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RESEARCH ARTICLE

A Study To Show The Relationship Between The Axial Length Of The Eye Ball & IOLz(intraocular Lens), To Be Used during Cataract Surgery in Right Eyes in Chhatisgarh Region.

Jagriti Agrawal¹, Bichitrananda Rout¹, Pradeep Jain²

1. Associate Professor ,Dept of Anatomy,Pt.J.N.M.Medical College,Raipur.
2. Ophthalmologist, Dept of Anatomy,Pt.J.N.M.Medical College,Raipur.

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***Corresponding Author**

Jagriti Agrawal

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 & 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 & were advised for cataract extraction & IOL implantation of age group 50-80years. Total 200 cases were studied, out of which 100 are male & 100 female & we have studied the the IOL requirement in Right eye only. The data which were collected were the (1)horizontal & Vertical curvature of cornea which was done by keratometry,(2)axial length which was done by A scan & after applying the SRK-II formula The 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 & female.

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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 & The axial length by ultrasound (A-scan) . The axial length (AL) is the distance between the anterior surface of the cornea and the fovea and usually measured by A-scan ultrasonography or optical coherence biometry. The AL is the most important factor in IOL calculation. 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 (M.J. Cegarra et al)¹⁴.

The use of ultrasound in ophthalmology goes back to 1956 (Mundt and Hughes,)¹⁷ and it was Gernet⁷, 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 (Drexler et al³, Haigis et al⁸).

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

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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 $d=vt$ Where d is the distance, t is the time and v is the velocity.

Material & 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 & were advised for cataract extraction & IOL implantation of age group 50-80years. Total 200 cases were studied, out of which 100 are male & 100 female & we have studied the the IOL requirement in Rt eye only. The data which were collected were the : (1)horizontal & Vertical curvature of cornea which was done by keratometry,(2)axial length which was done by A scan & after applying the SRKII formula The IOL required was calculated . 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 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 20.09mm to 27.14mm ,we divided this data in to four groups that(I) ranges from 19 mm to 21mm,(II)21.1-23 mm,(III)23.1-25mm& (IV)25.1 mm onwards.we have taken the average axial length of each group & also calculated the average power of the IOL required for each group & The data was interpreted.

Out of 100 male cases (Table -1) Group -1 we got 8 cases with axial length ranging from 20.09mm to 20.97mm with an avg of 20.67mm,In Group -2 we got 46 cases with axial length ranging from 21.22 to 22.92mm with an avg of 22.29mm,In group 3 we got 43 cases with axial length ranging from 23.13 to 24.96mm with an avg of 23.64mm & In Group -4 we got 3 case ranging from 25.11 to 27.14mm with an avg of 25.80mm. & the power of IOL found to as in Group 1 -it ranges from 23.00 to 26.34D with an avg of 24.5D,In group 2- it ranges from 20.39 to 24.92D with an avg of 22.47D,In group 3 -it ranges from 15.61 to 22.2D ,with an avg of 20.01,In Group 4- it ranges from 12.08 to 15.58 D with an avg of 14.62D &. 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 The value of axial length we got ,that varies 20.72 mm to 27.25mm in ,we divided this data in to four groups that(I) ranges from 19 mm to 21mm,(II)21.1-23 mm,(III)23.1-25mm& (IV)25.1 mm onwards .we have taken the average axial length of each group & also calculated the average power of the IOL required for each group & The data was interpreted.

Out of 100 Female (Table-2)Group 1 we got we got 6 cases with axial length ranging from 20.72 mm to 21.3mm with an avg of 20.89mm,In Group -2 we got 57 cases with axial length ranging from 21.2 to 23mm with an avg of 22.61mm,In group 3 we got 33 cases with axial length ranging from 23.15 to 24.98mm with an avg of 23.73mm & In Group -4 we got 4 case ranging from 25.02 to 27.25mm with an avg of 26.21mm. & the power of IOL found to as in Group 1 -it ranges from 23.07 to 26D with an avg of 24.78D,In group 2- it ranges from 17.3 to 24.7D with an avg of 22.30D,In group 3 -it ranges from 14.66 to 22.33D ,with an avg of 19.74D,In Group 4- it ranges from 12.2 to 17.2 D with an avg of 14.85D &. 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 decreases as the axial length of eye ball

Table-1

Table showing value of average axial length of eyeball & Average power of IOL required during surgery in Right eyes In Male

