Corneal Astigmatism in Adults Attending Eye Clinic

KEYWORDS

Astigmatism, adults, refractive errors, WTR, ATR.

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ABSTRACT

The magnitude of corneal astigmatism among adults is not only high but also has a wide variation worldwide. In many developing countries including India, there is insufficient data on its magnitude among adults. In this retrospective study, we have analyzed the distribution of different types, axis and grades of astigmatism. Out of 3086 patients of refractive errors 957 (31%) patients had astigmatic error. Male to female ratio was 0.9:1. Myopic, hyperopic, and mixed astigmatism was present in 420 (43.9%), 282 (29.5%), and 255 (26.65%) patients respectively. Out of 957 patients, 388 (40.5%) are of simple astigmatism, 314 (32.8%) of compound astigmatism and 255 (26.7%) of mixed astigmatism. Mild, moderate and high astigmatism was present in 587 (61.34%), 274 (28.63%), and 96 (10.03%) patients respectively. With the rule (WTR), against the rule (ATR), and oblique astigmatism was present in 488 (51%), 274 (28.63%), and 178 (18.6%) patients respectively.

Introduction

Astigmatism is a refractive error that occurs when parallel rays of light entering the non-accommodating eye, forms two or more images rather than a point focus due to unequal refraction of light in different meridians. Astigmatism has been classified as simple, compound and mixed or it can be classified according to axis as with the-rule (WTR), against the rule (ATR) and oblique, or by degree as low, medium and high. Since astigmatism affects the near and distance vision of an individual, its symptoms like, asthenopia and headache are more common than any other types of refractive errors. Common symptoms of uncorrected astigmatism are as follows: blurry vision, asthenopia, eye strain, headache, tearing and squinting. Worldwide high prevalence of astigmatism and increasing educated and working adult population and their peculiar symptoms, compelled us for this study.

Materials and Methods

A retrospective, cross-sectional and record based study was done in private Eye Clinic. All the adults (21-60 years of age) who attended the Clinic from 1st April 2013 to 31st March 2014 were included in the study after their consent. Adults with ocular pathology, history of trauma or operation were excluded from the study. There were 3086 patients of refractive errors over the period of one year. Cylinder of 0.25 diopter or more was considered an error and included in the analysis. Because of the high correlation between eyes and similarity of results in left or right eyes, only the results of right eyes are reported. Astigmatism is divided into low (0.25 to 0.75 D), moderate (1.0 to 3.0 D) and high (>3.0 D). It is also divided into three groups according to the position of axis and its steepness namely, with-the-rule (WTR) astigmatism if the steep axis was 0° or 180° ±20°, against-the-rule (ATR) astigmatism if the steep axis was 90°±20°, and oblique astigmatism if the axis was in between 20° to 70° and 110° to 160°. Common symptoms of uncorrected astigmatism are as follows: blurry vision, asthenopia, eye strain, headache, tearing and squinting. Worldwide high prevalence of astigmatism and increasing educated and working adult population and their peculiar symptoms, compelled us for this study.

Graph 1:

Graph 1 shows that out of the total 957 patients of Astigmatism, 388 (40.5%) are of simple, 314 (32.8%) of compound and 255 (26.7%) of mixed Astigmatism. Proportion of female patients 137 (58.3%) of myopic Simple astigmatism is higher than males 98 (41.7%). Vice versa, proportion of male patients 102 (66.7%) of hyperopic simple astigmatism is higher than females 51 (33.3%). This difference was statistically very highly significant (χ² = 22.135, df = 1, p < 0.001). Proportion of young females 93 (67.9%) is more in myopic simple astigmatism than males 47 (48.0%). This difference was statistically highly significant (χ² = 8.608, df = 1, p < 0.01). Proportion of cases of Mixed Astigmatism is higher amongst younger age group both in males as well as females.

Graph 2:

Graph 2 shows that out of the total 957 patients of Astigmatism, 388 (40.5%) are of simple, 314 (32.8%) of compound and 255 (26.7%) of mixed Astigmatism. Proportion of female patients 137 (58.3%) of myopic Simple astigmatism is higher than males 98 (41.7%). Vice versa, proportion of male patients 102 (66.7%) of hyperopic simple astigmatism is higher than females 51 (33.3%). This difference was statistically very highly significant (χ² = 22.135, df = 1, p < 0.001). Proportion of young females 93 (67.9%) is more in myopic simple astigmatism than males 47 (48.0%). This difference was statistically highly significant (χ² = 8.608, df = 1, p < 0.01). Proportion of cases of Mixed Astigmatism is higher amongst younger age group both in males as well as females.
Graph 2 shows that the highest proportion of cases amongst various grades of Astigmatism are those with low grade (61.3%), followed by moderate grade (28.6%) and high grade astigmatism (10.1%). Proportion of females 184(67.1%) in moderate grade astigmatism is more than in low grade astigmatism 257(43.8%). This difference was statistically very highly significant ($X^2 = 39.909$, df = 1, $p < 0.001$).

Graph 3 shows that there are 51.0% cases of with the rule astigmatism, 30.4% of against the rule and 18.6% are of oblique astigmatism. Proportion of ‘with the rule astigmatism’ cases is more in young adults 401(82.1%), while proportion of ‘against the rule astigmatism’ cases is comparatively lesser in adults 94(32.3%). This difference is statistically very highly significant ($X^2 = 193.558$, df = 1, $p < 0.001$).

Discussion
There is increasing trend of refractive errors in India, with astigmatism as second most common refractive error.\cite{2,14} In our study prevalence of astigmatism is 31%, which is less than (32.4% to 59.6%) other studies.\cite{4,9,11,12} This may be due to stringent criteria of selection. Males to females ratio is 0.9, which is similar to other studies. Myopic astigmatism (43.9%) is more common than hyperopic (29.5%) or mixed (26.6%), which is a worldwide trend.\cite{4,9,11,12,16,17} Myopic simple astigmatism is more common in young (21 -40 years) females 93(67.9%) than males 47(48.0%). Other studies did not find such significance.\cite{4,9,11,12,16,17} Low grade astigmatism was found in 61.3% patients, which very common and agrees with all studies.\cite{4,9,11,12,16,17} Higher proportion of females 184(67.1%) amongst moderate grade astigmatism as compared to those in low grade astigmatism 257(43.8%) is our new finding. With the rule astigmatism (51%) in young adults and higher proportion of against the rule astigmatism in adults above 40, is the common finding in other studies.\cite{4,9,11,12,16,17}

Conclusions
Astigmatism is the second most common refractive error. Simple, low grade and with the rule astigmatism is more common in young adults, while, mixed and against the rule astigmatism is common in adults above the age of 40. Females are more affected with simple myopic astigmatism. Asthenopia and headache are common symptoms. Correction of astigmatism may be tricky, but it should be corrected with spectacles, contact lens, surgery or laser procedure.