International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2016): 79.57 | Impact Factor (2015): 6.391

Evaluation of Vision Changes Using SRK / T Formula in Cataract Senilis Performed Phacoemulsification

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Abstract: ***Objective:*** ***The accuracy of biometric examination is very useful in cataract surgery to reduce refractive errors and best vision results. After the operation, it is expected to achieve target vision as emmetropia.*** ***Method:*** ***The total of 45 senile cataracts performed by phacoemulsification. Power IOL using Formula SRK/T, axial length, and anterior chamber depth measured by using Optical Biometry (IOL Master 500®) at Medan Baru Eye Centre Hospital from January to February 2018. After phacoemulsification each visual acuity of the patient was being examined then performed follow-up on days to 7, 14, and 30 post operative.*** ***Results:*** ***The number of cataract patients performed 45 phacoemulsification, visual acuity result is better in medium axial length as much as 15 eyes, compared to short and long axial length.*** ***Conclusions:*** ***There is no significant correlation between changing of vision and short, moderate and long axial length using the SRK / T formula.***

Keywords: phacoemulsification, SRK / T, axial length

1. Introduction

Cataract surgery is the most common eye surgery in the world. With advanced technology and improvements in surgical techniques, obscure results and patient satisfaction are essential to determine the success of this procedure. To achieve optimal results, preoperative biometry should be accurate and formulas for measuring accurate IOL strength must use Intraocular lens strength calculations are an equation for determining the appropriate size of intraocular lenses, related to variables such as axial length, keratometry results and anterior chamber depth (ACD). The accuracy of biometric examination is very useful in cataract surgery to reduce refractive errors and contribute to the better sharp visual results. After surgery, it is expected to achieve a sharp target vision of emetropia without the use of glasses or contact lenses.[1,2,3]

The calculation of intraocular lens formulas (IOL) has evolved since 1949 when Harold Ridley put the first IOL on the human eye. There are various theory and regression formulas available for IOL power calculations. It consists of Holladay 1, Hoffer Q, SRK-T (known as third generation formulas) and Holladay 2, Haigis, and Olsen as the fourth or newer generation formulas. Although third and fourth generation formulas prove to be quite good at calculating IOL strength in eyes with average axial length, there is no general consensus that assesses which formulas are used for IOL measurements in the eyes with short, medium and long axial lengths. [1,2,3]

The accuracy of lens strength measurement is very useful, considering most of the calculation errors are when the biometric and keratometry checks are performed. Optimal results for newly developed intra-ocular lenses such as toric, multifocal, accommodative, and aspheric lenses also depend on the accuracy of biometric measurements. The proliferation of tools for measuring eyeballs and the use of intra-ocular lens formulas requires an eye doctor to have a basic understanding of the relationship between the previous refraction status and possible errors in the calculation of the intra-ocular lens strength.[4,5,6,7]

This is very important because a measurement error of 0.1 mm will result in postoperative refraction disturbance up to 0.28 D. But with the discovery of optical biometry tools, the accuracy of the measurement of the axis length of the eyeball has increased significantly. Using optical biometry, postoperative refractive targets can be achieved up to ± 0.50 D in 62.5% of cases and ± 1.00 D in 92.4% of cases. This achievement is very large when compared with measurements using ultrasound devices that achieve refractive targets of ± 0.50 D in only 45.5% of cases and ± 1.00 D in 77.3% of cases.[8,9,10,11]

2. Method

This study was observational prospective analytic series by taking data on eye polyclinic patients at Medan Baru Eye Hospital from January to February 2018. Data were taken from subject group divided into three groups using the three variables and analyzed.

The inclusion criteria for this study were all ≥40 years old cataract patients who would undergo phacoemulsification, who were willing to be sampled for the study and for follow-up before surgery, and after the 7th 14th and 30th day of operation. Exclusion criteria for this study were patients who experienced intraoperative and postoperative complications, with anterior segment abnormalities, with systemic abnormalities, and non-follow-up.

The sample data were collected by performing a sharp visual examination, biometric examination using optical biometry (IOL Master 500) by selecting the SRK / T formula and the axial length results were divided into 3 groups (the short AL group of AL <23 mm, ie AL 23-24mm and AL length ie AL> 24mm), Anterior chamber depth (ACD), Power IOL. The sharpness vision of all patients who have performed phacoemulsification were being examined at the 7th ,14th 30 th day after the operatiom. The data were processed using Chi-Square Test and Wilcoxon Test. All statistical tests used p <0.05 as a meaning margin with SPSS software.

