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A Comparitive Study On Change In Choroidal Thickness Post Phacoemulsification And Manual Small Incision Cataract Surgery

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ABSTRACT:

AIM AND OBJECTIVE

To compare the variations in choroidal thickness post phacoemusification and manual small incision cataract surgery.

MATERIALS AND METHODS

Study conducted in Regional Institute Of Ophthalmology, Chennai, India. Institutional ethical clearance was obtained prior to initiation of study. 150 Patients admitted from march-april 2022 chosen with respect to inclusion and exclusion criteria after obtaining appropriate consent. They were divided based on planned surgical procedure (75 SICS & 75 phacoemulsification)

Visual acuity, intraocular pressure, axial length assessment and choroidal thickness measurement (subfoveal thickness, 2.5mm superior, inferior, nasal, temporal to SFT) done with spectral domain optical coherence tomography between 10-11am to avoid diurnal variation done preoperatively, postoperatively day 1, 1week and 4weeks. The collected data were analysed with IBM SPSS Statistics for Windows, Version 23.0.(Armonk, NY:IBM Corp). To describe the data descriptive statistics frequency analysis, percentage analysis were used for categorical variables and the mean & S.D were used for continuous variables. To find the significant difference between the bivariate samples in independent groups SICS and Phacoemulsification the Unpaired sample t test was used. In both the above statistical tools the probability value less than 0.05 is considered as statistically significant.

RESULTS

There was significant increase in choroidal thickness who underwent SICS postoperatively day 1 (p=0.0005), 1week (p=0.001) and 4weeks (p=0.004) postoperatively

CONCLUSION

Thus, the study concludes that, there is increase is significant increase in choroidal thickness in SICS than Phacoemulsification which maintains relatively same or milder increase in choroidal thickness irrespective of visual outcome

KEYWORDS: choroidal thickness post phaco, choroidal thickness post cataract surgery, phacoemulsification and sics.

I. INTRODUCTION

Choroid forms the posterior part of vascular coat of the eyeball. Its vasculature forms the major supply of oxygen and nutrients to outer layers of retina including the photoreceptors. Functions of choroid includes thermoregulation, adjustment of the position of the retina by changes in choroidal thickness and secretion of growth factors(1).

Histologically choroid has got 5layers with the Bruch's membrane being the innermost to the suprachoroidea being the outermost with vascular layers in between. The choroidal thickness in normal maculae decreases linearly from 193.5microns in the first decade to 84 microns in the tenth decade(2). Since choroid forms the keystone for retinal nourishment, any abnormalities in choroid results in retinal pathology.

Choroid get affected in a varied situations including infections, autoimmune and degenerative conditions. Appropriate investigations to assess the choroid serves beneficial to detect the pathologies. Various

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imaging modalities include FFA, ICGA and OCT. FFA and OCT provides a cross sectional image of retinal layers but choroidal layers are not assessed to full extent. This limitation is due to decreasing sensitivity and resolution with increasing displacement from zero delay, decreased maximal dynamic range inherent in Fourier domain systems, wavelength dependent light scattering and signal loss in the image path. These limitations are overcome by displacing the instrument to image deeper layers purposefully, the inverted image is displayed in which more anterior objects (those with more negative depth) are imaged lower the screen. This has the effect of delivering the most tightly focused portion of the illumination at the level of the choroid or inner sclera. Because the deeper the portions of the choroid are placed closer to the zero delay, the sensitivity of imaging of those structures is enhanced. This forms the basis of Enhanced Depth Imaging of Choroid(3).

Cataract surgery has been a known phenomenon for causation of posterior segment alterations in the form of pseudophakic macular edema and progression of diabetic retinopathy. This study is formulated to analyze the effect of cataract surgery on vascular structure- the choroid in terms of thickness variations.

