

A COMPARATIVE STUDY OF CENTRAL FOVEAL THICKNESS PRE AND POST CATARACT SURGERY USING SD-OPTICAL COHERENCE TOMOGRAPHY

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ABSTRACT

BACKGROUND

The purpose of this study is to compare central foveal thickness (CFT) of patients preoperatively and postoperatively cataract surgery using SD- optical coherence tomography and to correlate CFT with vision.

MATERIALS AND METHODS

200 eyes of 100 patients were examined and two groups were formed. Group-A was considered as the control group in the study and eyes in group-B were operated for cataract using SICS technique. The central foveal thickness (CFT) in each group was measured using SD-OCT machine (Cirrus Zeiss) preoperatively, postoperatively on day 1, week 1 and after 1 month and the data was compiled and compared.

RESULTS

OCT detected increased central foveal thickness postoperatively on day 1 and weeks 2 but this returned to preoperative levels in one month. It was also seen that preoperative BCVA was poor (0.53 ± 0.12 Snellen approx. 6/24). Improvement in BCVA was seen in postoperative day-1, week 2 and 1 month.

CONCLUSION

This study shows that preoperative CFT values were minimal which increased on postoperatively but returned to preoperative values at one month after surgery BCVA was poorer preoperatively due to cataract but improved as CFT decreased with time.

KEYWORDS

Central Foveal thickness (CFT), Ocular Coherence Tomography (OCT), Best Corrected Visual Acuity (BCVA), Spectral Domain (SD), Cystoid Macular Edema (CME).

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BACKGROUND

Cystoid Macular Edema is a well-known complication of routine phacoemulsification or extra capsular cataract extraction and intraocular lens (IOL) implantation. Extensive research study have reported on incidence of visual loss from CME. It is observed that visual acuity is inversely related to the foveal thickness subclinical CME appears in about 20% of the patients and can be detected by fluorescein angiography.¹

Foveal thickness increases following cataract extraction and IOL implantation and it has also been associated with decreased visual activity measured, one week post operatively by OCT (optical coherence tomography).²

OCT is a fairly new technique for high resolution cross sectional imaging of the retina which can quantify the development and resolution of foveal and extra foveal macular thickness.

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Degree of macular thickness is significantly correlated with visual acuity. Traditional investigation for evaluating macular thickness such as fundus photography, slit lamp biomicroscopy and fluorescing angiography can provide only qualitative information, which does not indicate subtle changes in macular thickness. OCT reliably detects & quantifies subtle changes in macular thickness and helps in making objective re-entering of disease progression and efficacy of different therapeutic modalities in various ocular diseases. In uncomplicated phacoemulsification surgery, CFT measured by optical coherence tomography (OCT) is increased.³

Cystoid Macular Edema- Aetiology

The cystoid macular edema (CME) is caused by many different factors such as inflammatory mediators, light toxicity, vitreo-macular traction, vitreous loss, drugs, diabetes and hypertension.⁴ The type of cataract surgery done can be a cause of CME. The phacoemulsification and SICS has contributed in the decrease in the occurrence of this complication.⁴ The incidence of CME is higher in older patients.⁴ rupture of posterior capsule with vitreous loss and capsulotomy by YAG laser are associated with high rate of CME. Many studies have confirmed that increased prevalence of CME by 10 to 20 % with vitreous loss during

cataract surgery. It is also seen that incidence of CME is high in patients with diabetes and existing NPDR. The development of CME is frequent in patients with uveitis.

Pathogenesis- The pathogenesis of CME after cataract surgery is multifactorial in origin.⁵

Important factors are vitreous traction, disturbance in blood retinal barrier BRB.⁶ and inflammation mediated by prostaglandins.⁴

Diagnosis- The diagnosis of CME is made by fundus examination with evidence of cystic spaces in macular area which is confirmed by FFA (classical pataloid pattern). The most definitive evidence is obtained by OCT examination. It is possible to see cystic spaces in outer nuclear layer of macula and measure the oedema (CFT) which should correspond with the value of outer retinal thickening.⁷

Management- Angiographic and clinical CME is prevented and treated by topical use of NSAID. Topical use of corticosteroid also helps in treating CME. It has been clinically suggested that NSAID used with corticosteroid always produces more effective results.

In times of premium intraocular lenses, laser guided surgery and economically active patients, expectations of perfect vision and fast recovery have increased significantly. Therefore, reduced visual acuity due to CME is not tolerated well by either patients or surgeons.

Study by Arcieri ES et al (2005).⁴ investigated the effect of prostaglandin analogues on the blood-aqueous barrier and to evaluate the occurrence of cystoid macular oedema in aphakic and pseudophakic patients with glaucoma.

Aims and Objectives

1. To analyze and correlate the central foveal thickness (CFT) after cataract surgery.
2. To correlate & analyze CFT after cataract surgery in relation to BCVA.

MATERIALS AND METHODS

This prospective cohort study was conducted between April 2015 to March 2016. 200 eyes of 100 patients were studied. In this study other eye of the some patient act as control.

