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ResearchArticle

The comparative study of applanation and optical coherence biometry methods for the intra ocular lens power calculation

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Abstract

Purpose: To compare applanation biometry (A-Scan) and optical coherence biometry (AL-Scan) methods for IOL power calculation based on Axial Length and post operative refractive outcome. **Methodology:** Prospective and Interventional Randomized Comparative Study, Sample size of 400, studied under two sub groups, for Axial Length readings and IOL power calculation by A-Scan (Biomedix) and AL-Scan (Nidek). Keratometry readings are taken only by AL-Scan.**Results**: Mean ± St. dev. of A.L. measured by App. Biometry was low (22.79 ± 0.9 mm) than Opt. Coh. Biometry (23.16 ± 0.78 mm) to be significant (*P*= <.0001). Mean ± St. dev. IOL power was higher (21.75 ± 2.1D) than App. Biometry (20.88 ± 1.59 D) to be significant (*P*= <0.0001). Mean ± St. dev. of refractive status for Myopia is higher -0.97 ± 0.53 by App. Biometry than Opt. Coh. Biometry -0.5 ± 0.19, to be significant (*P*= <0.0001) and Mean ± St.dev. for Hyperopia is higher 0.98 ± 0.59 by App. Biometry than Opt. Coh. Biometry 0.46 ± 0.18, to be significant (*P*= <0.0001). Bland–Altman plots showed perfect agreement between both methods regarding A.L. and calculated IOL power. Further subgroup analysis revealed a statistically significant difference in different age groups and types of cataract for Posterior Sub capsular cataract alone and Nuclear Sclerosis with Posterior Sub capsular cataract (P= <0.001). **Conclusion:** There is significant difference between App. and Opt. Coh. Biometry; however, certain situations of Cataract is demanding mandatory role of App. Biometry.

Introduction

The most important step for an accurate calculation of the IOL power is the preoperative measurement of the ocular axial length (A.L.).The ocular axial length measurement is calculated by two available procedures, Ultrasound Biometry (Applanation Biometry or A-scan) and Optical Coherence Biometry (AL-Scan, Nidek). Ultrasound Biometry has some disadvantages that have converted Optical Biometry in the first choice procedure in Ocular Biometry. However, in case of very dense cataracts Ultrasound Biometry is still required. [1]

Studies based on preoperative and postoperative Ultrasound Biometry show that 54% of errors in predicted refraction after IOL implantation can be attributed to A.L. measurement errors, 8% to corneal power measurement errors and 38% to incorrect estimation of postoperative anterior chamber depth [2].

The A.L. when measured by Applanation (A-scan) Biometry, Ultrasound causes erroneous A.L. measurement and an undesired post-operative refractive outcome. This might be attributed to the indentation of the globe and an off-axis measurement of the A.L. by the transducer particularly important in highly myopic eye. [3]

IOL master is a fast, noncontact method reported as a potentially more accurate method than Ultrasound Biometry [4].

IOL master uses the method of partial coherence interferometry (PCI) to measure the A.L., based on reflection of the interference signal of the retinal pigment epithelium. This technique was found to be more accurate than the acoustic method in cataractous eyes, with no other pathologies. However, it will not work in the presence of significant axial opacities. A mature or darkly brunescent lens, dense posterior subcapsular plaque, vitreous hemorrhage or central corneal scar will preclude any type of meaningful measurement [5].

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It has also been suggested that the IOL master is more precise and useful in difficult situations, including high myopia, posterior staphyloma or silicone oil filled globes [6].

The A.L. measurement with the IOL master is not affected by the subjective error sources of acoustical A-scan ultrasound biometry. Measurement along the visual axis is ensured as the patient fixates on the light source, precluding a misalignment error produced by an off-axis posterior staphyloma [7].

On the other hand, eyes with posterior staphylomata, or eyes with silicone oil, are very easy, and routinely measured with the IOL master [8].

Success in visual improvement in Silicon Oil filled phakic-induced cataractous eyes that require oil and/or cataract removal, and IOL implantation in one operation, depends on an accurate A.L. measurement and a precise IOL power calculation. However, biometry in Silicon Oil filled eyes is difficult to perform and measurement may be unobtainable, due to sound attenuation. Using A-scan ultrasound biometry in Silicon Oil filled eyes has several fallacies, such as false longer eyes, presence of multiple fluid interfaces, or poor penetration from sound absorption by oil [9].

