuity to the 20/30 or 20/50 level whereas astigmatism of 2 to 3 diopter may correspond to visual acuity between 20/70 and 20/100.[9] Thus control of post-operative astigmatism is a key factor in meeting these expectations. So it is important to analyze the magnitude and pattern of pre-existing corneal astigmatism to control postoperative astigmatism that is responsible for visual dissatisfaction of patients in cataract surgery.

Method:

This prospective observational study was carried out in Sheikh Fazilatunnessa Mujib Eye Hospital & Training Institute (SFMEHTI), Goplganj, Bangladesh; a tertiary eye hospital from January 2020 to June 2020. This study was carried out in patients admitted with age related cataract (ARC) for surgery. All patients provided written informed consent. We examined 577 eyes of 532 patients who underwent cataract surgery of both gender. The patients younger than 40 years and older than 100 years were excluded. Routine eye examinations were performed before operation, including visual acuity, refraction, tonometry, slitlampbio-microscopy and dilated fund us examination. Near and far uncorrected and best corrected visual acuity was measured using a Snellen's chart. We excluded the patients have corneal disease, irregular astigmatism, presence of pterygium, complicated cataract, cataract associated with glaucoma, ocular trauma and previous intraocular surgery from this study. We measured the corneal astigmatism by using Auto Refracto Keratometer. We carried out the measurement at least two times for each patient. Astigmatism was calculated from diopteric difference of vertical reading from horizontal reading. Astigmatism was also classified into with the rule (WTR), against the rule (ATR) and oblique astigmatism. With the rule (WTR) astigmatism was considered when steep meridian at 900±200. Against the rule (ATR) astigmatism was considered when steep meridian at 1800±200. Astigmatism is in other direction is define as oblique. On keratometry, when vertical reading (K1) was found greater than horizontal (K2) was considered WTR astigmatism and the reverse reading for ATR astigmatism.

Result:

This study comprised 577 eyes of 532 patients with a mean ± SD age of 61.2±7.1 (40 to 100 years). Only 1 patient was in the age of 100 years & 95 years each. Five patients were in 90 years of age. The numbers of eyes in the three age groups were described in Table 1. The mean ± SD of corneal astigmatism was 1.01±0.79.The distribution of corneal astigmatism was 0.0D to 0.25D in 148 eyes (25.7%), 0.5Din 126 eyes (21.8%), 0.51D to 1.0D in 175 eyes (30.3%), 1.01D to 1.5D in 64 eyes (11.1%), 1.51D to 2.0D in 34 eyes (5.9%) and more than 2D in 30 eyes (5.2%) cases (Table 2). In this study 1 patient found with 7.75D corneal astigmatism, 1 patient with 3.75D, 2 patients with 3.5D and 3 patients with 3.25Dcorneal astigmatism respectively. Corneal astigmatism of most cataract surgery candidates fell between 0.50D to 1.50 D in 360 eyes (62.4%) cases. The pattern of astigmatism was ATR astigmatism in 237 eyes (41%), WTR astigmatism in 165 eyes (28.6%) and Oblique in 175 eyes (30.4%). Prevalence of ATR astigmatism was more than WTR astigmatism and prevalence of ATR astigmatism axis significantly increased with the increase in age (Figure 1).

Table 1: Distribution of patients according to age.

Age in years	No. of Eyes	Percentage (%)
40 – 60	299	51.82
61 – 80	264	45.76
81 –100	14	2.42

Maximum patient in 40-60 years age group (51.82%).

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Figure 1: Pattern of corneal astigmatism among the study group.

