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Biometry and Retinal Detachments of High Myopic Eyes: Results of a Cross-sectional Study of 202 Eyes in Eastern Algeria

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ABSTRACT

Introduction: High myopia is defined by an axial length greater than 26m. The presence of staphylomas renders biometric measurement more difficult, thus requiring the use of a two-dimensional ultrasound coupled with ultrasound in mode A. The present study has a twofold objective: analyze the clinical characteristics of retina detachments of the high myopic according to their biometrics,and identify the particularities related to this patient group.

Methods: A longitudinal study was conducted at the Ophthalmology Clinic of Ibn Rochd University Hospital, Annaba (Algeria) over a three- year period, extending from June 1st, 2014 to June 1st, 2017, and involving 202 high myopic phacic eyes of 196 adult patients. The latter were all given a measure of axial length via a two-dimensional ultrasound associated with an A-mode ultrasound. With regard to statistical analysis, use was made of the Khi 2 test, Student test, ANOVA test, and linear regression for the analysis of quantitative variables.

Results: The measured average axial length of the affected eye is 27.88 ± 2.74, withextremes ranging from 26 to 34mm. Analysis was made of retinal detachment extent, tear type and size, as wellas location, staphyloma type, and preoperative visual acuity. A statistically significant relationship ($p < 0.05$) occurred between biometric variations and preoperative visual acuity. The increase in axial length was correlated with the presence of giant tears or macular holes, as well as equatorial or retroequatorial tear location.

Discussion: Concerning our series, the average biometric value was 27.88 ± 2.74 mm, a result close to El Matri and co, who found an average biometry of 26.85mm (from 26 to 31.44mm). For Meyer-Schwikerath and co, the average axial length was 28.4 +/- 1.6 in a group of 25 highly myopic patients with DDR, whereas Goose and co showed a statistically significant relationship between the presence of macular hole and axial length. With regard to our series, no correlation occurred between the existence of staphyloma and axial length, a result similar to those of Saka et al.

Conclusion: As a result of our study, a number of clinical features correlated with biometric value have been identified. Thus, axial length measurement in high myopic eyes may be considered, in the long term, as a predictive element in the occurrence and treatment of retinal detachments. However, a control case proves necessary for our results to be confirmed.

INTRODUCTION

High myopia is defined by an axial length greater than 26mm or a dioptria higher than -6. The presence of staphylomes renders biometric measurement, "more difficult" thereby requiring the use of a two-dimensional Bscan ultrasound sonography, coupled with an A-mode ultrasound. The present sudy has a twofold objective: analyze the functional and clinical characteristics of high myopic retinal detachments based on their axial length measurements, and identify the characteristics related to this patient group.

METHODS

A longitudinal study was conducted at the Ophthalmology Clinic of Ibn Rochd University Hospital, Annaba (Algeria) over a three- year period, extending from June 1st, 2014 to June 1st, 2017, and involving 202 high myopic phacic eyes of 196 adult patients. The latter were all given a measure of axial length via a two-dimensional ultrasound associated with an A-mode ultrasound. For all the patients, the best corrected visual acuity was measured before and after surgery (logarithmic and decimal scale), and a thorough, careful examination of the eye anterior segment and fundus was carried out in order to identify retinal detachment characteristics, as well as tear diameter and location.

For result analysis convenience, axial lengths shorter or longer than 30 mm have been taken into account. Indeed, beyond 30mm, many anatomical changes can be observed in the eye (scleral, retinal; choroid, etc.). With regard to statistical analysis, use was made of the Khi 2 test, Student test, ANOVA test, as well as linear regression concerning quantitative variable analysis.

RESULTS

Our population average age is 45.90 +/- 15.21 years, with extremes ranging from 18 to 81 years, comprising 93 males and 103 females. The resulting average refraction of the eye turned out to be -11.30 +/- 5.21, with extremes ranging from -6 to -29 dioptries, while the average axial length measure of the affected eye was 27.88 +/- 2.74, with extremes ranging from 26 to 34mm.

The retinal teardiameter was found greater with the increase in axial length (Table 1). Tear type analysis showed that giant tears were more frequently observed when the axial length exceeded 30mms. Macular holes were also correlated to axial length (Table 2). On the other hand, the presence of staphylomes in the patients treated during the course of our study turned out to be independent of axial length.

Thus, the extent of retinal detachment is not correlated with the increase in axial length (Table 3).

There is a highly significant relationship (p <0.001), with a correlation coefficient of 0.41, between the preoperative best corrected visual acuity and axial length (Graph 1).

