

COMPARISON OF VISION OUTCOMES BETWEEN SICS (SMALL-INCISION CATARACT SURGERY) AND PHACOEMULSIFICATION IN CATARACT SURGERY

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ABSTRACT

Objectives: The main objective of the study is to compare the vision outcomes between small-incision cataract surgery (SICS) and phacoemulsification (PHACO) procedures, to compare the quality of life (QOL) before surgery and after surgery, to improve the patient's knowledge of their disease condition, and to increase medication adherence after the surgery.

Methods: A prospective observational study was conducted for 6 months. About 100 patients were enrolled in the study according to the study criteria. Different scales ([visual function questionnaire] VFQ 25, QOL scale [QOLS] by Schallock and Keith, Morisky Adherence Scale -8 items) were scored from the patient's profile and treatment chart by communicating with physicians, counseling the patients.

Results: One hundred patients were assessed before and after cataract surgery and follow-up was made for 1 month. Overall, vision-related QOL was significantly improved in PHACO than SICS patients. National Eye Institute VFQ 25 was assessed on day 7 and day 30 where we have observed a statistically significant improvement in the PHACO group of patients than in SICS. Their medication adherence scores were categorized into a high, medium, low category, and most of the SICS patients remained in the medium category, whereas the number of patients increased from medium to high category in PHACO patients.

Conclusion: We concluded that PHACO is better than small incisional cataract surgery due to its small and self-sealing incision, which requires no stitches in most cases, with minimum complications the patient heals faster and recovers rapidly.

Keywords: Cataract, Small incisional cataract surgery, Phacoemulsification, National eye institute visual function questionnaire, Vision-related quality of life, Medication adherence, Patient counseling.

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INTRODUCTION

An eye is a spherical structure with a wall made up of three layers: The outer part sclera, the middle part choroid layers, ciliary body, and iris and the inner section nervous tissue layer retina. Just behind the iris and pupil lies the lens, which helps to focus light on the back of the eye [1]. Cataract is an ophthalmic disorder, in which the eye lens becomes opaque and leads to blindness when unoperated [2]. Around 45 million people in the world are blind of which 17.6 million are cataract cases. In India, 20 lakhs of the latest cataract cases are being added per annum [3]. Cataract may occur, either due to the formation of opaque lens fibers (congenital and developmental cataract) or due to a degenerative process resulting in opacification of the normally formed transparent lens fibers (acquired cataract) [4]. Modern cataract surgeries with the intraocular lenses are the safest, successful, simple, and most frequently performed surgeries. Our study included small incisional cataract surgery (SICS) which is a form of extracapsular cataract extraction and phacoemulsification (PHACO) is the most common technique performed, this restores vision in patients with cloudy lens [5].

Small-incision cataract surgery (SICS) is one of the most commonly used surgical technique in developing countries. This technique usually results in a good visual outcome and is useful for high-volume cataract surgery. Advantages: Universal applicability, Not machine-dependent, less surgical complications, and operating time in manual SICS is less than that of PHACO, especially in hard cataract. Therefore, it is ideal for mass surgery cost-effective. Disadvantages: Conjunctival congestion persists for 5-7 days at the location of a conjunctival flap, surgical induced astigmatism is more as the incision in SICS is large (about 6 mm) as compared to PHACO (about 3.2 mm).

PHACO is a way of emulsifying and aspirating cataract with the assistance of surgical procedures using a machine and microsurgical instruments. The PHACO procedure was introduced and was first performed on the human eye by Charles Kelman in 1967. PHACO is usually performed using a PHACO system in combination with the PHACO chop method. Advantages: Its small-sealing incision requires no stitches in most cases, the wound is more stable with minimum complications, and the patient heals faster, recovers rapidly, and can resume normal activities more quickly. Disadvantages: The PHACO procedure is related to nuclear drop complications and high risk of corneal damage and is extremely difficult to use within the treatment of mature hard cataracts, in areas where optimal health care is unavailable, PHACO is not a practical solution [6].

The main objective of this study was to compare the visual outcomes between SICS and phaco. The study rationale is to ascertain, in which technique has better outcomes to increase the quality of life (QOL) of the patients at a faster rate. In addition, the patient counseling was given to improve their medication adherence.