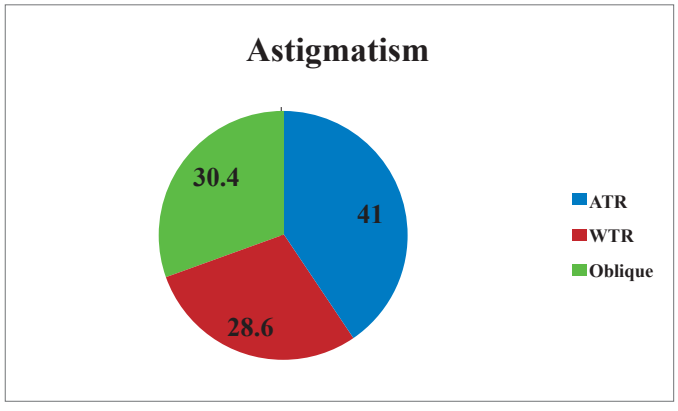

Table 2 Magnitude of pre-existing corneal astigmatism among the study group.

Pre-existing corneal Astigmatism (Diopter)	No. of Eyes	Percentage (%)	Mean Value ± SD
0.0 – 0.5	274	47.5	
0.51 - 1.0	175	30.3	1.01±0.79
1.01 - 2.0	98	17.0	
>2	30	5.2	

Corneal Astigmatism 0.0 – 0.5D was found in most of the patient (47.5%).

Discussion:

The success of cataract surgery either small incision cataract surgery or phacoemulsification is determined by quicker visual and functional recovery. Control of post-operative surgically induced astigmatism (SIA) is a key factor in meeting the expected visual outcome. In this study we found 40-60 years age group was the largest (52%) followed by the 61-80 (45.5%) and 81-100 (2.5%) years age group. Khan MI et al. [12] reported that the 71–80-year-old age group was the largest, followed by the 81–90 and 61–70-year-old age groups. Our upper limit of age was 100 years. The mean astigmatism was 1.01±0.79 diopter (range from 0.0 to 7.75D). The distribution of corneal astigmatism was 0.0D to 0.25D in 148 eyes (25.7%), 0.5Din 126 eyes (21.8%), 0.51D to 1.0D in 175 eyes (30.3%), 1.01D to 1.5D in 64 eyes (11.1%),1.51D to 2.0D in 34 eyes (5.9%) and more than 2D in 30 eyes (5.2%) cases. Thirty five percent (35%) pre-operative patient had 1D or more corneal astigmatism and sixty five percent (65%) had less than 1D corneal astigmatism. MA Rashid et al.[10] observed that the mean corneal astigmatism was 1.17±0.75 diopter. The percentage of preexisting corneal astigmatism was 1D or less was in 408 cases (69.6%), more than 1D and less than 1.5D in 302 cases (27.6%) and more than 1.5D and less than 2D in 20 cases (2.8%). Miyake et al.[11] observed that the mean corneal astigmatism was 1.02±0.81D. The percentage of 1D or less of corneal astigmatism was 63.6% that of more than 1D and 1.5D or less was 20.9% that of more than 1.5D and 2D or less was 7.4%, that of more than 2D and 2.5D or less was 3.8% and that of more than 2.5D and 3 D or less was 1.8%. Khan MI et al.[12] showed corneal astigmatism was 0.50D or less in 301 eyes (24.47%), 1.5D or less in 978 eyes (79.50%), and 3.0D or more in 24 eyes (1.93%). Ferrer- Blasco T et al.[13] observed that corneal astigmatism less than 1diopter was present in most cataract surgery patient; it was higher in about 22%, slight differences between the various age ranges. They also observed in 13.2% eyes, no corneal astigmatism was present; in 64.4% corneal astigmatism was between 0.25D and 1.25D and end 22.2% it was 1.5D or higher. Leffler et al.[14] found 1.0 diopter pre- existing corneal astigmatism in their series of 161 patients. Shen et al.[15] demonstrated average pre-operative corneal astigmatism 2.77±0.74 diopter. These results are comparable with our study. In this study on 577 eyes, we found 11.1% cataractous eye with more than 1.5 diopter of preexisting keratometric astigmatism. KJ Hoffer shows in his study on 7500 cataractous eye, approximately 15% patients have more than 1.5 diopter of preexisting keratometric astigmatims.[7]

Limitations:

1. Small sample size.
2. Single centered study.
3. Not all age group of patients were included.

Author's Contributions:

All the authors were contributed in various parts of the publication from concept and design, acquisition of data, analysis & interpretation of data and drafting of the manuscript.

