Preoperative corneal astigmatism among adult patients with cataract in Northern Nigeria

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The prevalence and nature of corneal astigmatism among patients with cataract has not been well-documented in the resident African population. This retrospective study was undertaken to investigate preexisting corneal astigmatism in adult patients with cataract. We analyzed keratometric readings acquired by manual Javal-Schiotz keratometry before surgery between January 1, 2011 and December 31, 2011. There were 3,169 patients (3286 eyes) aged between 16 and 110 years involved with a Male to female ratio of 1.4:1. Mean keratometry in diopters was K1 = 43.99 and K2 = 43.80. Mean corneal astigmatism was 1.16 diopter and a majority (45.92%) of eyes had astigmatism between 1.00 and 1.99 diopters. Two-thirds of the eyes (66.9%) in this study had preoperative corneal astigmatism equal to or above 1.00 diopter. Findings will help local cataract surgeons to estimate the potential demand for toric intraocular lenses.

Key words: Cataract, corneal astigmatism, keratometer, Nigeria, toric intraocular lens

Phacoemulsification with nontoric intraocular lens (IOL) implantation eliminates astigmatism attributable to the lens, but has no effect on corneal astigmatism. Correcting preexisting corneal astigmatism is commonly carried out at the time of cataract surgery by making limbal or corneal relaxing incisions or by the implantation of toric IOLs.[1] The need to know the pattern of corneal astigmatism for population groups in order for surgeons and IOL manufacturers to predict patient requirement consequently becomes necessary. In Nigeria, there is a gradual ongoing transition by cataract surgeons to performing phacoemulsification with IOL implantation from the presently common small incision cataract surgery and extra capsular cataract extraction procedures.[2] As the postoperative visual expectation of patients increases, there is an anti-cipated need for astigmatism correction as part of refractive cataract surgery. This study aims to investigate the pattern of corneal astigmatism among adult patients undergoing cataract surgery in a high volume eye hospital in Northern Nigeria.

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Materials and Methods

A retrospective analysis of the keratometry record of all patients aged 16 years and above that underwent routine elective cataract surgery was done for the period from January to December 2011. All the patients had manual keratometry using the JVL 1 keratometer (CSO Company, Italy) by a single examiner as part of the preoperative biometric assessment for IOL implantation. Data collected included the age and sex of the patient, keratometric readings in diopters along the two principal corneal meridians, and the anterior corneal astigmatism in diopters. Exclusion criteria (if occurring in the cataractous index eye) included a history of contact lens wear, present or past corneal disease, and previous eye surgery. Statistical analysis was by the use of SPSS for windows version 16 software (SPSS Inc Chicago. Released 2007) and bivariate correlation was evaluated using Pearson coefficient.

Results

A total of 3,286 eyes of 3,169 patients with cataract were involved. Of these, 1826 (57.62%) were male, while 1343 (42.38%) were female and a male to female ratio of 1.4:1. Astigmatism ranged from 0.25 diopters to 6.00 diopters with a mean of 1.16 diopters and a mode of 1.00 diopter. Astigmatism was with the rule in 1,373 eyes (41.78%), against the rule in 1862 (56.66%) and there was no astigmatism in 51 eyes (1.55%). Table 1 summarizes the patient demographics and keratometry values. Table 2, on the other hand, shows

Table 1: Patient demographics and keratometry values

Characteristic	Value
Number of patients	3169
Number of eyes	3286
Age range (years)	16-110
Mean age (years)	60.8 +/– 12.7 SD
Sex ratio (Male:Female)	1.4:1 (1826:1343)
Mean keratometry (D)	K1=43.99, K2=43.80
Range of keratometry (D)	36-57
Mean corneal astigmatism (D)	1.16
Range of corneal astigmatism (D)	0.25-6.00