METHODS

This was a prospective observational study carried out from October 2018 to March 2019. The study was conducted on both male and female patients of the Ophthalmology Department at ESI Hospital, Sanathnagar, Nacharam. About 100 consecutive patients were enrolled within the study, of which 50 patients underwent SICS and 50 patients underwent PHACO.

Inclusion criteria involve patients whose age is greater or equal to 40 years, suffering from Grades II, III, and IV cataract, well-dilating

pupil, good intact zonular apparatus, normal IOP, and suffering from comorbid conditions and patients who are willing to participate in the study [7]. Exclusion criteria include patients who are having any comorbidity that does not show much difference in the visual outcomes after surgery like optic nerve damage, weak zonular apparatus, macular edema, patients with corneal diseases (congenital anomalies, degeneration, and dystrophies) and patients with glaucoma, poorly dilated pupils, and systemic disorders such as bleeding problems [8].

After explaining, the purpose of the study signature was collected on the inform consent form. Patient's details were collected in self-designed pro forma and different scales such as National Eye Institute visual function questionnaire (NEI VFQ)-25, QOL scale (QOLS) by Schalock and Keith, and Morisky Medication Adherence scale- 8 items were used to measure the visual changes, QOL, and medication adherence, respectively.

Patient information leaflets were provided and were counseled for 6-8 min about the instructions that they need to follow for 1 month. Follow-up was done on days 1, 7, 14, and 30. The data were entered in the Excel sheet and a student-t statistical test was performed.

Ethical considerations

All the interventions in this study were performed by carefully assessing the need for intervention and implemented after prior approval from the hospital's management and Institutional Ethical Committee.

RESULTS

In this study, we have compared two different surgical techniques, that is, SICS and PHACO. A total number of 115 patients were included initially, 15 patients were dropped due to their personal reasons, so we have conducted a prospective observational study on 100 patients, of which 50 patients underwent SICS and 50 patients underwent PHACO.

Distribution of visual acuity in patients undergone SICS and PHACO

Presenting visual acuity was measured before surgery and on day 1, day 7, day 14, and day 30. Best correcting visual acuity was measured along with presenting visual acuity as listed in Table 1 [9].

Comparison of NEI VFQ 25 between SICS and PHACO

NEI VFQ 25 was scored in both SICS and PHACO group of patients on 7th day and 30th day¹¹ and the results are listed in Table 2.

Comparison of QOL between SICS and PHACO

The results obtained according to the QOLS provide information about the degree of difficulties in everyday activities before and after surgery Tables 3 and 4.

Comparison of medication adherence between SICS and PHACO

MMAS-8 Morisky Medication Adherence Scores at POD-7 and POD-30 in the SICS group of patients were increased in the high category, remained the same in the medium category, and decreased in the low category. which are represented in the Figure 1, Figure 2 respectively. In PHACO patients, there is an increase in the high, medium, and low category (patients are classified according to the score obtained as low adherence [score <6], medium adherence [score 6-8], and high adherence [score 8]).

DISCUSSION

This study includes patients who are ≥45 years of age and have taken an age interval of 5 years were listed in Table 5. The distribution of the patient's age has showed a majority of them aged between 45 and 55 years with a mean age of 56.76 years. This was in accordance with the retrospective study conducted by Semanyenzi *et al.*, in the year 2015, the distribution of the patient's age showed a majority of them aged between 50 and 79 years with a mean age of 65.8 years [10]. We have observed that 36% of the total population were found to be male and 64% are found to be female in SICS, whereas 56% are found to be male and 44% are found to be female in PHACO were listed in Table 6, this was in accordance with a prospective randomized controlled trial conducted by Singh *et al.*, in the year 2007, which showed no difference in terms of gender [11].

