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Full Length Research Article

A Study To Show The Relationship Between The Axial Length Of The Eye Ball and IOL(intraocular Lens), To Be Used during Cataract Surgery in Left Eyes in Chhatisgarh Region

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ABSTRACT

Different anatomical parameters of eye can give us very important values like power of IOL to be used after cataract surgery. In this study we have taken corneal diameter by keratometry and The axial length by ultrasound (A-scan) .This is a retrospective study done in a period of one year. Here those cases are taken in to consideration, those which were diagnosed as Immature or mature cataract and were advised for cataract extraction and IOL implantation of age group 50-80years. Total 200 cases were studied, out of which 100 are male and 100 female and we have studied the IOL requirement in Left eye only. The data which were collected were the : (1)horizontal and Vertical curvature of cornea which was done by keratometry,(2)axial length which was done by A scan and after applying the SRK-II formula The power of IOL required was calculated. Then by using various statistical method the result was interpreted. It was found that there is correlation between ocular axial length with the power of IOL to be used after cataract surgery. We observed as the axial length increases the power of IOL to be used decreases significantly .The trend remains same for male and female.

Key words: Axial length, IOL (intra ocular lens), A scan, Keratometry, Avg (average).

INTRODUCTION

Different anatomical parameters of eye can give us very important values like power of IOL to be used after cataract surgery. In this study we have taken corneal diameter by keratometry and The axial length by ultrasound (A-scan). For the in vivo study of the eye ultrasonic biometry is a valid method for the study of the ocular globe, It helps in anatomical exploration for the study of the ocular globe. By using ultrasound, information can be obtained on ocular structure since the passage of ultrasonic waves through different tissues is reflected in the generation of distinctive echoes and hence specific information on these tissues can be obtained (Cegarra *et al.*, 2001). The use of ultrasound in ophthalmology goes back to 1956 (Mundt and Hughes We, 1956) and it was (Gernet, 1965), who proposed the use of ultrasound to measure the ocular axial length. Clinically speaking, it is necessary to calculate the ocular axial length in order to establish the intraocular lens power (Drexlerw *et al.*, 1998), (Haigis *et al.*, 2000). In A-scan ultrasound biometry, a crystal oscillates to generate a high-frequency sound wave that penetrates into the eye. When the sound wave encounters a media interface, part of the sound wave is reflected back toward the probe. These echoes allow us to calculate the distance between the probe and various structures in the eye. Ultrasonography does not measure the distance but rather the time required for a sound pulse to travel from the cornea to the retina. The speed of sound varies in different parts of the eye. The measured transit time is converted to a distance using the formula d=t/v Where d is the distance, t is the time and v is the velocity.

MATERIAL AND METHODS

This is a retrospective study done in a period of one year. Here those cases are taken in to consideration, those which were diagnosed as Immature or mature cataract and were advised for cataract extraction and IOL implantation of age group 50-80years. Total 200 cases were studied, out of which 100 are male and 100 female and we have studied the IOL requirement in Left eye only. The data which were collected were the: (1) horizontal and Vertical curvature of cornea which was done by keratometry, (2) axial length which was done by A scan and after applying the SRK-II formula The IOL required was calculated. Then by using various statistical method the result was interpreted. The SRK formula is calculated easily by hand as $P = A-0.9K-2.5L$, where P is the IOL power to be used for emmetropia, A is the IOL specific A constant, K is the average corneal refractive power (diopters), and L is the length of the eye (mm). The SRK II formula

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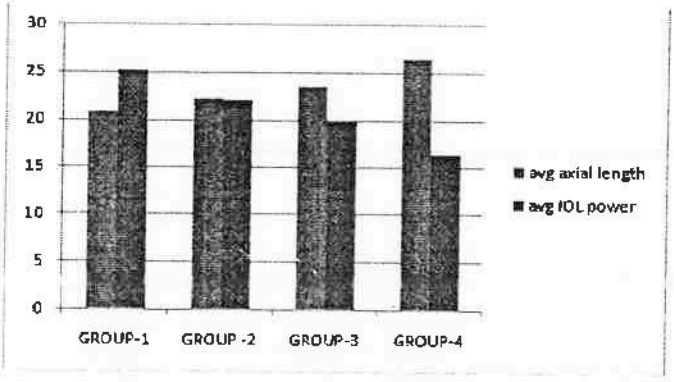
adjusts the A constant utilized depending on the axial length: increasing the A constant for short eyes and decreasing the A constant for long eyes. Then by using various statistical method the result was interpreted.

RESULTS

In male The value of axial length we got, that varies from 20.99mm to 27.71mm, we divided this data in to four groups that (I) ranges from19 mm to 21mm, (II)21.1-23 mm, (III)23.1-25mm and (IV)25.1 mm onwards. We have taken the average axial length of each group and also calculated the average power of the IOL required for each group and The data was interpreted. Out of 100 male cases in (Table-1, Graph-1) Group -1 we got 3 cases with axial length ranging from 20.97mm to 21mm with an avg of 20.99mm, In Group -2 we got 50 cases with axial length ranging from 21.1 to22.99mm with an avg of 22.26mm, In group 3 we got 45 cases with axial length ranging from 23.12 to 24.53mm with an avg of 23.7mm and In Group -4 we got 2 cases ranging from 25.17 to 27.71 mm with an avg of 26.44mm. The power of IOL found to as in Group 1 –it ranges from 24.26 to 27.33D with an avg of 25.53D, In group 2- it ranges from19.95 to26.01D with an avg of 22.22D, In group3 –it ranges from16.45 to 23.63D ,with an avg of 19.89D, In Group4- it ranges from 16.21 to 16.88 D with an avg of 14.54D and. From the above data it is found that as the axial length of the eye ball increases gradually the power of IOL to be used during operation, decreases gradually.