All patients were subjected to detailed history taking. All patients underwent a detained clinical evaluation. All included subjects were scanned with the SD- OCT by a single operator. Macular scanning using the macular cube 516X 258 protocol was used for measurement of central foveal thickness.

Complete ophthalmic examination was performed preoperatively OCT (SD- OCT Cirrus Carl Zeiss ophthalmic systems) measurements were taken through dilated pupil at the same visit and at day-1, 2 weeks and 1 month post operatively during OCT examination the minimum central foveal thickness (CFT) was measured the fellow eye of the patients served as control.

All cataract surgery were performed by the single surgeon under local anaesthesia with a standard technique of SICS with implantation of PC IOL.

Inclusion Criteria

1. All patients of cataract who can be evaluated by SD- OCT.
2. Age between 18 to 70 years.

Exclusion Criteria

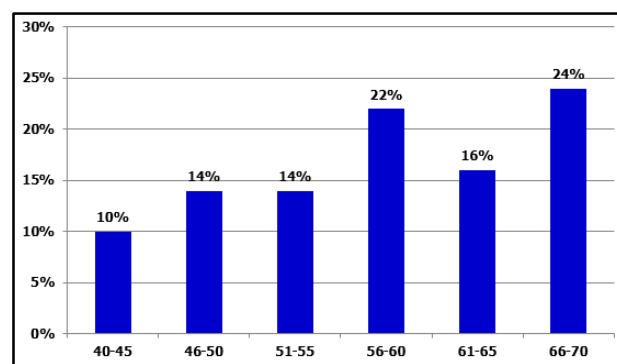
1. Patients with history of Uveitis, Diabetes, ARMD (Age Related Macular Degeneration), Glaucoma.
2. Intraoperative complications
3. Media Opacities (corneal opacities and mature cataract).
4. Un co-operative and unreliable patient.

OBSERVATION AND RESULTS

Age Group (Years)	Number of Patients	Percentage
40-45	10	10%
46-50	14	14%
51-55	14	14%
56-60	22	22%
61-65	16	16%
65-70	24	24%

Table 1. Distribution of the Studied Subjects based on Age

Above table shows age wise distribution of studied subjects. In study group maximum patients belongs to age group 65-70 yrs. Mean age of study was (57.75 ± 8.19) years.

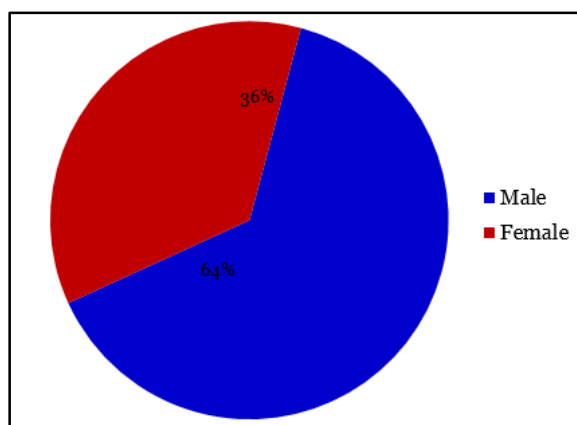


Graph 1

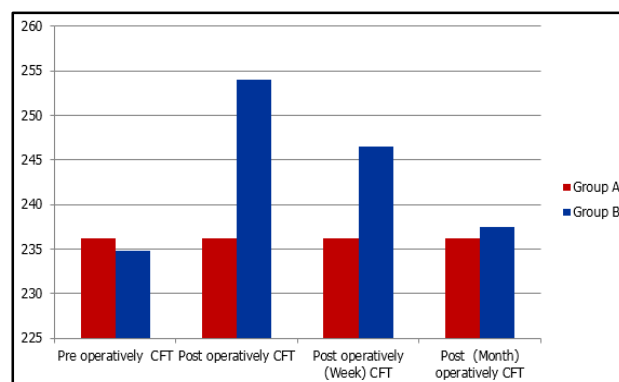
Sex	Number of Patients	Percentage
Male	64	64%
Female	36	36%

Table 2. Distribution of the Studied Subjects Based on Sex

Above table shows gender wise distribution of study group. In study 64% were Males and 36% were females.



Graph 2



Graph 3

	CFT(μm)			
	Pre-operative CFT	Post-operative CFT	Post-operative (Week) CFT	Post (Month) operative CFT
Group A	236.26 ± 14.74	236.28 ± 14.89	236.18 ± 14.54	236.28 ± 14.70
Group B	234.8 ± 15.9	254 ± 16.1	246.5 ± 14.9	237.52 ± 15.2

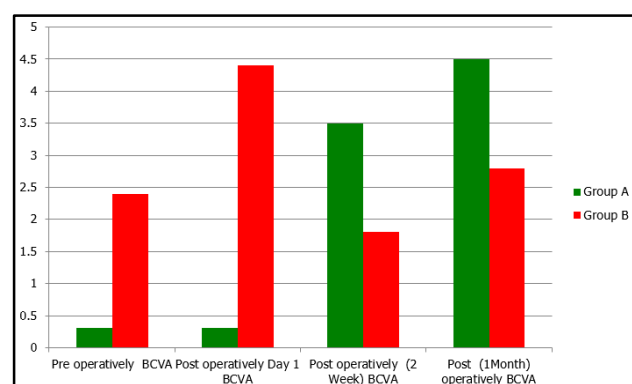
Table 3. Comparison of CFT Pre-operative and Post-operative in Group A & Group B