In our study, we have observed that 62% of the population in SICS, 74% in PHACO have no comorbidities, while diabetes mellitus (DM) was found to be in 12% of the population in SICS, 10% in PHACO. Hypertension (HTN) was found to be 14% in SICS and 6% in PHACO. Both DM and HTN were found to be 8% in SICS, 10% in PHACO, and 2% of the population was found to have DM, HTN, followed by knee pain in SICS and no comorbidities were observed in PHACO group of patients, 2% of the population was found to have DM, HTN, and hypothyroidism in SICS, and no comorbidities were observed in PHACO group of patients were listed in Table 7. Many studies have shown that there are increased chances of developing cataract in those who are suffering from diabetes mellitus.

In our study, we found that 54 patients had cataract in the left eye and 46 patients had cataract in the right eye. The total number of cases that were included in the study showed that the majority of them had Grade

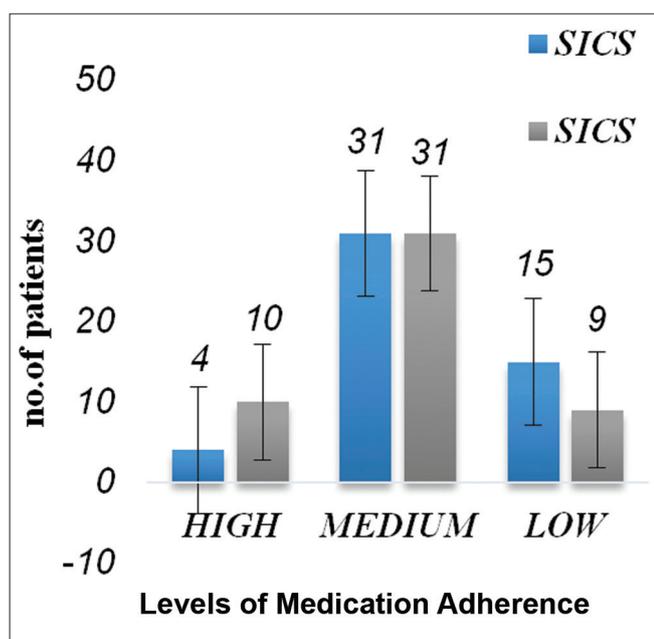


Figure 1: shows the scores of MMA-8 scale in SICS patients.

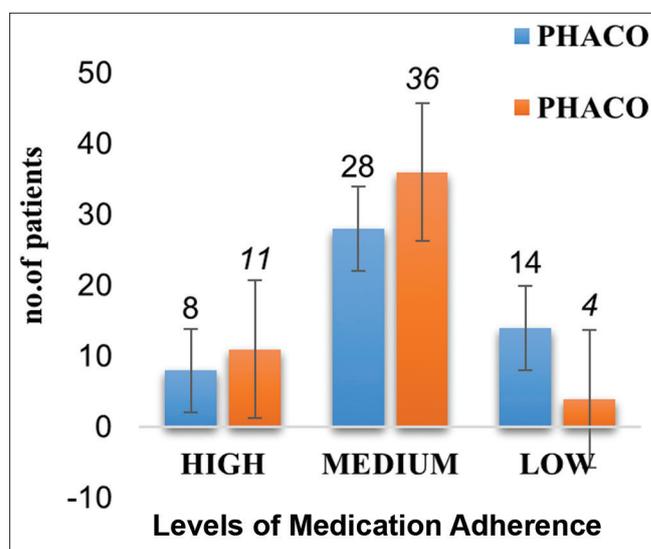


Figure 2: shows the scores of MMA-8 in Phacoemulsification patients

Table 1: The improvement in the vision who underwent SICS and phacoemulsification

Parameters	Pre-operative	Day 1		Day 7		Day 14		Day 30	
SICS	PVA	PVA	BCVA	PVA	BCVA	PVA	BCVA	PVA	BCVA
PL, HM, and CF	31	04	06	03	03	02	02	01	01
1/60-6/60	16	11	3	10	04	07	03	06	04
6/36-6/18	03	29	17	25	15	31	17	26	12
6/12-6/6	0	06	24	12	28	10	28	17	33
PHACO	PVA	PVA	BCVA	PVA	BCVA	PVA	BCVA	PVA	BCVA
PL, HM, and CF	13	03	03	0	0	0	0	0	0
1/60-6/60	25	10	05	02	0	01	03	0	0
6/36-6/18	12	20	12	30	08	26	04	22	04
6/12-6/6	0	17	30	18	42	23	43	28	46