II. MATERIALS AND METHODS:

Patients admitted for cataract surgery in our hospital will be chosen with respect to inclusion and exclusion criteria after obtaining appropriate consent.The patients will be divided into two groups based on the planned surgical procedure (phacoemusification and manual small incision cataract surgery).Preoperatively visual acuity, intraocular pressure, axial length assessment and choroidal thickness measured subfoveally, 2.5mm nasal,temporal, superior and inferior with spectral domain optical coherence tomography between 10-11am to avoid diurnal variation.The same ocular parameters done postoperatively on 1st postoperative day, 1 week and 4 weeks later.The results are compared.

INCLUSION CRITERIA

- Immature cataract with adequate visualization of fundus
- No other ocular pathology
- Uncomplicated surgery

EXCLUSION CRITERIA

- Hazy media hindering visualization of fundus
- Presence of any other ocular abnormalities

STUDY PROCEDURE

After obtaining informed consent, the following parameters namely- Anterior and Posterior segment examination, Visual acuity measurement, Intraocular pressure assessment, Axial length measurement and Choroidal Thickness measurement with SD-OCT analysed pre and postoperatively.

STATISTICAL ANALYSIS

The collected data analysed with IBM SPSS Statistics for Windows, Version 23.0(Armonk, NY: IBM corp). To describe about data descriptive statistics frequency analysis, percentage analysis were used for categorical variables and the mean and SD were used for continuous variables. To find the significant difference between the bivariate samples in Independent groups the Unpaired sample t-test was used. For the multivariate analysis for repeated measures the Repeated measures of ANOVA was used with Bonferroni correction to control the type 1 error on multiple comparison. To find the significance in categorical data Chi-square test was used. In all the above statistical tools the probability value 0.05 is considered as significant level.

III. RESULTS

A total of 150 patients with cataract were enrolled randomly in the present study. 75 patients containing group A were planned manual SICS and 75 patients containing group B were planned for Phacoemusification. The basic characteristics of the study population have been described in [Table/Fig-1]

SEX

Out of 75 patients underwent SICS, 26 were female and 49 were male. Similarly out of 75 patients underwent Phacoemulsification 31 were female and 44 were male.

The choroidal thickness measured subfoveally,

- patients underwent SICS, the mean values found to be 206.3um preoperatively, postoperative period day 1 was 243.1um, 1week 239.3um, 1 month 239.3um. The SD found to be 15.8, 38.9, 41.3. 41.3 respectively.

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- Patients underwent phacoemulsification, , the mean values found to be 211.5um preoperatively, postoperative period day 1 was 210.9um, 1week 199.1um, 1 month 210.0um. The SD found to be 26.2, 26.3, 24.9. 21.7 respectively.

The choroidal thickness measured 2.5mm superior to subfoveal region

- patients underwent SICS, the mean values found to be 196.6um preoperatively, postoperative period day 1 was 230.0um, 1week 229.8um, 1 month 229.8um. The SD found to be 12.0, 38.2, 37.6. 37.6 respectively.
- Patients underwent phacoemulsification, , the mean values found to be 204.1um preoperatively, postoperative period day 1 was 212.8um, 1week 219.5um, 1 month 221.5um. The SD found to be 26.4, 27.6, 27.4. 24.0 respectively.

The choroidal thickness measured 2.5mm inferior to subfoveal region

- patients underwent SICS, the mean values found to be 196.0um preoperatively, postoperative period day 1 was 230.3um, 1week 229.9um, 1 month 229.9um. The SD found to be 11.1, 39.4, 38.1. 38.9 respectively.
- Patients underwent phacoemulsification, , the mean values found to be 202.7um preoperatively, postoperative period day 1 was 206.5um, 1week 213.9um, 1 month 215.7um. The SD found to be 22.6, 21.0, 18.3. 17.7 respectively.

The choroidal thickness measured 2.5mm nasal to subfoveal region

- patients underwent SICS, the mean values found to be 198.3um preoperatively, postoperative period day 1 was 229.7um, 1week 228.1um, 1 month 228.1um. The SD found to be 13.8, 39.4, 38.8, 38.8 respectively.
- Patients underwent phacoemulsification, , the mean values found to be 201.9um preoperatively, postoperative period day 1 was 206.5um, 1week 213.7um, 1 month 214.1um. The SD found to be 21.0, 21.1, 19.5. 19.4 respectively.