SD: Standard deviation

Table 2: Magnitude of astigmatism in 3,286 eyes

Astigmatism (D)	Number of eyes	Percentage
<1.00	1036	31.53
1.00-1.99	1509	45.92
2.00-2.99	489	14.88
≥3.00	201	6.12
No astigmatism	51	1.55
Total	3286	100.00

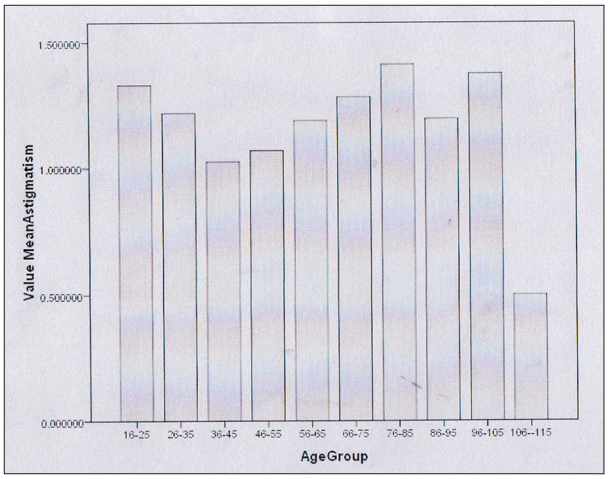

Figure 1: Mean astigmatism by age group

a grouping of eyes according to the magnitude of corneal astigmatism. 66.9% of the eyes had astigmatism equal to or >1.00 diopter, but only 6.12% had astigmatism >3.00 diopters. Although higher astigmatism values were seen in those aged 25 years and above 70 years [Fig. 1], bivariate correlation did not show any relationship between age and magnitude of astigmatism.

Discussion

The cornea and lens are the main contributors to ocular astigmatism. For patients undergoing uncomplicated cataract surgery (which eliminates lenticular astigmatism), significant preoperative corneal astigmatism remains the major obstacle to obtain satisfactory postoperative visual outcome. This presumes that surgically induced astigmatism has been minimized. Prevalence and nature of preoperative corneal astigmatism in patients with cataract have been reported by teams from several countries that involved different and essentially nonAfrican population groups.[3-6] To our knowledge there has been no previously published report from Nigeria or Africa. From these previous studies, occurrence of corneal astigmatism ≥1.00 diopter varied from 31.6% to 45.9% and was generally <50% but it was 66.9% in this study. A study involving 23,239 eyes in Germany,[7] also gave comparatively lower rates of significant preoperative corneal astigmatism (approximately only a third of all eyes had astigmatism >1.00 diopter). Genetic factors known to be important in the etiology and manifestation of corneal astigmatism may be partly responsible for this finding.[8] Based on this finding and assuming an astigmatic threshold for toric IOL insertion of 1.00 diopter, it means that about two-thirds (significantly more than half) of the adult patients undergoing cataract surgery in Northern Nigeria may be requiring toric IOLs. Unlike in most previous studies, this study had more males than females that could be due to the higher earning power of men and consequent ability to afford surgery in the study environment. 60.8 years was the average age of the patients, which conforms to the age range for the development of senile cataract and may also help explain why there are more patients with against the rule astigmatism. Against the rule, astigmatism has been generally more commonly associated with older age groups.[4,9] Mean astigmatism was above 1.00 diopter in this study but younger adults and the elderly generally exhibited higher values of astigmatism signifying that these group of patients will probably require more attention in the preoperative assessment for corneal astigmatism before cataract surgery.

Some limitations of this study include the nonmeasurement of posterior corneal astigmatism. Anterior corneal astigmatism though more significant, underestimates total corneal astigmatism by about 0.25–0.50 diopter.[10] Although manual keratometry is both accurate and reliable as a method of measuring corneal astigmatism, computerized corneal topography has over time become the gold standard.[11]

In conclusion, surgically significant corneal astigmatism was common in this group of cataract patients. Correction of this astigmatism especially by the use of toric IOLs should be considered in order to improve the visual outcome of these patients undergoing cataract surgery.

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