A-scan Ultrasonic type Applanation Biometry is an amplitude modulation scan. It gives the information in the form of one dimensional. It is used to detect the presence of flaws in the materials. It provides data on the Antereo-Posterior Length of the eye [10].

As generally applied to pulse echo Ultrasonics, the horizontal and vertical sweeps are proportional to time or distance and amplitude or magnitude respectively. Thus the location and magnitude of acoustical interface are indicated as to depth below the transducer. [11].

Ultrasound Biometry AL measurement errors have been demonstrated to be responsible for postoperative refractive error of 0.28 Diopters (D) resulting from an AL shortening of 0.1 m.m.[11, 12].

Optical Coherence Biometry (AL-Scan, NIDEK) has become the gold standard in ocular biometry as it is highly accurate, easy to perform, non-invasive and comfortable for the patient. An optical imaging technique, Optical Coherence Tomography (OCT), uses infrared laser light for Biometry and Tomography[3, 12].

It uses infrared light (λ=780 nm) of short coherence for the measurement of the AL, which is converted to geometric AL by using a group refractive index. Furthermore, it measures the corneal curvature, the anterior chamber depth, and the corneal diameter and it calculates the optimum IOL power by its inbuilt computer software[13, 14].

Material and Method

Our Comparative study is Prospective and Interventional Randomized type Study. The sample size Assuming Cohen's effect, the size is considered about 400 (200 per group).

The study was approved by the Ethics Committee of Government Medical College Haldwani and the patients underwent routine ophthalmologic examination in the OPD of Dr. SushilaTewari Hospital and Government Medical College, Haldwani (Nainital) were informed about the purpose of the study and had to give an informed consent before inclusion.

Inclusion criteria for all patients are age of 40 to 70 years, with the Changes of immature and mature type of senile cataract. Exclusion criteria are any Corneal Irregularities, Hyper Mature Cataract, Uveitis, Scleritis, Glaucoma, undergone patients of refractive surgeries, uncontrolled systemic illness, Connective tissue disorder, Immuno compromise status, patients having complicated course of surgery or who didn't turn up for follow up, Posterior Capsular rent, improper placing of IOL, Iris Prolapse, wound leak Patient having AL>25 mm and AL< 21 mm.

Those patients who selected under inclusion criteria observed in OPD, male and female adults both of 40 to 70 of age group, urban and rural type socio-economic status will include and a detailed historyregarding their complaints, onset, duration of symptoms and other relevant history will be taken. Preliminary examination of visual acuity for distance is to be determined with Snellen's chart; if possible Pre operativeCycloplegicretinoscopy also performed. If needed auto refracto-meter assistance also applied. Keratometry readings are taken with AL- Scan (Nidek) and readings noted in Diopter. The A.L. was determined by A-Scan (Biomedix) and AL- Scan (Nidek).

A.L. measurements were first performed by AL-Scan followed by applanation Biometry to maintain the integrity of the corneal epithelium, which may be compromised inadvertently by its contact with the ultrasound probe to avoid the error measurements for App. Biometry were taken with the patient sitting upright and the transducer held so that the ultrasound beam was perpendicular to the globe.

The detailed observation made through slit lamp bio-microscopy and fundus examination with direct and indirect ophthalmoscopy. Patients were reviewed on four weeks later for refractive correction and be noted in the form of spherical equivalent.

All surgeries performed by Phacoemulsification through limbal incision approach to prevent post-operative astigmatism with "Stop and Chop" technique with foldable in-the-bag IOL implantation by the same experienced surgeon for each case. The intraocular lens for implantation is Foldable Hydrophobic Acrylic IOL, I-SERT-HOYA (model 250), A-

constants 118.8 for AL-Scan (Opt. Coh. Biometry) & 118.4 for A-Scan (App. Biometry) suggested by ULIB and calculated with SRK-II formula.

A standard postoperative topical antibiotic and anti-inflammatory regime was administered by the operating surgeon.

Statistically all patients allocated into two groups. Keratometric readings are taken alone by AL-Scan for both the groups. Axial Length estimated by A-Scan Ultra Sound Biometer (App. Biometry) and AL-Scan (Opt. Coh. Biometry). The IOL power is calculated by SRK-II formula. The data entered in MS- EXCEL spreadsheet and analyzed withSPSS software (version 21) and p-value of <0.05 is considered statistically significant.

