A COMPARISON OF CENTRAL CORNEAL THICKNESS ON OCT IN PATIENTS UNDERGOING SICS AND PHACOEMULSIFICATION WITH INTRAOCULAR LENS IMPLANTATION

Ophthalmology

Priyanka D. Asgaonkar*

Post Graduate Student, Department Of Ophthalmology, Rural Medical College, Loni.
*Corresponding Author

K. P. Badhe

Prof. And HOD Department Of Ophthalmology, Rural Medical College, Loni.

ABSTRACT

AIM: To compare the CCT (CCT) on OCT in patients of senile cataract undergoing Phacoemulsification versus SICS with intraocular lens (IOL) implantation. **MATERIAL AND METHODS:** It was a descriptive, longitudinal study done on 168 patients > 50 years who underwent SICS or phacoemulsification with IOL implantation. Preoperative and postoperative CCT and visual outcomes were noted. **RESULTS:** Preoperatively CCT values in phaco and SICS groups were 513 and 507.65 respectively which increased to 592 and 555.27 respectively on post-op Day 1. On day 7 and day 30 CCT values in SICS group were 527.75 and 513.62 and in phaco group were 538.42 and 519.13 respectively. **CONCLUSION:** There was significant increase in CCT in both groups on postop day 1 (phaco > SICS). However on subsequent postop days 7 and 30 the CCT values in both groups kept on decreasing and reached close to preoperative value. Though overall CCT values of SICS group were lower as compared to phaco group, the difference between two groups was statistically insignificant.

KEYWORDS

SICS, Phacoemulsification, CCT, OCT

INTRODUCTION

Cataract is the main cause of blindness in many countries. According to WHO, cataract is the most common cause of blindness worldwide.¹

Cataract is usually an inevitable side effect of aging. However, some genetic and environmental factors such as smoking, ultraviolet light exposure, and certain diseases, like diabetes, uveitis, IOP-lowering medications/surgery, trauma, steroid usage, and certain occupations, increase the risk of developing cataract.² Management is surgical treatment in the form of manual removal of the lens either by SICS or phacoemulsification with IOL implantation. Recent advances in cataract surgery have reduced the incidence of corneal complications. However, it has also led to various new complications like mechanical or toxic injury to endothelium.³ Moderate damage to the endothelium during surgery can lead to a transient increase in corneal thickness. Detrusescence of the corneal stroma is controlled by the pumping action of the endothelial layer and can be monitored by measurement of CCT. Loss or damage of endothelial cells leads to an increase in corneal thickness, which may ultimately induce corneal decompensation and loss of vision.⁴ An interest has developed in the assessment of endothelial damage either by cell counts or indirectly by measuring CCT postoperatively, which may increase immediately after cataract surgery and gradually returns to normal values over the next few weeks.⁵ Both PHACO and SICS achieve excellent visual outcomes with low-complication rates. Preservation of corneal endothelial function is a major goal in cataract surgery as literature proves that the measurement of corneal thickness is an indirect indicator of corneal endothelial function, which plays an important role in maintaining the corneal transparency and, thus, visual rehabilitation.⁶ This study aims to compare the CCT in patients undergoing PHACO or SICS as an indirect indicator of corneal endothelial dysfunction post cataract surgery.

AIM

To compare the CCT on OCT in patients of senile cataract undergoing Phacoemulsification versus SICS with intraocular lens implantation.

OBJECTIVES

1. To assess the CCT and visual acuity in patients with senile cataract undergoing Phacoemulsification
2. To assess the CCT and visual acuity in patients with senile cataract undergoing SICS with intraocular lens implantation
3. To compare the CCT and visual acuity in patients with senile cataract undergoing Phacoemulsification versus SICS with intraocular lens implantation.

MATERIAL AND METHODS

This descriptive type of longitudinal study was conducted in the Department of Ophthalmology of Pravara rural hospital, Loni from September 2018 to August 2020. After obtaining permission from the institutional Ethics Committee, 168 cases of senile cataract (grading done as per LOCS II) which satisfied the inclusion and exclusion criteria were randomly selected to undergo SICS or Phacoemulsification with intraocular lens implantation.