Declaration of Conflicts:

The authors declare that, there is no conflict of interest regarding the publication of this article.

Conclusion:

Thirty five percent (34.3%) pre-operative patient had 1D or more corneal astigmatism and sixty five percent (65.7%) had less than 1D corneal astigmatism. Corneal astigmatism of most cataract surgery candidates fell between 0.50D to 1.50 D in

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360 eyes (62.4%) cases. So it is important to analyze magnitude and pattern of preexisting corneal astigmatism in age related cataract patients waiting for cataract surgery to control astigmatism and ensure good post-operative visual outcome.

References:

1. Wong TY, Loon SC, Saw SM. The epidemiology of age related eye diseases in Asia. Br J Ophthalmol2006;90(4):506-11.

2. Khan MI, Muhtaseb M. Prevalence of corneal astigmatism in patients having routine cataract surgery at a teaching hospital in the United Kingdom. J Cataract Refract Surg 2011;37:1751–5. doi:10.1016/j.jcrs.2011.04.026

3. Iftikhar S, Matin ZI, Kiani A. Outcome of phaco incision on steepest meridian in eyes with pre-existing astigmatism. Pak J Med Sci 2008;24(2):227-30.

4. Kohen S, Neuber R, Kohen T. Effect of temporal and nasalunsutured limbal tunnel incisions on induced astigmatism after phacoemulsification. J Cataract Refractive Sur 2002;28(5):821-5.

5. Guan Z, Yuan F, Yuan YZ, Niu WR. Analysis of corneal astigmatism in cataract surgery candidates at a teaching hospital in Shanghai, China. J Cataract Refract Surg 2012;38:1970–7. doi:10.1016/j.jcrs.2012.07.025

6. Ferrer-Blasco T, Montes-Mico R, Peixoto-de-Matos SC, Gonzalez-Meijome JM, Cervino A Prevalence of corneal astigmatism before cataract surgery. J Cataract Refract Surg2009;35:70-5. doi:10.1016/j.jcrs.2008.09.027

7. Hoffer KJ. Biometry of 7500 cataractous eye. Am J Ophthalmol 1980;90:360-8.

8. Lever J, Dahan E. Opposite clear corneal incision to correct preexisting astigmatism in cataract surgery. J cataract refract surg2000;26:803-5.

9. Lindstorm RL, Koch DD, Osher HL, Wang L. Control of astigmatism in cataract patient. In: Roger FS, editor. Cataract Surgery, Technique, Complications and Management (Second edition). Philadelphia, USA: Saunders; 2004.p.253.

10. Rashid MA, Hossain KA and Islam AR. Prevalence of Pre-Existing Corneal Astigmatism in Age Related Cataract Patient. Faridpur Medical College Journal2013;8(1):2-4.

11. Miyake T, Kamia K, Aman R and Shimizu K. Corneal astigmatism before cataract surgery. Nihon Ganka Gakkai Zasshi 2011;115(5):447-53.

12. Khan MI, Muhtaseb M. Prevalence of corneal astigmatism inpatients having routine cataract surgery at a teaching hospital in the United Kingdom. J Cataract Refract surg 2011, Oct; 1751.Epub 2011 Aug 12.

13. Ferrer-Blasco, Montes-Mico R, Pexoto-Matos SC, Gonzalez-Meijome JM, Cervino. Prevance of corneal astigmatism before cataract surgery. J cataract Refract surg 2009;35(1):70-5.

14. Leffler CT, Javey G, Mahmood MA. Prediction of post-operative astigmatism in cataract surgery. Can J Ophthalmol 2008;43:551-4.

15. Shen Y, Tong JP, Li Y. Corneal relaxing incision combined with phacoemulsion and IOL implantation. J Zhejiang Univ SCI 2004;5(8):985.

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