The categorical variables are presented in numbers and percentage (%). The continuous variables are presented as mean ± SD and median. The normality of data is tested by Kolmogorov-Smirnov test. If the normality is rejected then non parametric test will be used. Statistical tests are applied as Quantitative variables compared using Unpaired t-test/Mann-Whitney Test (when the data sets were not normally distributed.) between the two groups.The Qualitative variables are compared using Chi-Square test /Fisher's exact test.

Results

400 eyes were included in the study, 197 male and 203 females, ranging 40 to 70 years, divided into three age groups of 40-50, 51-60 and 61-70 with a male: female ratio of 1:1.03.The mean ± St.dev.of age for the study under App Biometry group is 61.1 ± 8.03 and 61.97 ± 8.57 is for Opt. Coh. Biometry group.

The case distribution according to age groups for 40-50 years of age group cases are 30 (15%) for App. Biometry and 24 (12%) for Opt. Coh. Biometry. For 51-60 years of age group cases are 55 (27.50%) for App. Biometry and 45 (22.50%) for Opt. Coh. Biometry and in 61-70 years of age group cases are 115 (57.50%) for App. Biometry and 131 (65.50%) for Opt. Coh. Biometry. **(Fig-1)**

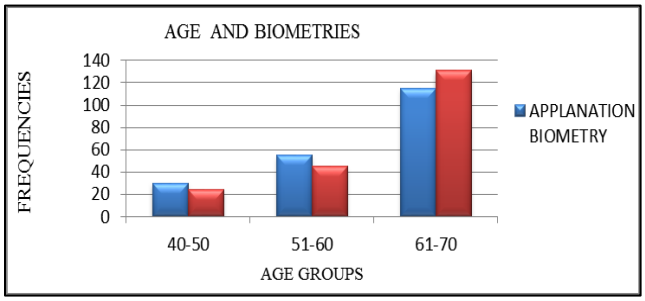

Fig. 1: Showing the frequencies of both the biometries in relation to the different age group

The cataract classification according to LOCS-3 system, this study showing that the qualitative comparison between different types of cataract with the different age groups, the most affected is Nuclear Sclerosis with Posterior Sub Capsular cataract having total count of 192 (48.00%) and we find it more prominent in the age group of 61-70, counted by 119 (48.37%). In relation to both the Biometries104 (52.00%) cases observed by Applanation Biometry and 88 (44.00%) cases observed by Optical Coherence Biometry, from the total count of 192 (48.00%).

The Posterior Sub Capsular cataract count is 38 (9.50%) and find more prominent in 40-50 age group, with the count of 17 (31.48%). In relation to both the Biometries groups Applanation Biometry has been applied successively on 21 (10.50%) cases and in same reference Optical Coherence Biometry could be applied on 17 (8.50%) cases, from the total count of 38 (9.50%).

In this study total sample size of 400 for K reading is accomplished with the Optical Coherence Biometry. The K1, K2 readings are taken in Diopter and are considered for further calculation in the fraction of 6 groups 38-40D, 40.01-42D, 42.01-44D, 44.01-46D, 46.01-48D and 48.01-50D. The maximum case frequency is 185 (46.25%), in the group range of 44.01- 46 D.

The A.L. observed under two sub groups, App. Biometry and Opt. Coh. Biometry, consisting sample size of 200 in each group with the inclusion criteria of 21-25 m.m. A.L. in accordance of both the biometry groups the Mean ± St dev for Applanation Biometry is 22.79 ± 0.9 and for the Optical Coherence Biometry it is 23.16 ± 0.78. The minimum to maximum range for Applanation Biometry is 21.12-24.83 and for the Optical Coherence Biometry is 21.54-24.97, with the median value for Applanation Biometry is 22.74 and for the Optical Coherence Biometry is 23.12. The Inter quartile Range for Applanation Biometry is 22.140 - 23.430 and for the Optical Coherence Biometry is 22.635 - 23.710. We find this relationship to be statistically highly significant (p-value < 0.0001).

