

Study of Interocular Difference in Axial Length Measured By Contact Ultrasound A Scan And Optical Biometry

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Abstract :

Introduction: Cataract surgery is no longer just for visual rehabilitation but has also become a form of refractive surgery in which the final refractive result can define visual outcome. Axial length is perhaps the most important parameter in most modern day formulae for IOL power calculation and in turn it affects the postoperative visual status of the patient.

Aim-To Study the Interocular Difference in Axial Length By Contact Ultrasound A scan and Optical Biometry

Method: The study was carried out in 864 eyes of 432 patients with bilateral cataract (864 eyes) who gave consent for the study. A thorough history was taken and ocular examination was done Axial length (AL) measurement was done by Optical Biometry first and then by Contact Ultrasound A scan and the Interocular difference in axial length obtained by both methods was studied.

Result: Interocular difference in axial length measured by Contact Ultrasound A scan was not statistically significant ($p= 0.93$). Similarly interocular difference in axial length measured by Optical Biometry was not statistically significant ($p= 0.82$).

Conclusion: The mean Interocular difference in Axial Length obtained by above two methods was not statistically significant.

Keywords: Axial Length, Contact Ultrasound A Scan, Optical Biometry, Interocular Difference, IOL Power

I. Introduction

Axial length (AL) is perhaps the most important parameter in most modern day formulae for IOL power calculation. 54 % of refractive outcome error is attributable to flawed AL measurements.⁽¹⁾ Axial Length can be measured by ultrasonic method or optical method. An axial length measurement error of 100 μm would result in a corresponding postoperative refractive error of ± 0.28 Diopter^(2,3). This is why a small difference in Axial length measurement leads to large errors in IOL power and in turn postoperative visual status of the patient. Cataract surgery is no longer just for visual rehabilitation but has also become a form of refractive surgery in which the final refractive result can define visual outcome⁽⁴⁾ and hence this study was taken up since we want precision in axial length measurement and so we compared two methods of axial length measurement and also studied the interocular difference of axial length. The study was carried out in 864 eyes of 432 patients with bilateral cataract (864 eyes) who gave consent for the study. A thorough history and ocular examination was done Axial length (AL) measurement was done by Optical Biometry and Contact Ultrasound A scan and compared them statistically. Interocular difference in axial length obtained by both methods was studied.

Objective Of The Study

To Study the Interocular Difference in Axial Length by Contact Ultrasound A scan and Optical Biometry

II. Materials And Methods

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- Study Design:** It was a hospital based cross sectional study
- Duration of study:** Study period was from 1st November 2014 to 31th October 2016
- Inclusion criteria:** Eyes of consecutive patients having bilateral cataract admitted to eye ward for cataract surgery who consented for the study.
- Exclusion criteria:**
 - Patients who have undergone previous ocular surgery in either eye (vitreoretinal or cataract or refractive surgery) ,
 - Those with irregular corneas , corneal opacity,
 - With retinal detachment,
 - Amblyopia

- Patients with history of trauma
 - Anisometropia
 - Glaucoma
 - Eyes with Choroidal Neovascularisation because of exudative changes like exudative retinal detachment which affects axial length
 - Uncooperative patients
 - Those not giving consent for the study
- e. **Methods:** Our study was carried out in a tertiary care rural hospital in 864 eyes of 432 patients with bilateral cataract (864 eyes) who consented for the study. A detailed history was taken followed by systemic and ocular examination. Ocular examination included visual acuity assessment, torch light examination; intraocular tension measurement followed by anterior segment and posterior segment examination. Keratometry was done by Autokeratorefractometer followed by Optical Biometer. Axial length (AL), Anterior chamber depth (ACD) was measured with Optical Biometer first followed by Contact Ultrasound A scan. Then data for 864 eyes of 432 patients was entered and analyzed and we studied interocular difference in Axial Length obtained by Contact Ultrasound A scan and Optical Biometry.

III. Results

As we know we have two eyes which have been made similar by the creator and hence we found it interesting to study whether there is any significant difference in Axial Length between right and left eye. Contact Ultrasound A scan was possible in both eyes of 432 patients but due to dense cataract axial length could be obtained in both eyes only in 176 patients (352 eyes) by Optical Biometry.

Mean Axial Length (mm)	Right Eye		Left Eye		Difference (mm)	p value
	n	Mean±SD(mm)	n	Mean ± SD(mm)		
Contact ultrasound A scan	432	22.76 ± 1.07	432	22.76 ± 1.07	0	0.93
Optical Biometry	176	22.96 ± 1.16	176	22.82 ± 1.65	0.14	0.82

Table 1a : Interocular Difference in Mean Axial length Obtained by Contact Ultrasound A scan and Optical Biometry

Table 1a show that interocular difference in mean axial length measured by Contact Ultrasound A scan was not statistically significant (p= 0.93), similarly interocular difference in mean axial length measured by Optical Biometry was not statistically significant (p= 0.82). Mean axial length of right and left eye was found to be 22.76 ± 1.07 mm by Contact Ultrasound A scan with no interocular difference. Mean axial length in right eye by Optical Biometry was 22.96 ± 1.16 mm and in left eye was 22.82 ± 1.65 with difference in mean axial length of 0.14mm which was not statistically significant as observed by unpaired t test. Further we analyzed the interocular difference in axial length of every individual patients right and left eye and grouped the difference into 4 groups as described in table below. We took right eye as reference eye and then calculated the interocular difference subtracting the value of left eye from right eye of each individual.

