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Refractive astigmatism and size of pterygium

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Summary
The study evaluates the relationship between varying sizes of pterygium and refractive astigmatism. All patients with pterygium seen at the eye clinic of the University College Hospital within a six months period were included. The length, width and area of pterygium were measured. Refractive astigmatism in the subjects were measured. The findings showed that the length of pterygium on the cornea has a statistically significant relationship with the amount of refractive astigmatism. The amount of astigmatism increases with increase in the length of pterygia. A linear regression analysis showed that 38% of the total variability in astigmatism could be explained by the length of pterygium. The width and area of pterygium on cornea had no significant association with amount of refractive astigmatism Size of pterygia could be an important predictor of the amount of astigmatism in an eye. However, a larger study need to be done to find other possible factors associating refractive astigmatism in eyes with pterygium.

Keywords: *Astigmatism and pterygium size.*

Résumé
Cette etude evalees la relation entre les different de pterygium et l'astigmatisms refractive. Tous les patients avec la pterygium rescu a les clinique d'ophthalmologie du centre hospitalier universitaire pendant une perode de six mois on eu la congeur la largue et le carre du pterygium mesures. L' astigmatisme refractive chez les sujets etait mesure. Les resultats de cette ettude montre que ca longeur du pterygium sur ca corne a une relation statistiquement significante avec lo quantite de l ;astigmatisme refractive. La quantite de l'astigmatisme augmente avec la lonqeur du pterygia. Une analyse de regression lincaire montre que 38% du total de variabilite en astigmatisme pourrait etre expeiquee par la longeur du pterygium. La largeur et le carre du pterygium sur la corne n'a aucane relation significative avec la quantite de l'astigmatisme refractive. La taille du pterygia pourrait etr un facteur important.pour previre la quantite de l'astigmatisme, oculaire. Une etude plus elaboree deviract etre fait lour idetifier un autre practur possible qui illi l'astigmatisme refractaire des eyes et le pterygium.

Introduction

Pterygium is a common eye disease seen in the outpatient clinic, University College Hospital, Ibadan [1]. Surgical excision is the accepted method of treatment. The waiting period for surgery for now is necessarily long as blinding conditions are given priority. Most patients who are bothered enough to come for surgical excision are in the presbyopic age group [1] and need reading glasses fairly urgently. It may not be advisable to correct their refractive errors before surgery as surgical excision changes the refraction in patients [2,3].

It is well known that the presence of a pterygium causes astigmatism in an eye [1,2,3,4,5.6,7,8,9]. The amount of refractive astigmatism associated with a pterygium varied from 0.25 to 1.50D In a series [3]. It is not known what causes this variation. Perhaps the size of pterygium especially the extent of its growth on cornea is related to the amount of refractive astigmatism. If the size of a pterygium is related to refractive astigmatism, it may be possible to predict the amount of refractive astigmatism induced by a given size of pterygium. This information will help us in the better management of patients who have pterygium and need correction of their refractive errors.

The aim of this study is to find out if there is any relationship between the size of pterygium and the amount of refractive astigmatism it produces. The study population was the group of patients earlier studied by the author [3].Pterygium excision induces a change in refractive astigmatism, the extent of change being variable [1,3,8,9]. In that series of patients who were compared to control groups, refractive astigmatism was associated with the presence of pterygium irrespective of age and sex [3]..

Materials and methods

Sixty-nine eyes of 50 consecutive patients with pterygium and no other ocular diseases were studied by the author. A manifest refraction was done in both eyes of the patients using a streak retinoscopy method. The eyes which had astigmatism with the rule i.e. relative flattening of the horizontal cornea curvature, were noted. The eyes that had astigmatism against the rule i.e. relative flattening of the vertical curvature were also noted. Number of eyes with no astigmatism was recorded. For the purpose of analysis, the amount of refractive astigmatism was categorised as:

0.00DC	-	0.50DC No astigmatism
0.75DC	-	1.00DC Mild astigmatism
1.25DC	-	1.50DC Moderate astigmatism
>1.50DC	-	Severe astigmatism

In eight eyes, the refractive astigmatism could not be measured because of the extent of pterygia on the cornea hence were excluded from the study.

Measurement of Pterygium

A topical anaesthetic agent, 2% oxybuprocaine hydrochloride was instilled into the affected eye after refraction. The horizontal and vertical width of the pterygium were measured with a pair of self retaining calipers as shown in fig. 1. The readings were recorded in millimeters.

A regression analysis of refractive astigmatism and the length, width and area of pterygium was investigated.

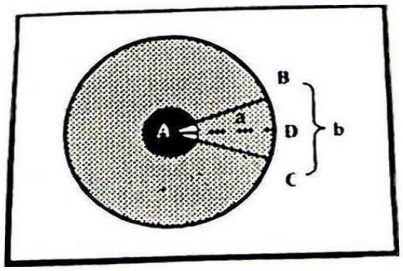

Fig. 1: Measurement of pterygium

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BC = *b is the vertical height of pterygium at the limbus called the width.*

AD = *is the horizontal length i.e from the outer most apex of the growth to the midpoint of the width and it is called the length.*

Results

61% of eyes with pterygium had astigmatism with the rule, 31% had astigmatism against the rule, 8.0% had zero astigmatism. 11 out of the eyes that had astigmatism against the rule had pterygium length of 2mm or less i.e. they were small pterygia.