The Quantitative analysis on Bland-Altman plot is to evaluate the agreement between two different Biometries for the commonly observed sample size of 281with 95% of confidence intervals. The Y axis shows the difference between the two paired measurements App. and Opt. Coh. Biometry and the X axis represent the average of these measures. The Arithmetic mean -0.4839 is the estimated bias with 95% CI value -0.5226 to -0.4453, this means that on average the axial length measured by App. Biometry was 0.4839 units less than (underestimated) the axial length measured by Opt. Coh. Biometry. The SD 0.3292 measures the random fluctuations around this mean; with the limits of agreement estimated an

interval of -1.1292 and 0.1614 respectively. The 95% CI value -1.1954 to -1.0631 is for lower limit and 0.09525 to 0.2276 is for upper limit. The results obtained from axial length measured by App. Biometry may be -1.1292 units below or 0.1614 units above the results obtained from axial length measured by Opt. Coh. Biometry. **(Fig-2)**

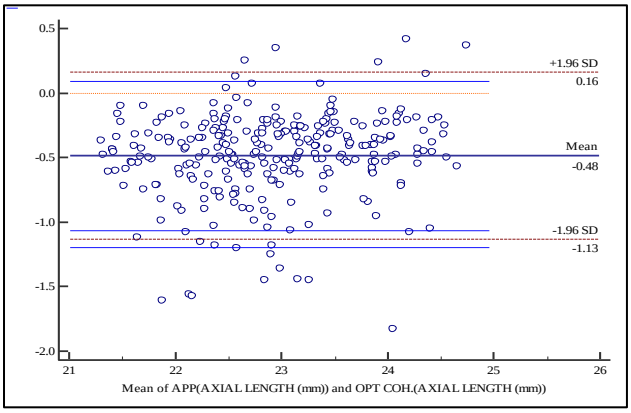

Fig.2: Bland-Altman plot to evaluate the agreement between App. and Opt. Coh. Biometry in relation to A.L

The IOL Power groups sub divided into 8 groups in relation to both the Biometries groups, the 20.50 to 22.00 D showing maximum frequency of 180 (45.00%) among them 84 (42.00%) observed by App. Biometry and 96 (48.00%) observed by Opt. Coh. Biometry. The second frequency for the IOL Power group of 18.50 to 20.00 D is 99 (24.75%) among them 35 (17.50%) observed by App. Biometry and 64 (32.00%) observed by Opt. Coh. Biometry. The third frequency for the IOL Power group of 22.50 to 24.00 D is 71 (17.75%) among them 44 (22.00%) observed by App. Biometry and 27 (13.50%) observed by Opt. Coh. Biometry. **(Fig-3)**

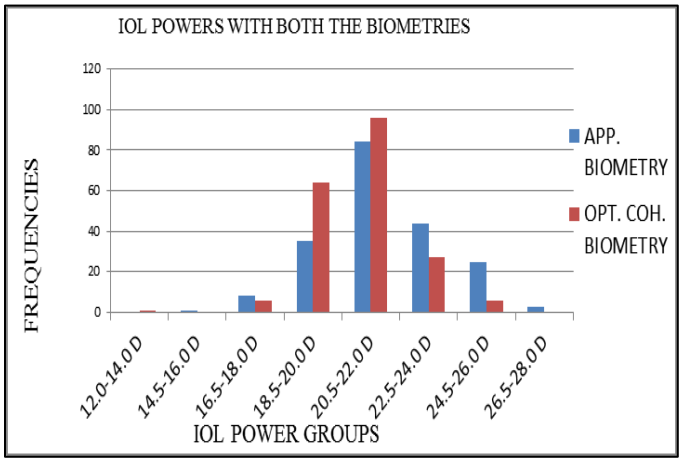

Fig.3: The IOL Power sub groups division in relation to both the Biometry groups

IOL Power distribution in relation of both the groups of Biometries total sample size is 400, equally devided for both the biometries. The Mean ± St. Dev. for App. Biometry is 21.75 ± 2.1 and for the Opt. Coh. Biometry, it is 20.88 ± 1.59. The minimum to maximum range for App. Biometry is 14.5-27.5 and for the Opt. Coh. Biometry is 14.00-25.00, with the median value for App. Biometry is 21.5 and for the Opt. Coh. Biometry is 21.00.The Inter quartile Range for App. Biometry is 20.500 - 23 and for the Opt. Coh. Biometry is 20.00 - 22.00. We find this relationship to be statistically highly significant (p-value < 0.0001).**(Fig-4)**