A detailed history was recorded of each patient which included the age, sex and systemic diseases if any. Ocular investigations were recorded in detail which included visual acuity (VA), intraocular pressure (IOP), keratometry, A-scan for axial length, detailed anterior segment and posterior segment (fundus) examination. CCT (CCT) was measured preoperatively and postoperatively on days 1, 7 and 30. Anterior segment optical coherence tomography (AS-OCT); similarly visual acuity was recorded preoperatively and postoperatively day 30. Only uneventful surgeries were included in the study.

RESULTS

In the present study, 53% of the patients were females (n=89) and males were 47% (n=79).

In the Phaco group, CCT was measured as 513 ± 10.28 preoperatively, 592.6 ± 15.36 on post-operative day 1, 538.42 ± 13.06 on postoperative day 7 and 519.13 ± 10.01 on post-operative day 30. When compared within the group, we observed a significant reduction in subsequent CCT measurements. We observed an increase of 79.59 ± 13.77 when pre-operative values were compared against post-operative value on day 1. Then, we observed an increase of 25.41 ± 9.04 when pre-operative values were compared against post-operative value on day 7. And, we also observed an increase of 6.13 ± 1.55 when pre-operative values were compared against post-operative value on day 30.

In the SICS group, CCT was measured as 507.65 ± 8.602 preoperatively, 555.27 ± 25.73 on post-operative day 1, 527.75 ± 9.95 on postoperative day 7 and 513.62 ± 8.56 on post-operative day 30. When compared within the group, we observed a significant reduction in subsequent CCT measurements. We observed an increase of 47.61 ± 24.58 when pre-operative values were compared against post-operative value on day 1. Then, we observed an increase of 20.09 ± 7.41 when pre-operative values were compared against post-operative value on day 7. And, we observed an increase of 5.96 ± 2.90 when pre-operative values were compared against post-operative value on day 30.

Table 1. Comparing preoperative and post-operative CCT values in Phaco and SICS study groups

CCT assessment	PHACO				SICS			
	Mean	N	Std. Deviation	Std. Error Mean	Mean	N	Std. Deviation	Std. Error Mean
Preop	513	84	10.28	1.122	507.65	184	8.602	0.939

Postop day 1	592.6	84	15.362	1.676	555.27	84	25.737	2.808
Postop day 7	538.42	84	13.065	1.426	527.75	84	9.958	1.086
Postop day 30	519.13	84	10.017	1.093	513.62	84	8.564	0.934
	Paired Differences (paired t test)				Paired Differences (paired t test)			
	Mean	SD	t	P value	Mean	SD	t	P value
Preop - Postop day 1	-79.595	13.772	-52.97	<0.001	-47.619	24.58	-17.756	<0.001
Preop - Postop day 7	-25.417	9.046	-25.75	<0.01	-20.095	7.415	-24.839	<0.01
Preop - Postop day 30	-6.131	1.558	-36.058	<0.01	-5.964	2.906	-18.811	<0.01

Table 2. Comparing preoperative and post-operative CCT values in Phaco and SICS study groups

CCT assessment	Surgery	N	Mean	Std. Deviation	Std. Error Mean	p value*
Preoperatively	Phaco	84	513	10.28	1.122	<0.001
	SICS	84	507.65	8.602	0.939	
Postoperative day 1	Phaco	84	592.6	15.362	1.676	<0.001
	SICS	84	555.27	25.737	2.808	
Postoperative day 7	Phaco	84	538.42	13.065	1.426	<0.001
	SICS	84	527.75	9.958	1.086	
Postoperative day 30	Phaco	84	519.13	10.017	1.093	<0.001
	SICS	84	513.62	8.564	0.934

Graph 1. Comparing preoperative and post-operative CCT values in Phaco and SICS study groups

Table 3. Comparing visual acuity pre- and post-operatively among the two study groups using Snellen's chart

