

Relation Between Different Grade of Pterygium and Amount of Induced Corneal Astigmatism

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ABSTRACT

Objective: In the present study an attempt was made to assess the effect of pterygium excision on the induced astigmatism, and the relationship between the size of pterygium and the amount of astigmatism.

Study Design: Cross-sectional study

Place and Duration: Conducted at Jinnah International Hospital during from March 2021 - September 2021.

Methods: There were fifty five patients of both genders were presented in this study. Patients were aged between 20-65 years. After obtaining informed written permission, we collected demographic data on all of the participants, including their age, gender, place of residence, and job title. All the included patients in this study had pterygium. The paired t-test was used to compare data from before and after surgery. One-way analysis of variance was used to compare preoperative astigmatism to the grade of pterygium. SPSS 24.0 was used to analyze all data.

Results: Among 55 patients, 30 (54.5%) were males and 25 (45.5%) were females. Mean age of the patients was 35.9±15.45 years. There were 32 (58.2%) patients had urban residency and 23 (41.8%) cases had rural residency. Majority of the patients were outdoor workers 38 (69.1%). Majority of the eyes had grade II pterygia 24 (43.6%), 17 (30.9%) patients had grade III and 12 (21.8%) had grade IV pterygia and 2 (3.6%) had double headed pterygia. Pre-operative mean astigmatism in eyes with grade II was 3.43±1.34D, in eyes of grade III mean astigmatism was 4.83 ±1.62D and in eyes of grade IV 8.78±2.39D decreases to 1.5±2.18D, 1.56±3.61D and 5.11±4.32D. We found visual acuity same in 26 (47.3%) and improvement in 29 (52.7%) eyes from 0.50±1.41 D to 1.1±0.56 D. Refractive cylinder was improved to 2.91±2.61D with p value <0.003.

Conclusion: In this study, we found that as the pterygium grows in size, so does the degree of induced astigmatism. A successful pterygium surgery lowers the astigmatism caused by the pterygium and enhances visual acuity.

Keywords: Pterygium, Astigmatism, Visual acuity, Pterygia grades

INTRODUCTION

Premature degenerative bulbar conjunctiva tissue grows over and onto the cornea to form an irregular triangular fibrous sub-epithelial growth. As a result of exposure to UV rays and other environmental variables such as chronic dryness, it is common in individuals who have lived in hot regions. Hematology analysis reveals elastotic degradation of the stromal collagen with subepithelial fibrovascular tissue. Pterygium is considered a public health hazard in rural regions due to solar exposure.[1] It is clear that pterygium is a multi-factorial disease because of independent variables such as older age, males, and a history of outdoor activities. As one gets closer to the equator, the likelihood of contracting pterygia rises[2]. As the eye grows, so does its astigmatism, which may be either regular or irregular. Stable and long-standing pterygium may be detected on the cornea with a pigmented iron line (Stockerline) on the centre anterior border of the cornea. It is best to remove the pterygium when it becomes too close to the eye's optical axis, creating blurry vision due to uneven astigmatism, or if the patient is irritated to the point of discomfort. In the vast majority of instances, pterygium results in a kind of astigmatism that is consistent with the rule. [3, 4] Opposing the rule and oblique astigmatism may also be caused by pterygium. If the pterygium pulls on and distorts the corneal curvature, or if tears pool in front of the pterygium, astigmatism may result. In the aftermath of pterygium surgery, astigmatism is strongly associated with the horizontal extent of invasion. Increased astigmatism is directly proportional to increasing pterygium size.[5-7]

When it comes to lowering astigmatism, pterygium excision operations using amniotic membrane graft and conjunctival autograft are superior than sclera removal alone.[8] But even though its impact on corneal curvature and vision has long been known, there is still a lack of focus on the benefits of early surgical treatment for astigmatism. Pterygium length has been linked to preoperative astigmatism in several research, but only a handful

have looked at the effect of pterygium length on postoperative corneal astigmatism using conjunctival autograft without suture and glue.

Pterygium deform the cornea and increase the amount of astigmatism in the eye considerably. Pterygium was investigated for astigmatism and surface phenomena and found increased astigmatism with the rule (more than 0.5 D in 46%, 4 D in 13%), but no related vision impairment [9]. Using refraction, keratometry, and corneal geography, researchers have calculated the influence of the pterygium on the eye's refractive condition [10]. Astigmatism may be explained by a number of factors. These are only a few examples: The pterygium's primary edge has a pooling of tear film. (b) the pterygium's mechanical pressure on the cornea [11]. For the vast majority of pterygium patients, regional flattening of the corneal curvature occurs near the horizontal meridian, resulting in astigmatism.[12] Pterygium-induced astigmatism, similar to attacks on the visual axis and limitations on the average rectus muscle, may have a significant impact on visual acuity and result in blurry vision[13]. Pterygium smoothing is greater in the periphery than in the central cornea, hence keratometry that exclusively evaluates the centre cornea might provide problematic findings [14].