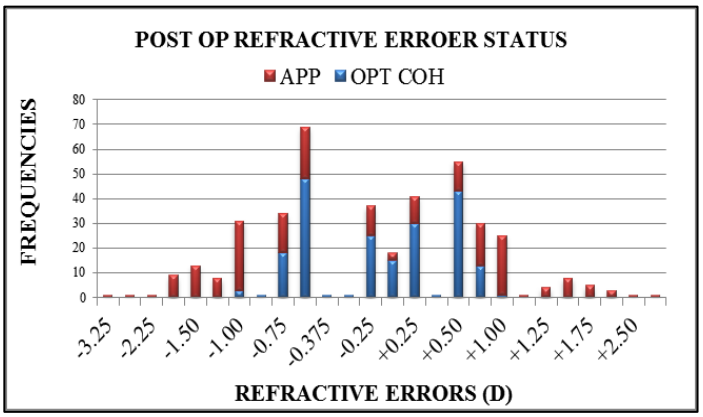

Fig.4: The different types of errors obtained by both the biometries

The Quantitative analysis on Bland-Altman plot is to evaluate the agreement between two different Biometries in relation to IOL Power measurement. The Y axis shows the difference between the two paired measurements App. and Opt. Coh. Biometry and the X axis represent the average of these measures for IOL Power. The Arithmetic mean 1.1441 is the estimated bias with 95% CI value 1.0122 to1.2761, this means that on average the IOL Power measured by App. Biometry was 1.1441 units more than (overestimated) the IOL Power measured by Opt. Coh. Biometry. The SD 1.1235 measures the random fluctuations around this mean; with the limits of agreement estimated an interval of -1.0579 to 3.3461 respectively. The 95% CI value -1.2836 to -0.8321 is for lower limit and 3.1204 to 3.5719 are for upper limit. The result obtained from IOL Power measured by App. Biometry may be 1.0579 units below or 3.3461 units above the results obtained from IOL power measured by OPT COH. **(Fig-5)**

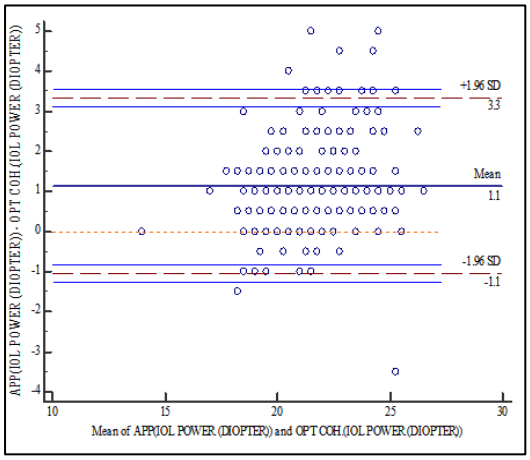

Fig.5: Bland-Altman plot to evaluate the agreement between different Biometries and IOL Power measurement

The post operative observation is on the basis of spherical equivalent has been considered for both the groups of Biometries with the sample set of 200 for each. The Ammetropes types of errors are obtained by the Opt. Coh. biometry within the range of -1.00 D Spherical of Myopia to +1.00 D Spherical of Hyperopia, while with the Applanation biometry it's around -3.25 D Spherical of Myopia to +4.00 D Spherical of hyperopia. The Emmetrops are found 3 by Applanation Biometry and 15 by optical coherence Biometry. The most efficient results for total Emmetropia cases are 18 (4.50%), among them 3 (1.50%) cases by the App. Biometry and 15 (7.50%) cases by Opt. Coh. Biometry. The relationship between both the Biometries and Post Op. refractive result we find statistically high significance (p-value < 0.0001). **(Table-1)**