The choroidal thickness measured 2.5mm temporal to subfoveal region

- patients underwent SICS, the mean values found to be 196.7um preoperatively, postoperative period day 1 was 227.7um, 1week 227.1um, 1 month 227.1um. The SD found to be 13.2, 39.3, 38.8, 38.8 respectively.
- Patients underwent phacoemulsification, , the mean values found to be 199.0um preoperatively, postoperative period day 1 was 207.6um, 1week 212.0um, 1 month 217.6um. The SD found to be 20.4, 23.0, 19.5. 18.5 respectively.

IV. DISCUSSION

The p value of subfoveal choroidal thickness taken preoperatively was 0.148 which is insignificant. In day 1, 1week and 1month Post operatively the t test for equality of means taken and p value is found to be 0.0005, 0.001, 0.004 which were found to be highly significant

Independent Samples Test

	Levene's Test for Equality of Variances		t-test for Equality of Means						
								95% Confidence Interval of the Difference	
	F	Sig.	t	df	p-value	Mean Difference	Std. Error Difference	Lower	Up

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										per
PRE	Equal variances not assumed	19.246	.000	-1.456	121.608	.148	-5.1467	3.5341	-12.1429	1.8496
Day1	Equal variances not assumed	23.067	.000	5.938	130.102	.0005	32.2000	5.4226	21.4721	42.9279
1st Week	Equal variances not assumed	25.889	.000	3.437	121.522	.001	19.1467	5.5711	8.1177	30.1757
1 Month	Equal variances not assumed	38.255	.000	2.963	112.073	.004	15.9733	5.3914	5.2910	26.6557

Table 1

2.5mm superior to subfoveal region

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	p-value	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
PRE	Equal variances not assumed	33.619	.000	-2.241	103.168	.027	-7.4933	3.3435	-14.1243	-.8624
Day1	Equal variances not assumed	8.583	.004	3.157	134.837	.002	17.1733	5.4390	6.4165	27.9302
1st Week	Equal variances not assumed	10.059	.002	1.905	135.183	.059	10.2267	5.3694	-.3921	20.8455
1 Month	Equal variances not assumed	20.515	.000	1.608	125.656	.110	8.2800	5.1500	-1.9121	18.4721

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Table 2

2.5mm inferior to subfoveal region

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	p-value	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
PRE	Equal variances not assumed	18.725	.000	-2.309	107.661	.023	-6.7200	2.9108	-12.4899	-.9501
Day1	Equal variances not assumed	37.645	.000	4.607	112.978	.0005	23.7600	5.1568	13.5434	33.9766
1st Week	Equal variances not assumed	48.902	.000	3.211	105.267	.002	15.9600	4.9701	6.1056	25.8144
1 Month	Equal variances not assumed	51.602	.000	2.872	103.356	.005	14.1867	4.9399	4.3900	23.9833

table 3

2.5mm nasal to sub foveal region

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	p-value	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
PRE	Equal variances not assumed	6.737	.010	-1.261	127.845	.210	-3.6533	2.8982	-9.3880	2.0814
Day1	Equal variances not assumed	31.086	.000	4.486	113.279	.0005	23.1333	5.1563	12.9181	33.3486
1st Week	Equal variances not assumed	32.239	.000	2.877	109.038	.005	14.4133	5.0098	4.4841	24.3426
1 Month	Equal variances not	31.746	.000	2.803	108.999	.006	14.0400	5.0092	4.1119	23.9681

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	assumed									

Table 4

2.5mm temporal to subfoveal

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	p-value	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
PRE	Equal variances not assumed	4.419	.037	-.847	126.968	.399	-2.3733	2.8017	-7.9174	3.1707
Day1	Equal variances not assumed	26.236	.000	3.824	119.519	.0005	20.0933	5.2542	9.6899	30.4968
1st Week	Equal variances not assumed	36.877	.000	3.113	108.978	.002	15.6533	5.0287	5.6865	25.6202
1 Month	Equal variances not assumed	42.617	.000	2.015	105.793	.046	10.0267	4.9772	.1586	19.8948