Visual acuity		PHACO		SICS	
		Preoperative	Post-op day 30	Preoperative	Post-op day 30
PL+PR+	n	3	0	16	0
	%	3.60%	0.00%	19.00%	0.00%
HMcF	n	0	0	2	0
	%	0.00%	0.00%	2.40%	0.00%
FC	n	27	0	31	0
	%	32.10%	0.00%	36.90%	0.00%
6/60	n	16	0	16	0
	%	19.00%	0.00%	19.00%	0.00%
6/24 to 6/36	n	38	8	19	9
	%	45.20%	9.50%	22.60%	10.70%
6/18 to 6/12	n	0	22	0	29
	%	0.00%	26.20%	0.00%	34.50%
6/9 to 6/6	n	0	54	0	46
	%	0.00%	64.30%	0.00%	54.80%
Total	n	84	84	84	84
	%	100.00%	100.00%	100.00%	100.00%

DISCUSSION

In the present study, 168 patients were included, 84 in each study group. The mean age of the patients was 67.21 ± 5.85 years and 67.36 ± 5.05 years in Phaco and SICS group respectively. 53% of the patients were females (n=89) and rest males (n=79, 47%). In our study, we observed a significant increase in the CCT on post-operative day 1, day 7 and day 30 as compared to pre-operative values in both the study groups. When compared between the two study groups, patients in the SICS group had consistently lower CCT values as compared to patients in the Phaco group at all the follow up points. Deshpande et al reported that at day 30, there was a decrease in CCT value as compared to day 7. In their study, the decrease was more in SICS as compared to PHACO, however, the difference between the two groups was statistically insignificant when compared to preoperative values. Ruit et al reported that on postoperative day 1, the phacoemulsification group had an average increase of 70 μ m in CCT vs 9 μ m in the manual SICS cohort.⁷ Edema decreased by day 5 to 29 μ m and 4 μ m in the

phacoemulsification and manual SICS groups, respectively. In their study, by postoperative week 3, CCT had returned to baseline in both groups. A meta-analysis by Wang et al⁸ showed no statistically significant difference between CCT values between Phaco and SICS (WMD=2.03, 95% CI (-4.76, 8.83), Z = 0.59). The authors commented that based on the included studies, at day 1 after surgery no statistically significant difference between Phaco and SICS was found. Similarly, at 7 days after surgery no statistically significant difference between Phaco and SICS was observed. Finally, at 90 days after surgery no statistically significant difference between Phaco and SICS was found with regards to CCT. Pipat performed a comparative, prospective, non-randomized study on 42 patients with white cataract, who underwent cataract surgery.⁹ The patients were divided into SICS (21 eyes) and Phaco cataract surgery group (21 eyes, phaco group). The authors reported that the group who underwent phaco had significantly higher corneal thickness than the group who underwent MSICS (p<0.008).

In our study, the visual acuity of patients in the two study groups were compared pre-operatively and at post-operative day 30. We observed that post-operatively, Phaco and SICS groups had 64% and 55% patients with good visual outcome respectively. Poor visual outcome was observed in 10% and 11% of the patients in the Phaco and SICS group respectively. However, the visual outcomes post-operatively were similar in the two study groups (p value = 0.43). Ruit et al found that both the surgical techniques achieved excellent visual outcomes with low complication rates.⁷ At six months 85% of the SICS patients had UCVA of 20/60 or better and 98% had a BCVA of 20/60 or better vs. 82% of patients with UCVA of 20/60 or better and 98% of patients with BCVA of 20/60 or better at six months in the phaco group. Venkatesh et al found that the UCVA was 20/60 or better in 99 patients (87.6%) in the phacoemulsification group and 96 patients (82.0%) in the manual SICS group (P=0.10) and the BCVA was 20/60 or better in 112 (99.0%) and 115 (98.2%), respectively (P=0.59) so they concluded that MSICS is significantly less expensive, and less technology-dependent than phacoemulsification, it may be a more appropriate technique in eyes with mature cataract in the developing world.¹⁰ Similar to our results, Hamid et al also found that the primary post-operative visual outcome for small incision cataract surgery and phacoemulsification was comparable in terms of uncorrected visual acuity.¹¹ While choosing between Phaco and SICS, numerous other factors have to be kept in mind. Although, phaco is the preferred method for cataract surgery worldwide, it is not always available in developing countries.¹² The manual SICS is less expensive, less technology dependent and might be faster than phaco. Ruit et al revealed that manual SICS is faster than phaco for advanced cataracts cases.⁷ Gogate et al¹⁴ showed that a shorter duration of SICS decrease backlog of cataract patients. Thus SICS is preferred in high volume outreach camp, such as in low socio-economic communities in the developing countries, due to its cost effective, comparable visual outcome, while being non machine dependent.