	Average Axial Length(in mm)	Average Power of IOL(in D)
Group-1(19-21mm)	20.67	24.5
Group-2(21.1-23mm)	22.29	22.47
Group-3(23.1-25mm)	23.64	20.01
Group-4(>25.1mm)	25.80	14.62

Table-2

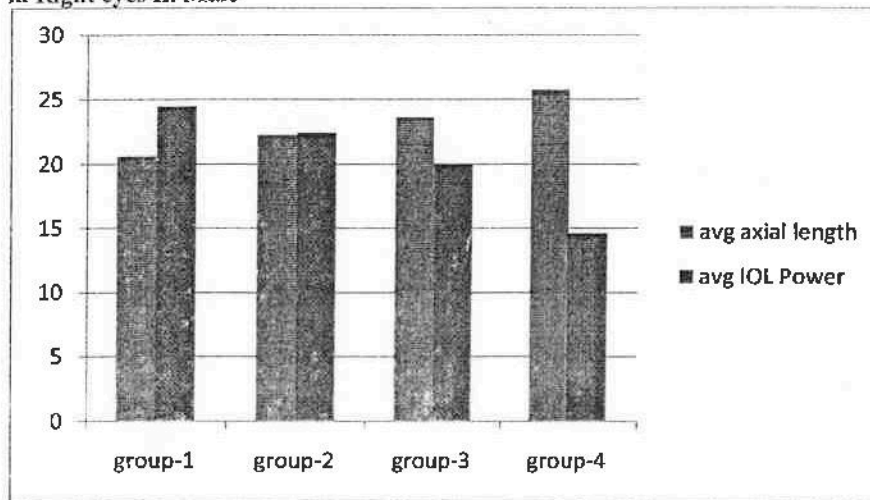
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Table showing value of average axial length of eyeball & Average power of IOL required during surgery in Right eyes In Female

	Average Axial Length(in mm)	Average Power of IOL(in D)
Group-1(19-21mm)	20.89	24.78
Group-2(21.1-23mm)	22.61	22.30
Group-3(23.1-25mm)	23.73	19.74
Group-4(>25.1mm)	26.21	14.85

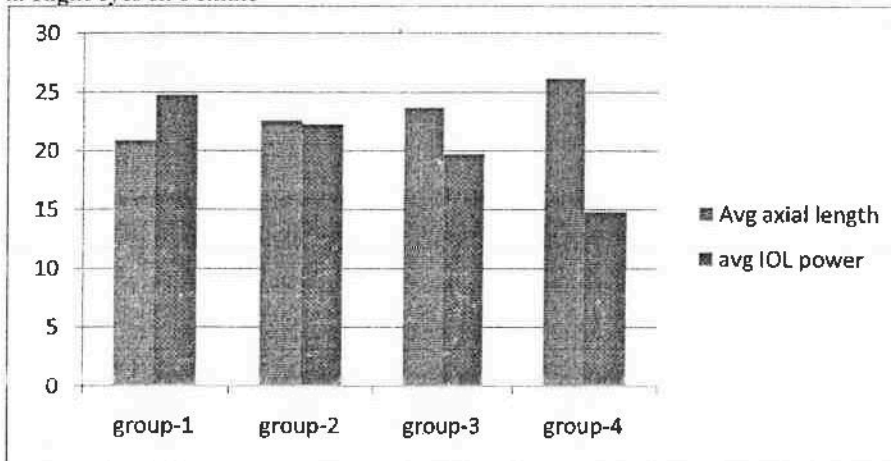
Graph-1

Graph showing value of average axial length of eyeball & Average power of IOL required during surgery in Right eyes In Male



Graph-2

Graph showing value of average axial length of eyeball & Average power of IOL required during surgery in Right eyes In Female



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 during 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 al¹⁴, on relationship between ocular axial length & refractive error found significant relationship between ocular axial length & refractive error. Patients with myopia had a mean ocular axial length that was significantly higher than the readings from the hyperopic patients.

In the present study we made use of contact ultrasonic biometry in order to measure ocular axial length. Nonetheless, applanation of the ocular surface may be a cause of error. It has been said (Drexler et al³) 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 al¹ 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 50-70 yrs

In a previous study by Eun Young dong et al⁵ found significant correlation between corneal diameter & axial length & corneal diameter & lens diameter. Another study by Mohamed Hosny et al¹⁵ 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 in both male & female

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