Pterygium excision on induced astigmatism and the link between the size of pterygium and the quantity of astigmatism were examined in the current research.

MATERIAL AND METHODS

This cross-sectional study was conducted at Jinnah International Hospital during from March 2021 - September 2021 and comprised of 55 patients with pterygium. After obtaining informed written permission, we collected demographic data on all of the participants, including their age, gender, place of residence, and job title. Pterygium that is recurrent or unusual on the horizontal/nonsal pterygia, pseudo pterygia, eyes with astigmatism other than corneal causes, patients with diabetes mellitus,

hypertension, corneal diseases, eye trauma or previous intraocular surgery and contact lens wearers were excluded from the study.

Patients were aged between 20-65 years. The inclusion criterion was a refraction measurement of >2D with-the-rule astigmatism. Peribulbar anaesthesia was used for all of the author's surgeries. Pterygium head was medial incision and subconjunctival dissection up to the caruncle, superior and inferior fornix were performed. Pterygium head avulsion was performed using a combination of blunt dissection and traction on the corneal epithelium 2mm anterior to the head. The pterygium's whole body was then removed. Light cautery was used on bleeders to produce hemostasis. Free conjunctival graft from the superotemporal quadrant was used to cover the exposed scleral bed. Snellen's visual acuity, manifest refraction, and slitlamp examinations were performed before and one month after surgery. There were four grades for pterygium, based on the level of corneal involvement: Grade I (crossing the limbus), Grade II (middle between the limbus and the pupil), and Grade III (extending up to the pupillary edge) for the most severe. The decimal equivalent of visual acuity was used. The arithmetic mean was used to represent the result.

Preoperative and postoperative values were compared using the paired t-test. Preoperative astigmatism was compared against the grade of pterygium using one-way analysis of variance. SPSS 24.0 was used to analyze all data.

RESULTS

Among 55 patients, 30 (54.5%) were males and 25 (45.5%) were females.(fig 1)

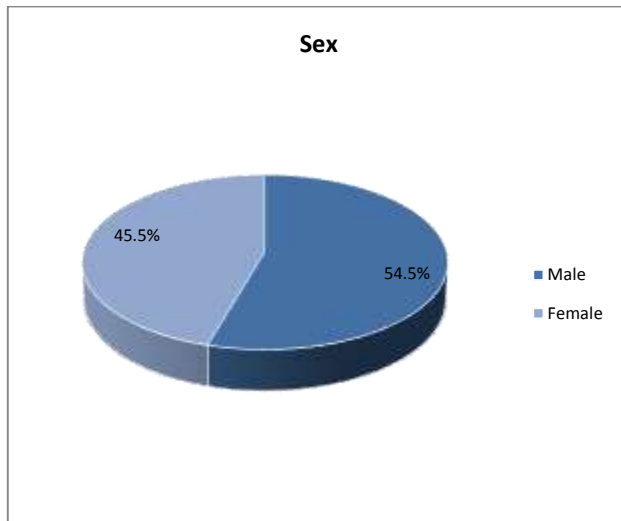


Figure-1: Enrolled cases with gender distribution

Mean age of the patients was 35.9±15.45 years. There were 32 (58.2%) patients had urban residency and 23 (41.8%) cases had rural residency. Majority of the patients were outdoor workers 38 (69.1%).(table 1)

Table-1: Enrolled cases with baseline details

Variables	Frequency	Percentage
Mean age (years)	35.9±15.45	
Residency		
Urban	32	58.2
Rural	23	41.8
Work place		
Outdoor	38	69.1
Indoor	17	30.9

Majority of the eyes had grade II pterygia 24 (43.6%), 17 (30.9%) patients had grade III and 12 (21.8%) had grade IV pterygia and 2 (3.6%) had double headed pterygia.(fig 2)

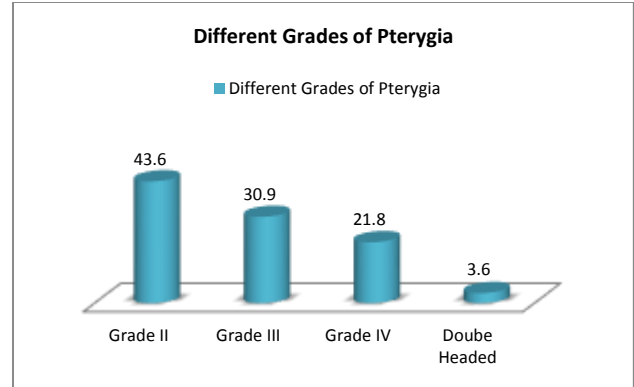


Figure-2: Association of pterygia grade among eyes

Pre-operative mean astigmatism in eyes with grade II was 3.43± 1.34D, in eyes of grade III mean astigmatism was 4.83 ±1.62D and in eyes of grade IV 8.78±2.39D decreases to 1.5±2.18D, 1.56±3.61D and 5.11±4.32D.(table 2)