Table 5

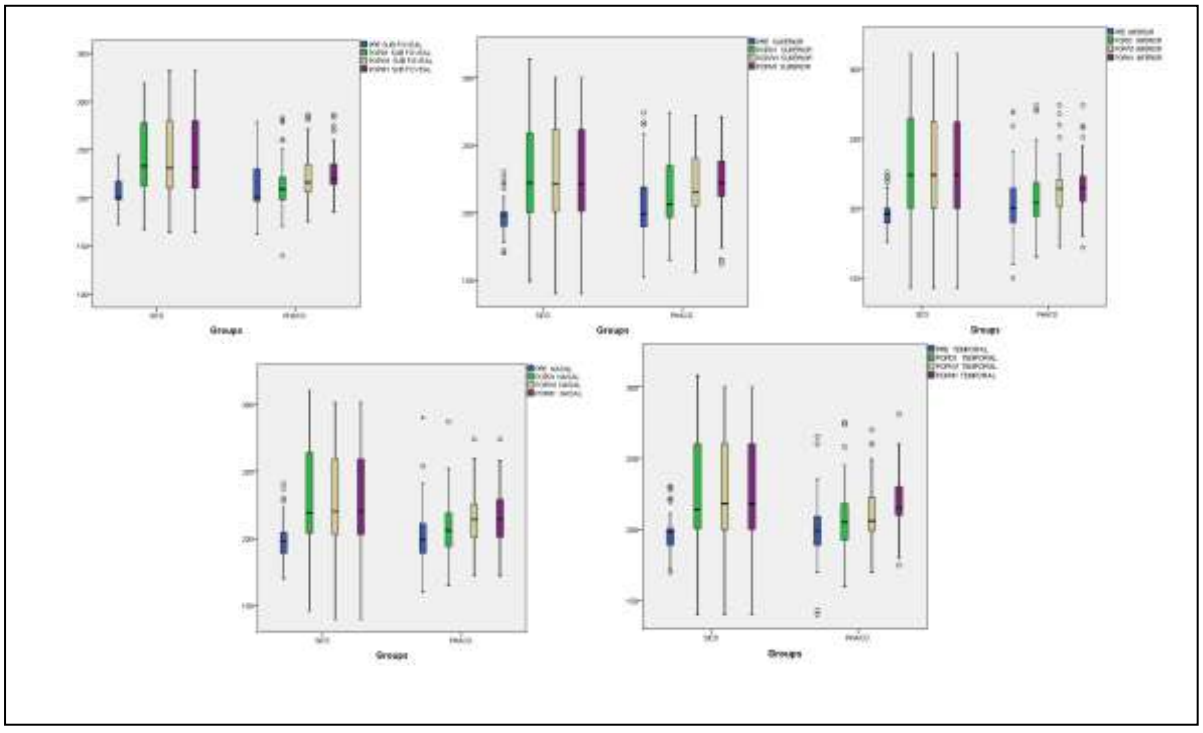

Fig.1 graphical representation of comparison of choroidal thickness in SICS and Phacoemulsification

V. CONCLUSION

- The subfoveal choroidal thickness and an area of 2.5mm nasal, temporal, superior, inferior to sub foveal thickness showed a significant increase postoperatively following manual SICS
- Such significant increase in choroidal thickness was not noted after clear corneal Phacoemusification surgery. This is in accordance with other studies.
- The exact pathophysiogical mechanism leading to such subtle difference following Phacoemulsification is not in previous studies.
- One possible explanation can be based on the length of incision (clear corneal Phacoemusification vs Scleral tunnel incision) which may alter the ocular dynamics and contribute to increase in choroidal thickness.
- Further no studies have been done during conventional ECCE era, with respect to choroidal thickness, where the incision site was even more longer
- The exact mechanism following increase in choroidal thickness following SICS and subtle increase following Phacoemulsification and their effect on visual outcome needs further long term study.

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