

Central Corneal Thickness Changes after Phacoemulsification

Tanveer Anjum Chaudhry, Muhammad Hamza, Wajiha Koomal, Khabir Ahmad

Pak J Ophthalmol 2015, Vol. 31 No. 2

See end of article for authors affiliations

Correspondence to:
Tanveer Anjum Chaudhry
Section of Ophthalmology,
Department of Surgery,
Aga Khan University Hospital,
Stadium Road, Karachi
tanveer.chaudhry@aku.edu

Purpose: To determine when the mean central corneal thickness (CCT) returns to normal values after uneventful phacoemulsification.

Material and Methods: This was a prospective case series. The study was carried out at the Section of Ophthalmology, Department of Surgery, Aga Khan University Hospital, Karachi. Eyes scheduled to undergo phacoemulsification during December 2011 – March 2012 were eligible to be included. Eyes with corneal degenerations, dystrophies or high pre-op astigmatism were excluded. A structured proforma was used to collect data on sociodemographics, comorbidities, visual acuity, and CCT before surgery and 1 day, 1 week and 1 month after surgery. Changes in the mean CCT over time were measured using repeated measures Analysis of Variance (ANOVA) was done.

Results: Eighty one eyes were included in the study. The mean (\pm SD) age of the participants was 58.30 (\pm 10.04) years. The majority of them (58.0%) were women. Sixty two (76.5%) eyes completed the last follow-up and were included in the final analysis. The mean CCT was 542.81 \pm 34.85 μ m before surgery which markedly increased to 595.27 \pm 43.78 μ m 24 hours after surgery, but decreased to 565.82 \pm 38.30 μ m at one week, and returned to normal baseline values (544.42 \pm 28.95 μ m) in almost all operated eyes in 1 month time. There was no statistically significant difference in the mean CCT before surgery and at 1 month ($p=0.685$).

Conclusion: The mean CCT substantially increasing after post-operative uneventful cataract surgery but returns to normal baseline values in almost all operated eyes in 1 month time. IOP measured during this period may be falsely higher than the true values due to increased CCT.

Key words: central corneal thickness, phacoemulsification, cataract surgery.

Cataract surgery is the commonest surgical procedure performed worldwide.¹ Central corneal thickness (CCT) increases significantly immediately after cataract surgery and gradually returns to normal values over the next few weeks.^{2,3} Cautions should be taken while interpreting the results of intraocular pressure measurements during this period as increased CCT may lead to false higher readings and unnecessary treatment and anxiety.^{4,5} CCT is an important predictor of IOP.^{6,7} Generally, thicker the cornea, greater is the false IOP readings. Changes in CCT after cataract surgery have been described by several investigators.^{2,4} We aimed to

determine when the mean CCT returns to normal values after uneventful phacoemulsification in our population.

MATERIAL AND METHODS

This was a prospective case series. Consecutive eyes scheduled to undergo phacoemulsification cataract surgery by a single surgeon at the Section of Ophthalmology, Aga Khan University Hospital, Karachi, during December 2011 – March 2012 were enrolled. Those who had corneal degenerations, corneal dystrophies or high pre-op astigmatism of 2.5

D or greater were excluded. After informed consent, patients underwent a thorough eye assessment and specific questions were asked regarding refractive errors, glaucoma and refractive surgery. IOP was measured using Goldman applanation tonometer. CCT was measured using ultrasonic pachymetry (Tomey SP-3000, Tomey Ltd, Japan). Five CCT reading were taken and their mean reading was recorded. All measurements were taken by a single senior ophthalmic technician. Using a structured proforma, data were collected on age, sex, ethnicity, co-morbid (diabetes, hypertension and glaucoma), visual acuity as well as CCT before surgery and 1 day, 1 week and 1 month after surgery. The data were entered and analysed using IBM SPSS version 19. Repeated measures Analysis of Variance (ANOVA) was used to compare changes in the mean CCT over time. A p-value < 0.05 was considered statistically significant. GraphPad Prism version 5.0 software (GraphPad, San Diego, CA, USA) was used for graph production.

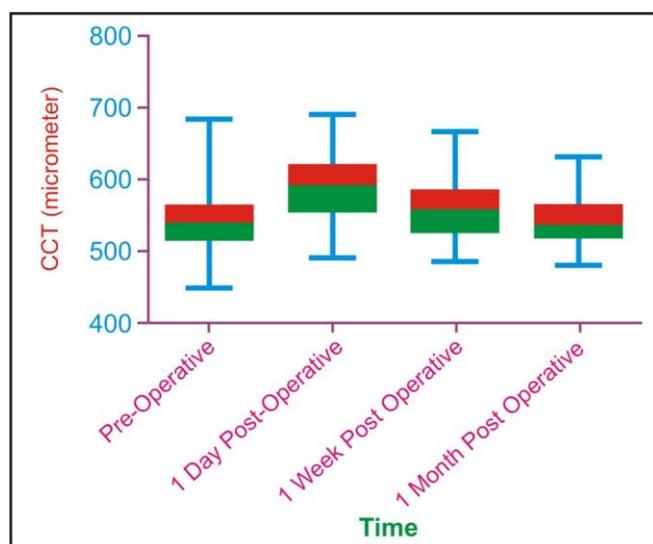


Fig. 1: Changes in the mean central corneal thickness after phacoemulsification.