Thirty-one eyes with pterygia had 0.50 diopter or less of astigmatism. 20 eyes had between 0.75 diopters and 1.00 diopter of astigmatism while 10 eyes had more than 1.00 diopter of astigmatism. (Table 1)

Table 1: Amount of Astigmation in patients eyes

Amount of astigmatism	No. of eyes
00.50D	31
0.75D - 1.00D	20
1.25D - 1.50D	4
>1.50D	6
Total	61

Table 2 shows the frequency distribution of the age and sex of patients with pterygium.

Table 2: Age and sex distribution of patients with pterygium

Age	Male	Female	Total	%
<20 yrs	1	0	1	2
20 - 29	1	2	3	6
30 - 39	4	6	10	20
40 - 49	8	13	21	42
50 - 59	4	4	8	16
60 - 69	4	3	7	14
70	0	0	0	0
Total	22	28	50	

Table 3: Summary statistics of the length, width and area of pterygium by amount of astigmatism.

Variables		No. Astigmatism	Mild Astigmatism	Moderate Astigmatism	Severe Astigmatism
Length	Mean	2.4 mm	2.8 mm	3.0 mm	3.5 mm
	SD	0.8	0.9	0.9	1.5
	n	31	20	4	6
Width	Mean	4.2 mm	4.2 mm	4.2 mm	4.8 mm
	SD	1.4	1.5	1.3	1.5
	n	31	20	4	6
Area	Mean	5.6 mm	6.1 mm	7.0 mm	8.7 mm
	SD	1.4	4.0	3.6	4.6
	n	31	20	4	6

Table 3 is the summary statistic of the length, width and area of pterygium by amount of astigmatism.

Astigmatism and size of Pterygium

A multiple regression analysis of preoperative refractive astigmatism on the length, width and area of pterygium was used to investigate the relationship between refractive astigmatism on age, sex, length, width and area of pterygium. The analysis of variance for the multiple regression of preoperative refractive astigmatism is shown in the table 4 below.

Table 4: Analysis of variance for length, area, and preop refraction

Source of variation	D.F.	SSQ	MSQ	F
Regression	2	3.70	1.85	5.73
Deviations	58	18.72	32	
Total	60	22.42		

Regression coefficients and SE

	Value	SE	T
Length B1	0.40	-0.17	2.33
Area B2	-0.05	0.04	-1.13

Analysis of variance for length, width and preop refraction

Source of variation	D.F	SSQ	MSQ	F
Regression	2	3.65	1.82	5.35
Deviations	58	19.77	0.34	
Total.	60	23.42		

Regression coefficients and SE

	Value	SE	T
Length B1	0.26	-0.09	2.89
Width B2	-0.04	0.07	-0.64

Discussions

The results show that the length of pterygium is significantly related in a linear form to the amount of refractive astigmatism in both analysis ($P < 0.05$).

The width however appears to be inversely proportional to the amount of refractive astigmatism even though this is not statistically significant. The area of pterygium on cornea appears to be linearly related to the amount of refractive astigmatism even though the relationship is not as strong as that between length of pterygium and astigmatism. This may be due to the dampening effect of the width on refractive astigmatism. The area was obtained by multiplying ½ length x width.

To test further the possible relationship between astigmatism induced by pterygium and length of pterygium on cornea, the Pearson's correlation co-efficient was used and this gave an R value of 0.38 and with a degree of freedom of 60 (P is < 0.001). It seems likely then that the longer the pterygium, the more refractive astigmatism it is likely to produce.

It seems from table 3 that the increase in mean lengths of pterygium is associated with increasing astigmatism. It may be inferred that in this study pterygia which are 2.8mm length ± 0.9mm may give astigmatism of 0.5D or less. Pterygia of lengths 3.0mm ± 0.9mm may give astigmatism of between 0.75D – 1.00D while pterygium length 3.5mm ± 1.5mm may produce astigmatism greater than 1.25D.

Subjecting these mean values to statistical analysis showed no significance in such relationship. Even if the length

of pterygium varies with the amount of astigmatism, there must be other confounding factors which may make it difficult to predict the amount of astigmatism. The value of astigmatism may in fact be the net change in both curvatures of the cornea. Also the contribution made to astigmatism by lenticular shapes cannot be easily excluded.

If 61% of patients with pterygium in this series had astigmatism with the rule and if the length of pterygium is important in the amount of astigmatism caused, it is possible that the astigmatism resulted from flattening of the horizontal curvature. It can however, also be interpreted to mean that pterygium causes increase in the vertical curvature. But if the vertical height of pterygium does not have a linear relationship with the amount of astigmatism, the former assumption may be the case.

It is interesting to note that 11 out of 18 eyes that had astigmatism against the rule had pterygium length of 2mm or less i.e. they were small pterygia. The length of pterygium on the cornea have a statistically significant relationship with the amount of astigmatism it produces.

It may be possible to estimate the amount of astigmatism induced by a given length of pterygium which is expected to be eliminated after excision pterygium excision. Large pterygia produce large amount of astigmatism.

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