Table 2: Astigmatism with different grades of pterygia

Variables	Before Surgery	After Surgery
grade II	3.43± 1.34D	1.5±2.18D
grade III	4.83 ±1.62D	1.56±3.61D
grade IV	8.78±2.39D	5.11±4.32D

We found visual acuity same in 26 (47.3%) and improvement in 29 (52.7%) eyes from 0.50± 1.41 D to 1.1±0.56 D.(table 3)

Table-3: After pterygium excision improvement in acuity

Variables	Frequency	Percentage
Improvement in Acuity		
Yes	29	52.7
No	26	47.3
Pre-operative mean acuity	0.50± 1.41 D	
Post-operative mean acuity	1.1±0.56 D	

Refractive cylinder was improved to 2.91±2.61D with p value <0.003.(table 4)

Table-4: Improvement in refractive cylinder

Variables	Before Surgery	After Surgery
Refractive astigmatism	5.32±1.75D	2.91±2.61D

DISCUSSION

Astigmatism caused by pterygium may cause visual discomfort. Studies have revealed that pterygium causes astigmatism that defies the rules. [15] Because of the lesion, the tear film seems to have changed, resulting in the astigmatism. During the progression of the pterygium, the corneal curvature seems to straighten as the pterygium's head reaches the apex of the cornea. [16]

In this study 55 patients were presented. Among 55 patients, 30 (54.5%) were males and 25 (45.5%) were females. Mean age of the patients was 35.9±15.45 years. There were 32 (58.2%) patients had urban residency and 23 (41.8%) cases had rural residency. Majority of the patients were outdoor workers 38 (69.1%). Findings of our research was comparable to the previous researches.[17,18] Majority of the eyes had grade II pterygia 24 (43.6%), 17 (30.9%) patients had grade III and 12 (21.8%) had grade IV pterygia and 2 (3.6%) had double headed pterygia. Malaysian and Pakistani research found similar outcomes, whereas two investigations in Iraq and India found results that differed to some degree. [19-22]

This research found a statistically significant link between the size of the pterygium and the degree of induced astigmatism in the cornea.[23] According to the findings of a research conducted in Malaysia, the width and total area of the pterygium on the cornea have a stronger link with the induced astigmatism than the

height of the pterygium. [19] In current study pre-operative mean astigmatism in eyes with grade II was $3.43 \pm 1.34D$, in eyes of grade III mean astigmatism was $4.83 \pm 1.62D$ and in eyes of grade IV $8.78 \pm 2.39D$ decreases to $1.5 \pm 2.18D$, $1.56 \pm 3.61D$ and $5.11 \pm 4.32D$. According to a study by Lin and Stern, there is a strong link between the length of the pterygium and the amount of induced corneal astigmatism that occurs when the pterygium is longer than 45 percent of the cornea's radius or is within 3.2 millimetres of the visual axis. [24] In eyes with pterygium, more incorrect results are seen because only the central and peripheral corneas are measured by Keratometry. There is no better method for assessing corneal astigmatism than computerised videokeratography, which was a drawback in our research. [25] Those with pterygium >3.0 mm reported $1.97D$ of astigmatism, compared to $1.11D$ in those with pterygium 3mm. [26] More than 2.25 millimetres in length was found to have a 2D or greater astigmatism by Kampitak. [27] Jaffar et al. recently discovered a strong link between a mean length of 2.84 ± 0.557 mm and an astigmatism of $3.46 \pm 1.441 D$ ($P = 0.01$). [28]

We found visual acuity same in 26 (47.3%) and improvement in 29 (52.7%) eyes from $0.50 \pm 1.41 D$ to $1.1 \pm 0.56 D$. Refractive cylinder was improved to $2.91 \pm 2.61D$ with p value <0.003 . The amount of astigmatism in the cornea that results after pterygium surgery may be greatly reduced. [29] Pterygium excision and conjunctival autograft significantly reduced corneal astigmatism three months following surgery. There is a higher association between the length of the pterygium and corneal astigmatism than there is between its breadth. [20] Only the length of the pterygium was shown to be a significant predictor of pterygium-induced astigmatism by Han et al. multivariate analysis. [30] A decrease in astigmatism and the removal of the pterygium from the visual axis may both be responsible for the improvement in vision.

The patients' astigmatism consists of both naturally occurring and induced astigmatism. To characterise the whole astigmatism as "induced" may be erroneous. While naturally occurring astigmatism may occur at any of the axes, I think that the pterygium was the primary source of most of the astigmatism seen in this research. After all, it was never "outside-the-rule."

CONCLUSION

In this study, we found that as the pterygium grows in size, so does the degree of induced astigmatism. A successful pterygium surgery lowers the astigmatism caused by the pterygium and enhances visual acuity.

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