

Comparative study of axial length measurement using B scan and A scan biometry in intra ocular lens power calculation

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Abstract

Background: Intra Ocular Lens power calculation are done preoperatively using different formulas like SRK-1, SRK-2, SRK-T, Holladay, Hoffer- Q, Haigis. They need Eye's Axial Length (L)², Corneal power (K)⁵, Estimated Lens Position post operatively (ELP) and A- constant for accurate IOL power (P) calculation to get emmetropic vision after surgery. Axial length of the eye ball can be measured by many methods like A scan, B Scan, OCT etc. **Aim:** To compare the accuracy of B-mode guided biometry with that of Contact A Scan biometry in preoperative IOL Power calculation and to assess the reproducibility while measuring the axial length of eye ball. **Materials And Methods:** Axial length of 50 eyes(Group A) were calculated using A scan contact biometry. In the other 50 Preoperative eyes(Group B) , B Scan were used to calculate the Axial length of eyeball . IOL power calculation were done for both groups using SRK -2 formula. For all these patients, cataract surgery were performed by Phaco emulsification method in the period of Feb 2015 till Jan 2016. Postoperative refractive status were calculated and tabulated after 45th postoperative day and comparison were done between both the groups. **Results:** Postoperative refraction for all 100 patients calculated and the details tabulated. The deviation of +/- 0.75Dsph and more of postoperative refraction is noted and tabulated. The axial length measured by B scan(22.9+1.3) was slightly longer than that measured by A-Scan(22.8+1.2). Postoperative refractive error showed mean of -0.045 in A Scan and-0.015 in B Scan. Postoperative refractive error showed Standard deviation of 0.43 in A Scan and 0.214 in B scan. Both the data's are compared with paired t test and chi square test. Emmetropia is significantly higher in patients for whom IOL was implanted with the Axial length measured by B Scan(x2 =23.52, p=0.001) than the A Scan. **Conclusion:** Axial length measurement done by B Scan measurement gives less variation in readings and also better postoperative refractive stability compared to Axial length measurement done by A Scan biometry. **Key Word:** B scan, A scan.

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INTRODUCTION

Axial length of eyes can be measured by multiple methods¹² like A Scan Biometry, B mode ultrasound B-Scan, Anterior segment OCT, partial coherence

interferometry based machines like IOL Master. Postoperative IOL refractive Power calculation^{3,4} was done based on many Regression formulas. Some of the common formulas used are SRK-1, SRK-2, SRK-T⁷, HOLLADAY, HAIGIS, HOFFER-Q. Most of these regression formulae needs few measurements like Axial length of eyeball, Keratometry⁵, A constant which is dependent of the make of the IOL. The final desired result is attaining emmetropia after the surgery. Conventionally axial length measurement were done by A scan biometry⁸ either by contact method or by immersion method. By this method A Scan probe is aligned over the anterior surface of the cornea for the axial length measurement. Intra ocular surfaces of interest are corneal surface, lens surfaces, macular vitreo retinal surface. Highest amplitude of ultrasonic wave peaks are used for axial length

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measurement. In B mode ultrasound^{9,10}, ultrasonic waves are used to find the optimal axial length on the frozen section of the ultrasound images got by using the probe – usually by immersion method or even over the gel.

MATERIALS AND METHODS

100 eyes chosen for cataract surgery were divided into 2 groups. In first group- A(50 eyes), the axial length was measured using contact A scan and in group B(50 eyes), the axial length of eyes were measured using frozen section of B Scan. IOL Power calculation were done using the formula⁷ $P=A-2.5L-0.9K$ Where P is the Power of IOL, L is axial length of the eye ball and K is the Keratometry reading. A is the constant determined by the manufacturer of the IOLs. All the 100 eyes underwent uneventful cataract surgery by phacoemulsification under Peribulbar block by different surgeons at Meenakshi medical college hospital from the period Feb 2015 till Jan 2016. All the surgeries went uneventful with no intra or postoperative complications like PCR. Foldable IOLs were placed in all cases in the capsular bag after proper IOL power calculation as mentioned above. Postoperative refraction was done by 45th postoperative day.

RESULTS

100 patients underwent cataract surgery by phacoemulsification. Among them 50 patients had axial length measured by A Scan biometry and 50 patients had their axial length measured by B Scan.

Table 1: Gender Wise Distribution

Sex Of The Patient	No. Of Patients	Percentage
MALE	45	45
FEMALE	55	55
TOTAL	100	100

Patients were reviewed periodically and refraction was done by the end of 6 weeks. The deviation of +/-0.75D is taken as cut off and thus the results were tabulated as below in both groups. In both groups tabulations were made with axial lengths as criteria- less than 22mm and ones within 22-24.5mm and the ones more than 24.5mm

Table 2: Post Op Refractive Status In Group A(A-Scan)

Axial Length	Hypermetropic	Emmetropic	Myopic
<22MM	9	1	4
22-24.5MM	8	6	10
>24.5MM	6	3	3

Table 3: Post Op Refractive Status In Group B (B-Scan)

Axial Length	Hypermetropic	Emmetropic	Myopic
<22MM	1	4	5
22-24.5MM	1	10	15
>24.5MM	0	11	3

Both the groups are compared by taking mean and chi square test and paired t test.

Table 4: Test Of Significance For Group A And Group B

Post Operative Refractive Error	Group- A	Group- B	Test Of Significance X ² , Df, P-Value
Emmetropic	10	25	23.52, 1, 0.001
Myopic	17	23	1.5, 1, 0.02
Hypermetropic	23	2	9.89, 1, 0.001

DISCUSSION

By analyzing the results., 96% of patients in group B had achieved desired post of refraction (ie within+/-0.75Dsph). B scan being a two dimensional study is more effective in accurately measuring axial length even in myopic patients or the ones with staphyloma. B mode biometry also is more reproducible. According to Quing hua Yang⁹ et al, axial length measured by B-Scan (23.48+/-1.15) did not have significant difference from that measured by A-Scan (23.38+/-1.20) or IOL master (23.52+/-1.17) and there was there was significant difference in mean absolute refractive error +/-0.5D between A scan and B scan three months post operatively ($x^{(2)}=5.67$, $p<0.05$) and there was no significant difference between B Scan or IOL master. Our study too says that mean absolute refractive error has significance difference between group A and B. Also that almost 96% of patients in group B(the one with axial length measured by B Scan) attained desired postoperative refraction. Oliver Berges² et all in their study showed that 63% of patients with axial length measured by B scan had desired postoperative refraction (ie <=/- 0.5D sph) to that of 43% of patients with axial length measured by A scan. p value = <0.05

CONCLUSION

Axial length measurement done by B Scan measurement gives less variation in readings and also better postoperative refractive stability compared to Axial length measurement done by A Scan biometry

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