3. Result

This study was a prospective observational analytic series that aims to determine the relationship of sharp change of vision in short, medium and long axial length for 30 days postoperative phacoemlusifikasi by using formula SRK / T on optical biometry in patients by taking data at Medan Baru Eye Centre Hospital. Patients with axial length in each group were 15 eyes and the total sample was 45 eyes.

Table 3.1: Demographic Distribution In Patients' Eyes with Various AL

Characteristics	*Axial Length*						
	N	Short $\bar{x} \pm SD$	N	Medium $\bar{x} \pm SD$	n	Long $\bar{x} \pm SD$	P
Age (y.o)	15	66.00 ± 9.09	15	62.93 ± 8.05	15	65.20 ± 7.17	0.569
ACD (mm)	15	3.43 ± 0.47	15	3.44 ± 0.25	15	3.46 ± 0.34	0.967
K_1	15	44.26 ± 1.67	15	44.30 ± 1.45	15	42.18 ± 1.36	0.0001*
K_2	15	45.24 ± 1.64	15	45.12 ± 1.62	15	43.16 ± 1.38	0.001*
Power IOL	15	22.03 ± 1.69	15	20.10 ± 1.12	15	18.30 ± 2.60	0.0001*

* Chi-Square test, significant <0.05

In Table 3.1. above explains that the mean value of the sample age distribution of the research sample in the short axial length is 66.00, the axial length is 62.93, and the long axial length of 65.20, where P = 0.569 (not significant). From the observed data from the anterior chamber depth (ACD) the average value of ACD in the short axial length is 3.43, at the medium axial length of 3.44, and at the long axial length of 3.46, where P = 0.967 (not significant).

Table 3.2: Gender Characteristics with various Axial Lengths

Characteristics	*Axial Length*				P
	Short n (%)	Medium n (%)	Long n (%)	Total n (%)	
Man	5 (23.8%)	8 (38.1%)	8 (38.1%)	21 (100%)	0.448
Women	10 (41.7%)	7 (29.2%)	7 (29.2%)	24 (100%)	
Total	15	15	15	45 (100%)	

* Chi-Square test, significant <0.05

From Table 3.2. above, it shows that Chi-Square test results described no significant difference in proportion P = 0.448 (P> 0.05) between the short, medium and long group AL genders. Where the sex of the short-lived AL group was 41.7% more women, while the sex of the moderate and long-acting group was seen more in 38.1% of men.

Table 3.3: Characteristics Of Visual Acuity Before Phacoemulsification

Visus Pre Op	Axial Length		
	Short n (%)	Medium n (%)	Long n (%)
1/300	1 (25%)	2 (50%)	1 (25%)
1/60	6 (42.9%)	4 (28.6%)	4 (28.6%)
2/60	2 (66.7%)	1 (33.3%)	0 (0%)
3/60	0 (0%)	0 (0%)	2 (100%)
4/60	2 (40.0%)	3 (60.0%)	0 (0%)
5/60	2 (25.0%)	3 (37.5%)	3 (37.5%)
6/60	2 (22.2%)	2 (22.2%)	5 (55.6%)

From Table 3.3. above described that visual acuity before the phacoemulsification is the most 1/60 as many as 14 eyes and at least is on visual acuity 3/60 as much as 2 eyes.

Table 3.4: Evaluation Test of Visus 7thday Change to Visus 14thday on Short axial length Post Phacoemulsification by Using Formula SRK / T

Variables	Visus		The change of rank		*p.*
	7thday	14thday			
	N	N		N	
Visus • Advanced • Not Advanced	11 4	13 2	Negative Ranking Positive Ranking Ties	2 0 13	0.157

Wilcoxon test results described p = 0.157, thus according to statistical test no significant change in the visual acuity of 7thday to 14thday in short axial length post Phacoemulsification by using formula SRK /T.