Above table shows comparisons of CFT preoperative and postoperative in group A and group B. Preoperatively CFT in group A and group B were $236.26 \pm 14.74 \mu\text{m}$ and $234.8 \pm 15.9 \mu\text{m}$ respectively. Postoperative day 1, week 2 and month 1, CFT in group A and group B were $236.28 \pm 14.89 \mu\text{m}$ and $254.2 \pm 16.1 \mu\text{m}$, $236.18 \pm 14.54 \mu\text{m}$ and $246.5 \pm 14.9 \mu\text{m}$, $236.28 \pm 14.70 \mu\text{m}$ and $237.52 \pm 15.2 \mu\text{m}$ respectively.

	CFT(μm)			
	Pre-operative BCVA	Post-operative Day 1 BCVA	Post-operative (2 Week) BCVA	Post (1 Month) Operative BCVA
Group A	0.31 ± 0.20 Snellen (6/12) approx.	0.31 ± 0.20 Snellen (6/12) approx.	0.31 ± 0.20 Snellen (6/12) approx.	0.31 ± 0.20 Snellen (6/12) approx.
Group B	0.53 ± 0.12 Snellen (6/12) approx.	0.23 ± 0.09 Snellen (6/12) approx.	0.18 ± 0.04 Snellen (6/12) approx.	0.14 ± 0.04 Snellen (6/12) approx.

Table 4. Comparison of BCVA Pre-operative and Post-operative in Group A & Group B

Above table shows comparison of BCVA preoperative and postoperative in group A and group B. Preoperatively BCVA in group A and group B were 0.31 ± 0.20 and 0.53 ± 0.12 respectively. Postoperatively day 1, week 2 and 1 month BCVA in group A and group B were 0.31 ± 0.20 and 0.23 ± 0.09 , 0.31 ± 0.20 and 0.18 ± 0.04 , 0.31 ± 0.20 and 0.14 ± 0.04 respectively.



Graph 4

DISCUSSION

In this study OCT detected increased CFT Post operatively on day 1 and week 2 and this returned to pre-operative levels in 1 month.

From Table-1 we found that the thickness of the retina pre-operatively is significantly smaller (234.8 ± 15.9) ($p < 0.05$) than the thickness of the retina on day 1 (254.2 ± 16.1) and week 2 (246.5 ± 14.9) and returned to the initial levels on month 1 (237.52 ± 15.2). The estimated correlation coefficients between pre-operative and post-operative thickness of the retina were significant ($p < 0.05$).

Pre-operative BCVA was poor (0.53 ± 0.12 Snellen approx. 6/24). Improvement in BCVA was seen in post-operative day, week 2, 1 month. The estimated correlation coefficients between pre-operative and post-operative BCVA were significant ($p < 0.05$).

Georgopoulos GT et al (2008).⁸ found that the estimated correlation coefficient between pre-operative and post-operative thickness of the retina were significant ($p < 0.05$).

Biro and Colleagues (2008).⁹ found no difference between the preoperative and post-operative day 1 foveal and perifoveal retinal thickness. However, increases were found in the perifoveal 3.0 and 6.0 mm diameter and foveal area thickness on post-operative day 7, 30, 60.

No significant differences in foveal thickness were detected in other studies in week Cheng et al (2002).¹⁰ Degenring et al (2007).¹¹

The mediation of confounders (eg. age, sex, race, body mass, axial length or refractive state.) was studied by Koozekanani et al (2000).⁷ Massin et al (2001).¹² and is suggested to be controlled on the effect of cataract extraction and IOL implantation on foveal thickness.

Ching and Colleagues (2006).⁵ in great contradiction to the aforementioned studies Cheng et al (2002).¹⁰ Degenerating et al (2007).¹¹ Biro et al (2008).⁹ showed thickness preoperative foveal and central retinal thickness than those in the post-operative period.

Sourdille and Santiago (1999).² as well as Cheng and Colleagues (2002).¹⁰ found BCVA inversely relates to the foveal thickness in the early post-operative period.

In our study positive correlation was detected between visual acuity foveal thickness in postoperative day 1 ($r=0.03$) which was clinically not significant ($p=0.69$).

CONCLUSION

- Study show that pre-operative CFT values were minimal which increased on post-operative day 1, week 2 and returned to level of pre-operative values at 1 month after cataract surgery.
- BCVA was poor pre-operatively due to cataract, after surgery BCVA improves and further improvement was seen as CFT decreases with time.
- Positive correlation was found between visual acuity and foveal thickness in post-operative day which was clinically not significant.
- OCT is capable of detecting changes in foveal thickness in cataract patients pre and post operatively.

Key Benefits of OCT

1. Live sub surface images at near – microscopic resolution.
2. Instant direct imaging of tissue morphology.
3. No preparation of samples or subject.
4. No ionizing resection.

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