CONCLUSION

Based on the results of the present study, we conclude that

- Both Phaco and SICS resulted in significant increase in CCT on post-operative follow up assessments. However, with subsequent follow ups we observed that CCT kept on decreasing and reached pre-operative values. Patients in the SICS group had significantly lower CCT values as compared to patients in the Phaco group.

2. Post-operatively good visual outcomes based on visual acuity were observed in 64% and 55% of the patients in the Phaco and SICS group respectively. There was no significant difference in the visual acuity outcomes between the two study groups.

As manual SICS is a much faster and less expensive technique than phacoemulsification, it is suggested that it has more advantages when managing large volume of senile cataract cases in a country like India. However, manual SICS technique is not easy to master and requires practice. Further investigations with a larger number of patients and longer follow-up periods are warranted to conclusively label one technique superior over the other. Also, further studies are required to compare parameters like, patients comfort and satisfaction, rate of early and late postoperative complications and financial costs associated with the two techniques.

REFERENCES

1. World Health Organization. Vision 2020: the right to sight. Global initiative for the elimination of avoidable blindness: Action Plan 2006–2011. Accessed January 2020. Available from: http://www.vision2020.org/mediaFiles/downloads/40322249/Vision2020_report_pdf.pdf
2. Cheng C, Liu J, Chen S, Lee F. Population-based study on pre- valence and risk factors of age-related cataracts in Peitou, Taiwan. *Chin Med J*. 2000;63:641–8.
3. Lebuissou DA, Weiser MY. General complications of cataract surgery and lens implantation. *Curr Opin Ophthalmol* 1993;4:75-82.
4. Ventura AS, Wälti R, Böhnke M. Corneal thickness and endothelial density before and after cataract surgery. *Br J Ophthalmol* 2001;85:18-20
5. Falkenberg B, Kutschen A, Wiegand W. Analysis of optical parameters after cataract surgery and implantation of foldable lens. *Ophthalmologie*. 2005;102:587-91
6. Ravindran RD, Haripriya A, Minu M. Relevance and clinical significance of SICS (Manual Phaco) in modern cataract surgery. In: Ashok G, Luther L, Geoffrey T, editors. *Clinical practice in small incision cataract surgery (Manual Phaco)*. 1st ed. New Delhi, India: Jaypee Brothers Medical Publishers; 2005. pp. 238–240
7. Ruit S, Tabin G, Chang D, Bajracharya L, Kline DC, Richheimer W, et al. A prospective randomized clinical trial of phacoemulsification vs. manual sutureless small-incision extracapsular cataract surgery in Nepal. *Am J Ophthalmol* 2007; 143 :32-38
8. Wang L, Xiao X, Zhao L, Zhang Y, Wang J, Zhou A, Wang J, Wu Q. Comparison of efficacy between coaxial microincision and standard-incision phacoemulsification in patients with age-related cataracts: a meta-analysis. *BMC ophthalmology*. 2017 Dec;17(1):267.
9. Kongsap P. Visual outcome of manual small-incision cataract surgery: Comparison of modified Blumenthal and Ruit techniques. *Int J Ophthalmol*. 2011;4:62–5.
10. Venkatesh R, Tan CS, Sengupta S, Ravindran RD, Krishnan KT, Chang DF. Phacoemulsification versus manual small-incision cataract surgery for white cataract. *Journal of Cataract & Refractive Surgery*. 2010 Nov 1;36(11):1849-54.
11. Hamid KA, Habibullah S. Comparison of visual outcomes in patients undergoing small incision cataract surgery versus phacoemulsification at Divisional Headquarters Hospital, New Mirpur, Azad Kashmir. *The Professional Medical Journal*. 2019 Aug 10;26(08):1365-9.
12. Farmer L, Innes-Wong C, Bergman-Hart C, Casson RJ, Crompton J. Visual acuity, quality of life and visual function outcomes after cataract surgery in Bali. *Ophthalmic Epidemiol*. 2015;22(4):274–82.
13. Gogate P. Comparison of various techniques for cataract surgery, their efficacy, safety and cost. *Oman J Ophthalmol*. 2010;3(3):105-6.