Table 3.5: Evaluation Test of Visus 14thday Change to Visus 30thday on Short axial length Post Phacoemulsification by Using Formula SRK / T

Variables	Visus		The change of rank		*p.*
	14thday	30thday			
	N	N		N	
Visus • Advanced • Not Advanced	13 2	14 1	Negative Ranking Positive Ranking Ties	0 0 15	0,100

Wilcoxon test results described p = 0.100, thus according to statistical test no significant changes in visual acuity of 14thday to 30thday in short axial length post Phacoemulsification by using formula SRK /T.

Table 3.6: Evaluation Test of Visus Change of 7th day to Visus 14th day at Medium axial length Post Phacoemulsification Using SRK / T Formula

Variables	Visus		The change of rank		*p.*
	7th day	14th day			
	N	N		N	
Visus • Advanced • Not Advanced	12 3	15 0	Negative Ranking Positive Ranking Ties	3 0 12	0,083

Wilcoxon test results described p = 0.083, thus according to statistical test no significant change was found on visual acuity of 7th day to 30th day on medium axial length post Phacoemulsification using SRK / T formula.

Table 3.7: Evaluation Test of Visus 14th day Change to Visus 30th day at Medium axial length Post Phacoemulsification by Using Formula SRK / T

Variables	Visus		The change of rank		*p.*
	14th day	30th day			
	N	N		N	
Visus • Advanced • Not Advanced	15 0	15 0	Negative Ranking Positive Ranking Ties	0 0 15	0,100

Wilcoxon test results described p = 0.100, thus according to statistical test no significant changes in sharp changes in vision of 14th day to 30th day in medium axial length post Phacoemulsification by using formula SRK / T.

Table 3.8: Evaluation Test of Visus 7th day Change to Visus 14th day on Long axial length Post Phacoemulsification by Using Formula SRK / T

Variables	Visus		The Change of Rank		*p.*
	7th day	14th day			
	N	N		N	
Visus • Advanced • Not Advanced	12 3	14 1	Negative Ranking Positive Ranking Ties	2 0 13	0,157

Wilcoxon test results show p = 0.157, thus according to statistical test not found significant changes in sharp changes of vision of 7th day to 14th day on long axial length post Phacoemulsification by using formula SRK / T.

Table 3.9: Evaluation Test of Visus 14th day Change to Visus 30th day on Long axial length Post Phacoemulsification by Using Formula SRK / T

Variables	Visus		Perubahan Ranking		p.
	14th day	30th day			
	n	N		N	
Visus • Advanced • Not Advanced	14 1	14 1	Negative Ranking Positive Ranking Ties	0 0 15	0,100

Wilcoxon test results show p = 0.100, thus according to the statistical test no significant changes in the sharp changes in vision of 14th day to 30th day in long axial length post phacoemulsification using SRK / T formula

Research conducted by Wang JK et al (2012) on IOL power calculations using various formulas in patients with various axial lengths explains that SRK / T gives significant results against moderate and long AL. Previous research conducted by Karbela et al (2016) in Turkey carried out research on the performance of SRK / T formulas using A-scan ultrasound biometry after phacoemulsification of the eyes with short and long AL AL proved that the SRK / T formula had an accuracy in the eyes with a short AL and long, there is little tendency to be myopia at long AL and hypermetropia in short AL. In the same year Karbela et al in Turkey also conducted a study of the sharp prediction of vision and accuracy of IOL power calculations after phacoemulsification using SRK / T formula with ultrasound biometry in the eye with AL was proving that the SRK / T formula was the best choice to produce sharp predictions good vision after phacoemulsification at moderate AL. Another study conducted by Kapadia et al (2013) describes in his research, postoperative phacoemulsification patients using the formula SRK / T on short and long AL with A-scan biometry achieved post operative accuracy ± 1 D of 67.85% of cases.

4. Conclusion

There is no association between Age and ACD with short, medium and long axial lengths in the demographic distribution of senile cataract patients in various ALs. There is a relationship between K1, K2 and Power IOL with short, medium and long axial lengths. There is no significant difference between the sexes of patients who would undergo phacoemulsification with short, medium and long axial lengths. There is no relationship between sharp eyesight before phacoemulsification action with short, medium and long axial lengths.

There is no statistical test of the accuracy of SRK / T formula using IOL Master in senile cataract patients performed phacoemulsification action on short, medium and long axial lengths, but data obtained a sharp change of vision after 30 days of observation.

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