Table.1: Post-operative observation on the basis of spherical equivalent

Spherical Equivelent (Diopter)	Groups of Biometries		Total	Test of Significance
	ApplanationBiometry	Opt. Coh.Biometry		
-3.25	1 (0.50%)	0 (0.00%)	1 (0.25%)	P-VALUE= <.0001 Chi Square Test = 151.383 Degree of Freedom = 25
-2.5	1 (0.50%)	0 (0.00%)	1 (0.25%)	
-2.25	1 (0.50%)	0 (0.00%)	1 (0.25%)	
-1.75	9 (4.50%)	0 (0.00%)	9 (2.25%)	
-1.5	13 (6.50%)	0 (0.00%)	13 (3.25%)	
-1.25	8 (4.00%)	0 (0.00%)	8 (2.00%)	
-1	28 (14.00%)	3 (1.50%)	31 (7.75%)	
-0.88	0 (0.00%)	1 (0.50%)	1 (0.25%)	
-0.75	16 (8.00%)	18 (9.00%)	34 (8.50%)	
-0.5	21 (10.50%)	48 (24.00%)	69 (17.25%)	
-0.38	0 (0.00%)	1 (0.50%)	1 (0.25%)	
-0.37	0 (0.00%)	1 (0.50%)	1 (0.25%)	
-0.25	12 (6.00%)	25 (12.50%)	37 (9.25%)	
0	3 (1.50%)	15 (7.50%)	18 (4.50%)	
+0.25	11 (5.50%)	30 (15.00%)	41 (10.25%)	
+0.37	0 (0.00%)	1 (0.50%)	1 (0.25%)	
+0.5	12 (6.00%)	43 (21.50%)	55 (13.75%)	
+0.75	17 (8.50%)	13 (6.50%)	30 (7.50%)	
+1	24 (12.00%)	1 (0.50%)	25 (6.25%)	
+1.12	1 (0.50%)	0 (0.00%)	1 (0.25%)	
+1.25	4 (2.00%)	0 (0.00%)	4 (1.00%)	
+1.5	8 (4.00%)	0 (0.00%)	8 (2.00%)	
+1.75	5 (2.50%)	0 (0.00%)	5 (1.25%)	
+2	3 (1.50%)	0 (0.00%)	3 (0.75%)	
+2.50	1 (0.50%)	0 (0.00%)	1 (0.25%)	
+4	1 (0.50%)	0 (0.00%)	1 (0.25%)	
Total	200 (100.00%)	200 (100.00%)	400 (100.00%)	

The consolidated figure to confirm effective type of obtained refractive error against both the type of Biometries, the results shows that the Post. Operative cases of Myopia are 207 (51.75%) among them 110 (55.00%) are from App. Biometry and 97 (48.50%) are with the Opt. Coh. Biometry. The Hyperopia is 175 (43.75%) among them 87 (43.50%) are from App. Biometry and 175 (43.75%) are with the Opt. Coh. Biometry. The consolidated relationship between both the

Biometries and Myopic and Hyperopic types of refractive error we find statistically significant (p-value < 0.012). **(Table-2)**

Table.2: Consolidated figures of effective of refractive error type

Sph. Eq.	Groups of Biometry		Total	Test of Significance
	App.	Opt. Coh.		
Emmetropia	3 (1.50%)	15 (7.50%)	18 (4.50%)	P- Value= 0.012
Myopia	110 (55.00%)	97 (48.50%)	207 (51.75%)	Chi Square Test= 8.822
Hyperopia	87 (43.50%)	88 (44.00%)	175 (43.75%)	
Total	200 (100.00%)	200 (100.00%)	400 (100.00 %)	Degree of Freedom= 2

Discussion

For A.L. measurements, the non-invading type of procedure is Opt. Coh. Biometry measures the distance between the anterior corneal interfaceto the retinal pigment epithelium (RPE). Opt. Coh. Biometry has greater accuracy because it measures the ocular A.L. along the visual axis, as the patient fixates at the measurement beam [15].

App. biometry measures the distance from the corneal vertex to the internal limiting membrane (ILM). During measurement with App. biometry a misalignment may occur between the measured axis and the visual axis [16].

The difference in the A.L. measurement may be due to starting point of measurement between the two modalities. Ultrasound A-scan measures A.L. from the anterior surface of the corneal apex to the internal limiting membrane ILM of the fovea, whereas Opt. Coh. Biometry measures A.L. from the second principal plane of the cornea (0.05 mm deeper than the corneal apex) to RPE (0.25 mm deeper than ILM) of the fovea. The resolution improves with the decrease in wavelength. The laser light has better resolution, and the accuracy of A.L. by App. Biometry is approximately 0.10–0.12 mm compared to 0.012 mm of A.L. by Opt. Coh. Biometry. The corneal indentation is also possible during contact of probe of App. Biometry, leading to the shortening of A.L. by an average of 0.1–0.3 m.m.[20].

In our study, A.L. measured by Opt. Coh. Biometry was 23.16±0.78 mm longer than that of App. Biometry 22.79±0.9 with the mean difference of 0.37±0.84and was statistically significant (P <0.0001).