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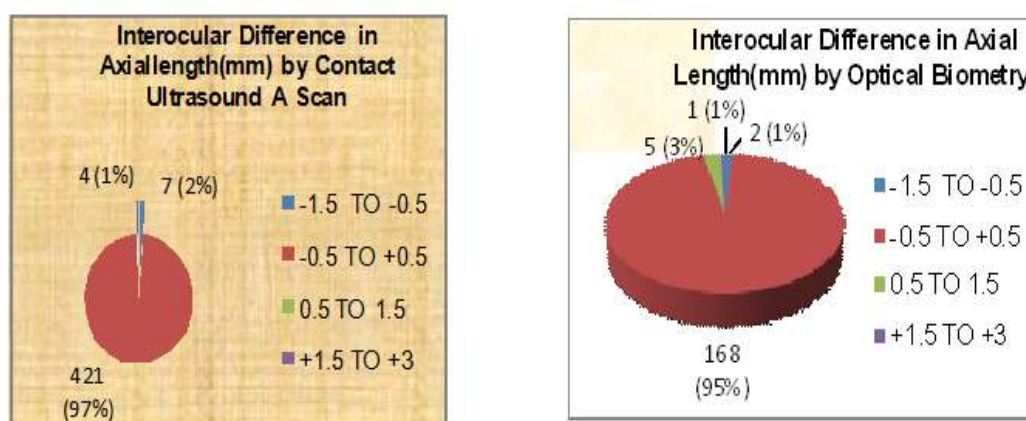


Fig 1a 1b: Interocular Difference in Axial Length obtained by Contact

Ultrasound A Scan and Optical Biometry respectively

Interocular Difference in Axial Length by Contact ultrasound A scan (mm)	n (patients)%
-1.5 TO -0.5	07(2%)
-0.5 TO +0.5	421(97%)
+0.5 TO +1.5	00(00%)
+1.5 TO +3	04(1%)
TOTAL	432(100%)
p value	0.93

Table 1b : Interocular Difference in Axial Length obtained by Contact Ultrasound A scan

Interocular Difference in Axial Length by Optical Biometry (mm)	n (patients)
-1.5 TO -0.5	02(1%)
-0.5 TO +0.5	168(95%)
+0.5 TO +1.5	05(3%)
+1.5 TO +3	01(1%)
TOTAL	176(100%)
p value	0.82

Table 1c : Interocular Difference in Axial Length obtained by Optical Biometry

Of 432 patients, 421 patients (97%) had interocular difference of axial length of +0.5 to -0.5 mm as measured by Contact Ultrasound A scan. When measured by Optical Biometer interocular difference in axial length could be studied only in 176 patients (352 eyes) out of 432 patients (864 eyes) since due to dense cataract measurement could not be obtained in rest of the eyes. 168 patients (95%) had interocular difference of -0.5 to +0.5 mm when measured by Optical Biometer.

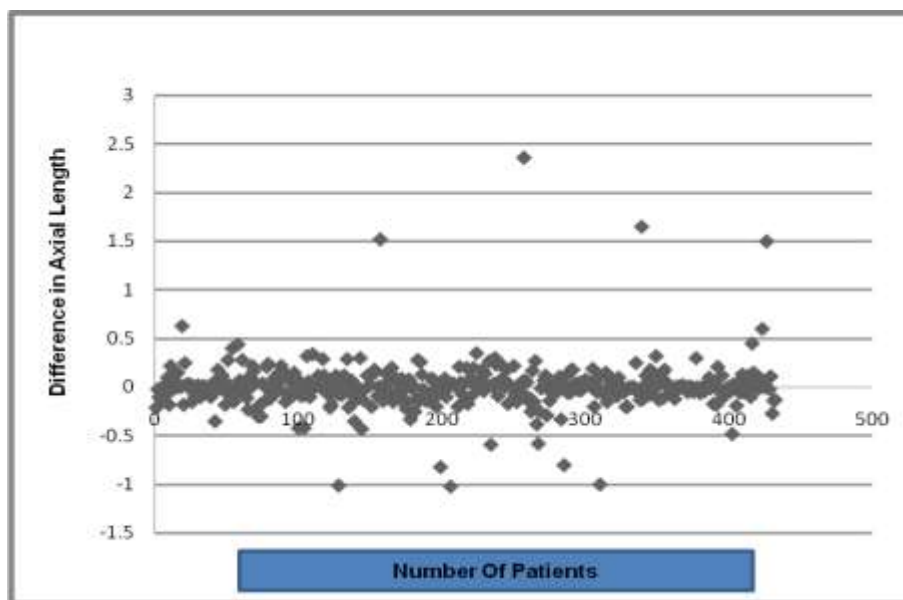


Fig 1c: Scatter Plot Showing Interocular difference in Axial length

In the scatter plot Fig 1c we can see that most of the patients (97%) had interocular difference of axial length within the range of +0.5 mm to -0.5mm.

IV. Discussion

Very few studies have been done to evaluate the interocular difference in axial length measured by Contact Ultrasound A scan and also by Optical Biometry. In a study done by Wissa et al (2012), on examining 163 eyes, they found no difference in the laterality by student t test ($t = 1.374, p = 0.172$)⁽⁵⁾

V. Conclusion

Difference in mean axial length of right and left eye measured by Optical Biometry was 0.14mm. (n= 176 patients, 352 eyes) which shows Interocular difference in axial length measured by Contact Ultrasound A scan was not statistically significant (p= 0.93). Similarly interocular difference in axial length measured by Optical Biometry was not statistically significant (p= 0.82).

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