RESULTS

A total of 81 eyes were included in the study. The mean (\pm SD) age of the participants was 58.30 (\pm 10.04) years whereas the median age was 60 years (range 29–77). 42% of the participants were men (Table 1). Complete follow-up data were available for 62 (76.5%) of the eyes and were included in the final analysis. The mean CCT was $542.81 \pm 34.85 \mu\text{m}$ before surgery which markedly increased to $595.27 \pm 43.78 \mu\text{m}$ 24 hours after surgery (Table 2 and Figure 1). It decreased

to 565.82 ± 38.30 one week after surgery, and to 544.42 ± 28.95 four weeks after surgery, which was not significantly different from the baseline CCT values ($p = 0.685$).

Table 1: Characteristics of the study population.

Age Group	Frequency n (%)
≤ 49	11 (13.6)
50 - 59	29 (35.8)
60 - 69	31 (38.3)
≥ 70	10 (12.3)
Total	81 (100.0)
Gender	
Male	34 (42.0)
Female	47 (58.0)
Comorbid	
Diabetes	35 (43.2)
Hypertension	26 (32.1)
Glaucoma	4 (4.9)
Ethnicity	
Urdu speaking	45 (55.6)
Sindhi	1 (1.2)
Pakhtoon	9 (11.1)
Baloch	6 (7.4)
Gujrati	7 (8.6)
Punjabi	13 (16.0)

DISCUSSION

Corneal thickness influences IOP readings. If it is greater than the normal values, it will require greater force to indent the cornea and significantly high IOP readings will be obtained. For a thin cornea, it is otherwise. Knowledge of how changes in CCT can influence IOP readings is critical.^{6,7} Previous research has shown that central corneal thickness returns to normal levels in most operated eyes following an initial increase 1 week after cataract surgery.² Our study shows that the mean CCT markedly increases

Table 2: Changes in mean central corneal thickness after cataract surgery

CCT	Gender	No. of Subjects	Mean	SD
Before surgery	Male	24	537.96	27.39
	Female	38	546.18	38.80
	Overall	62	542.81	34.85
1 day after surgery	Male	24	596.08	39.74
	Female	38	594.76	46.67
	Overall	62	595.27	43.78
1 week after surgery	Male	24	558.54	31.56
	Female	38	570.42	41.76
	Overall	62	565.82	38.30
1 month after surgery	Male	24	542.13	29.97
	Female	38	545.87	28.59
	Overall	62	544.42	28.95

after uneventful clear corneal cataract surgery, returns to normal baseline values in majority of the operated eyes at 1 week, touching near normal baseline values at 1 month. The increase in CCT after cataract surgery appears to be due to corneal edema, which generally settles over the next 1 – 4 weeks.

Compared with the baseline, there was a mean increase in CCT of 52.46 μm at 1 day, and 23.01 μm at 1 week, and 1.61 μm at 4 weeks. The mean increase at day 1 in our study is higher than that reported by other authors^{2,3,8} as is the mean increase at 1 week. For example, Salvi et al² reported a mean increase of 3.15 μm at week 1. Possible explanations could be the difference in the population studied, duration of surgery, and density of cataract that were operated.

Our study provides a key message regarding postoperative measurement. IOP measured postoperatively in the first week and even up to 1 month may be falsely elevated because of the increased corneal thickness after cataract surgery; thus, not all IOP rise have to be treated in this period in otherwise healthy eyes.

A limitation of our study was the loss to follow up. 23.5% of the eyes were lost to follow up at 4 week. While there was no difference in the mean preoperative CCT values between those who were lost to follow-up (n = 19) and those who completed the last

follow-up (n = 62), there were significant differences between the two groups at 24 hours and 1 week. Early visual recovery may have led them to skip the final routine visit.

CONCLUSION

Our study shows that the mean CCT substantially increases after uneventful clear corneal cataract surgery but returns to normal baseline values in almost all operated eyes in 1 month time. Cautions should be taken while interpreting the results of intraocular pressure measurements during this period as increased CCT may lead to false higher readings and unnecessary treatment and anxiety.

Author's Affiliation

Dr. Tanveer Anjum Chaudhry
Section of Ophthalmology,
Department of Surgery,
Aga Khan University Hospital,
Stadium Road, Karachi

Dr. Muhammad Hamza
Section of Ophthalmology,
Department of Surgery,
Aga Khan University Hospital,
Stadium Road, Karachi

Dr. Wajiha Koomal
Section of Ophthalmology,
Department of Surgery,
Aga Khan University Hospital,
Stadium Road, Karachi

Dr. Khabir Ahmad
Section of Ophthalmology,
Department of Surgery,
Aga Khan University Hospital,
Stadium Road, Karachi

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