In our study the A.L. difference found 0.37 mm (P <0.0001) higher with the Opt. Coh. Biometry and in comparison with others, Rajan *et al*. (2002)[5] estimated in clinical trial of 100 patients for the difference of 0.04mm (P > 0.05) higher with the Opt. Coh. Biometry[5].

Eleftheriadis (2003)[8]estimated in 100 eyes that the AL obtained by IOL master was significantly longer by 0.47 m.m. than applanation US [8].

Hitzenberger *et al*. (2003) found that AL measured by optical biometry were 0.18 mm longer than AL measured by immersion technique and 0.47 mm longer than measured by applanation technique[17].

In the study by Goyal *et al*. (2003) [18]found a difference of 0.2 mm between A-scan US and IOL master [18].

Rose LT, Moshegov CN*et al.* (2003)[19] studied 51 eyes in 46 patients presenting to clinical practice for cataract surgery assessment. On average the axial lengths measured by the Opt. Coh. Biometry was longer by 0.15 mm compared to App. biometry (P < 0.01).

In reference to IOL power and post operative refractive status on behalf of spherical equivalent, our study concludesMean ± St. Dev. for App. Biometry is 21.75 ± 2.1 and for the Opt. Coh. Biometry, it is 20.88 ± 1.59 with the mean difference of 0.87±1.86, for IOL Power in relation to Both the Biometries group. All the IOL Power was calculated with SRK-II formula.

The conclusion is Opt. Coh. Biometry provides low IOL Power in comparison of App. Biometry method. We find this relationship to be statistically highly significant (p-value < 0.0001). The relationship between both the Biometries and refractive errors type myopia and Hyperopia, we find more myopic cases than hyperopic and greater count was by the App. Biometry, its find statistically significant (p-value < 0.012).

The major refractive error value for myopia is -0.50 D Sph with 69 (17.25%) among them App. Biometry provides 21 (10.50%) and Opt. Coh. Biometry provides 48 (24.00%), while for Hyperopia it is about +0.50 D Sph with 55 (13.75%) among them App. Biometry provides 12 (6.00%) and Opt. Coh. Biometry provides 43 (21.50%). The Emmetropic cases are 18 (4.50%), among them 3 (1.50%) cases by the App. Biometry and 15 (7.50%) cases by Optical Coherence Biometry. However statistically, the test of significance is strongly proven (p-value < 0.0001).

The best post-operative V.A. was 6/9 for 131 (65.50%) in total, from them 152 (76.00%) achieved by App. Biometry and 283 (70.75%) achieved by Opt. Coh. Biometry.

The comparison of our study with others, Rajan *et al*. (2002) [5]found that the non contact optical biometry using the partial coherence laser interferometry principle improves the predictive value for postoperative refraction and is a reliable tool in the measurement of intraocular distances in pseudophakic eyes[5].

Eleftheriadis (2003)[8]found the mean postoperative spherical equivalent was 0.00 (0.40) D and the mean prediction error -0.15 (0.38) D. The mean absolute prediction error was 0.29 (0.27) D. 96% of the eyes were within 1 D from the intended refraction and 93% achieved unaided visual acuity of 6/9 or better **[8]**.

Hitzenberger *et al*. (2003) found that the mean postoperative spherical equivalent was 0.00 (0.40) D and the mean prediction error −0.15 (0.38) D. The mean absolute prediction error was 0.29 (0.27) D. 96% of the eyes were within 1 D from the intended refraction and 93% achieved unaided visual acuity of 6/9 or better **[17]**.

Goyal *et al*. (2003)[18] found the coefficient of variation was lower with laser interferometry (0.1%) than with the ultrasound technique (0.49%) **[18]**.

Rose LT, Moshegov CN*et al.* (2003)[19] made Preoperative measurement of axial length with applanation ultrasound and the IOL Master. The IOL Master Measurements were used to determine the intraocular lens power based on the SRK/T formula. Using the IOL Master over applanation ultrasound biometry significantly improved the postoperative refractive outcome from 0.65 D to 0.42 D (P=0.011).

Conclusion

The AL-Scan (Opt.Coh. Biometry) is sensitive, user friendly and noncontact technique type of device. It allows accurate A.L. measurement and determination of IOL power for cataract surgery in comparison of A-Scan (App. Biometry). But the App. Biometry still has magnificent role in cases of dense ocular media, some retinal disorders where fixation issues arises and on non-ambulatory patients.

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