Table 1: Correlation of tear size to axial length.

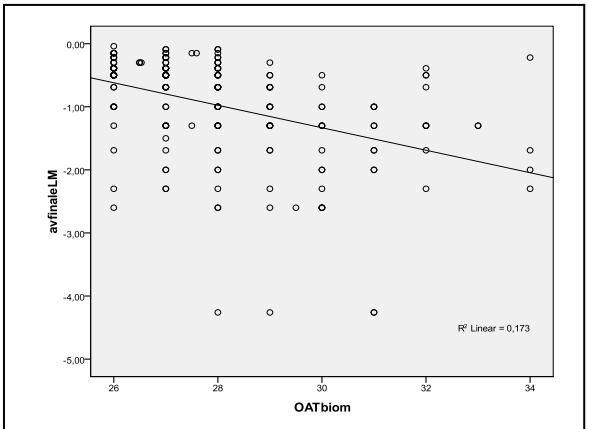
	Axial length	P of significance (<0,05)
Tear size < 2 papillary diameters	27.51 ± 2.93	**0.0198**
≥ 2 papillary diameters	28.50 ± 2.27	

Table 2: Correlation of teartypesto axial length.

	Axial length < 30	Axial length ≥30	P of significance (<0,05)
Oral withdrawal/ horse tears	95.7	90.2	0.7131
Giant tears	1.2	7.3	0.0254
Macular holes	1.2	14.6	0.0001

Table 3: Correlation of retinal detachmentextent and axial length.

	Axial length	P of significance (<0,05)
RD extent		
< 2 quadrants	27.51±1.38	0,0701
≥ 2 quadrants	27.51±1.38	



Graph 1: Correlation of the best corrected visual acuity and biometry.

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DISCUSSION

High myopia is defined by a refractive error higher than -6 dioptries or an axial length greater than 26mm. Posterior ectasy ultrasound identification proves necessary for the choice of surgery to be performed, as well as IOL power calculation in case of combined surgery. The frequent occurrence of a staphyloma requires the duplication of measurements, and even the coupling of mode A and B ultrasound, in order to identify posterior ectasia, when necessary. In several studies, an attempt was made to identify fundus and sclera variations, depending on those of the axial length, but the complex mathematical modelling of the high myopic eye does not enable us to predict the appearance of a staphyloma or axial length evolution depending on the degree of myopia [1]. Indeed, accurate axial length preoperative measurements are fundamental so as to avoid likely errors, especially in the case silicone oil use, when cataract surgery proves to be necessary, postoperatively.

Concerning our series, the average axial length value was 27.88 to 2.74 mm, a result close to that of El Matri et co [2], according to whom an average axial length of 26.85mm (from 26 to 31.44mm) was found in a series of 83 cases of retinal detachments in high myopic eyes. A study conducted by Gerd Meyer Schwickerath and Edmund Gerke revealed a statistically significant difference in axial length, equatorial diameter, and eye volume in retinal detachment-bearing eyes compared to healthy ones [3]. Such results imply that the eye biometric valuesdo influence the frequency of occurrence of retinal detachments. The presence of retinochoroidal anomalies secondary to axial length increase in strong myopic eyes encourages the occurrence of retinal detachment. Thus, variations in eye volume should be taken into account in the case of surgical treatment.

Oie and co show a statistically noticeable relationship between the occurrence of macular hole and axial length. Retinal detachments by macular hole are more frequently observed on high myopic eyes, due to the presence of staphyloma and scleral thinning in such eyes. Similar results were observed in our series, since the increase in axial length turned out to be correlated with the occurrence of macular holes, as well as giant tears, and equatorial or retro-equatorial ones. No correlation occurred between the presence of staphyloma and axial length, a result similar to that of Saka et co, who found a random staphylome distribution in myopic eyes, regardless of the degree of myopia or axial length [4]. A statistically noticeable relationship between axial length and visual acuity was present in our work, which can be accounted for by the higher frequency of chorio-retinal macular atrophy in cases of very high myopia, together with the occurrence of histological abnormalities detectable upon OCT examination, in the case of significant axial length [5].

CONCLUSION

Resulting from our study, a number of clinical elements correlated with biometric value have been identified. Such measures are of paramount importance in a surgery context, especially for the choice of instruments and operative technique. They are also significant postoperatively, as far as the IOL value measurement is concerned, in case of cataract surgery. They may eventually be considered as a predictor factor in the occurrence and treatment of retinal detachments. However, such results cannot be generalized until a control case study be performed for confirmation.

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