Table 1. Showing value of average axial length of eyeball and Average power of IOL required during surgery in Left eyes In Male

	Average Axial Length (in mm)	Average Power of IOL (in D)
Group-1(19-21mm)	20.99	25.53
Group-2(21.1-23mm)	22.26	22.22,
Group-3(23.1-25mm)	23.7	19.89
Group-4(>25.1mm)	26.44	16.54



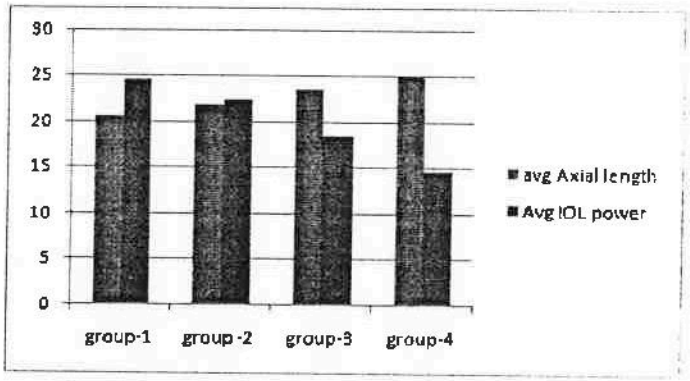
Graph 1. Showing value of average axial length of eyeball and Average power of IOL required during surgery in Left eyes In Male

In female The value of axial length we got ,that varies 20.76 mm to 25.16mm, we divided this data in to four groups that(I) ranges from19 mm to 21mm,(II)21.1-23 mm,(III)23.1-25mmand (IV)25.1 mm onwards.

We have taken the average axial length of each group and also calculated the average power of the IOL required for each group and The data was interpreted. Out of 100 Female (Table-2,Graph-2) In Group 1 we got we got 6 cases with axial length ranging from20.48 mm to 20.86mm with an avg of 20.76mm, In Group -2 we got 52 cases with axial length ranging from 21.28 to22.98mm with an avg of 22.09mm.In group 3 we got 40 cases with axial length ranging from 23.13 to 24.98mm with an avg of 23.69mm and In Group -4 we got 2 cases ranging from 25.06 to 25.27mm with an avg of 25.16mm. .The power of IOL found to as in Group 1 –it ranges from 21.92 to 26.7D with an avg of 24.67D, In group 2- it ranges from18.34 to21.28D with an avg of 22.50D,In group3 –it ranges from14.44 to 20.97D, with an avg of 18.79D, In Group4- it ranges from 13.79 to 15.63 D with an avg of 14.71D and. From the above data it is found that as the axial length of the eye ball increases gradually the power of IOL decreases gradually in female also. So irrespective of sex the value of Power of IOL to be used decrases as the axial length of eye ball

Table 2. Showing value of average axial length of eyeball and Average power of IOL required during surgery in Left eyes In Female

	Average Axial Length (in mm)	Average Power of IOL(in D)
Group-1(19-21mm)	20.76	24.67
Group-2(21.1-23mm)	22.09	22.50
Group-3(23.1-25mm)	23.69	18.79
Group-4(>25.1mm)	25.16	14.71



Graph 2. Showing value of average axial length of eyeball and Average power of IOL required during surgery in Left eyes In Male

DISCUSSION

Our results report the anatomical relationship between ocular axial length and power of IOL to be used after cataract surgery. The results reconfirm the association of ocular axial length with the power of IOL to be used after cataract surgery. We observed as the axial length increases the power of IOL to be used decreases significantly. In a previous study by M.J. (Cegarra *et al.*, 2001), on relationship between ocular axial length and refractive error found significant relationship between ocular axial length and refractive error. Patients with myopia had a mean ocular axial length that was significantly higher than the readings from the hypermetropic patients. In the present study we made use of contact ultrasonic biometry in order to measure ocularaxial length. Nonetheless, applanation of the ocular surface may be a cause of error. It has been said (Drexler *et al.*, 1998) that there are differences between contact and non-contact ultrasound axial eye length measurements (approximately 0.14 to 0.36 mm). This is an important issue that anatomists and clinicians should be aware

of when analysing the morphometric ocular results obtained with ultrasound technology common ocular pathologies associated with age are able to modify ocular morphometric values, (Connel *et al.,* 1997). Demonstrated that elderly patients with cataracts presented an ocular axial length that was greater by approximately 0.30 mm than that presented by healthy adults, but our study was between age group 50-80 yrs. In a previous study by (Eun Young Dong and Chon K.I. Joo, 2001) found significant corealtion between corneal diameter and axial lenth and corneal diameter and lens diameter. Another study by (Mohamed Hosny *et al.,* 2000) found that the anterior chamber depth was found to correlate significantly with both the average corneal diameter and the axial length of the globe (0.744, 0.531, $P < .01$) and was also found to correlate through an inverse relation with both age and spherical equivalent refraction

Conclusion

In this study we found there is correlation between ocular axial length with the power of IOL to be used during cataract surgery. We observed as the axial length increases the power of IOL to be used decreases significantly. The trend remains same for both male and female

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