SICS: Small-incision cataract surgery, PHACO: Phacoemulsification, PVA: Presenting visual acuity, BCVA: Best-corrected visual acuity, PL: Perception of light, HM: Hand movements, CF: Count fingers

Table 2: The NEI VFQ-25 on both the group of patients on day 7 and day 30

Parameters	SICS(n ₁)				Phaco(n ₂)			
	7 th day	30 th day	T-statistic	P-value	7 th day	30 th day	T-statistic	p-value
General health	48	57.5	2.73	0.000,751	65.5	71.5	2.48	0.014 844
General vision	54.9	62.6	2.75	0.007,098	62.8	66.8	2.26	0.026,035
Ocular pain	90.2	92.75	2.72	0.007,724	96.25	113.75	2.57	0.011,675
Near activities	48.5	58.32	2.77	0.006,706	71.40	75.1	2.98	0.003,635
Distance activities	53.6	61.6	2.46	0.015,645	71.6	77.8	2.45	0.016,059
Social functioning	58.25	66.25	2.52	0.013,351	75.5	81.75	2.58	0.011,364
Mental health	58.7	66.25	2.23	0.028,029	75.1	79.3	2.12	0.036,532
Role difficulties	58.6	66.12	2.20	0.030,157	72.2	77.80	2.30	0.023,569
Dependency	61.8	69.16	2.12	0.036,532	73.49	80.99	2.87	0.005,029
Driving	0	0	0	0	19.49	19.65	2.02	0.046,113
Color vision	64	71	2.29	0.024,165	79.5	8.2	2.62	0.010,192
Peripheral vision	56.5	66.25	2.75	0.007,098	74.1	78.5	2.97	0.603,745

SICS: Small-Incision Cataract Surgery, PHACO: Phacoemulsification. n₁=50, n₂=50, NEI VFQ: National Eye Institute visual function questionnaire

Table 3: Quality of life score in SICS and phacoemulsification patients

Parameters	Pre-SICS (n ₁) (mean±S.D)	Post-SICS (n ₁) (mean±S.D)	Pre-PHACO(n ₂) (mean±S.D)	Post-PHACO(n ₂) (mean±S.D)
Reading small prints	3.21±0.80	3.86±0.23	3.62±0.40	3.94±0.83
Reading large size letters	3.16±0.65	3.12±0.84	3.36±0.68	3.66±0.93
Reading newspaper	3.2±0.44	3.54±0.77	3.58±0.44	3.92±0.80
Recognizing faces	3.22±0.44	3.56±0.79	3.48±0.70	3.82±0.61
House work	3.4±0.41	3.5±0.78	3.54±0.69	3.9±0.61
Cooking	3.46±0.53	3.54±0.80	3.49±0.57	3.8±0.61
Watching TV	3.24±0.45	3.54±0.77	3.58±0.79	3.86±0.54
Driving during a day	3.4±0.30	3.58±0.77	3.53±0.72	3.9±0.53
Driving at night	3.48±0.38	3.58±0.77	3.55±0.73	3.88±0.53
Recognizing money	3.28±0.49	3.6±0.82	3.64±0.80	3.8±0.53
Recognizing prices	3.6±0.48	3.5±0.79	3.62±0.49	3.82±0.61
Recognizing food	3.1±0.54	3.68±0.79	3.42±0.78	3.78±0.58
Recognizing objects	3.3±0.48	3.58±0.80	3.59±0.76	3.74±0.60
Recognizing colors	3.12±0.53	3.7±0.80	3.42±0.79	3.8±0.50

SICS: Small-incision cataract surgery, PHACO: Phacoemulsification. S.D: Standard deviation, n₁=50, n₂=50.

Table 4: The T-statistic and p-value of quality of life in SICS and phacoemulsification patients

Parameters	T-statistic (SICS)	p-value (SICS)	T-statistic (PHACO)	p-value (PHACO)
Reading small print	2.46	0.00,001	5.52	0.01,564
Reading large size letters	2.84	0.000,203	3.86	0.0054
Reading newspaper	2.63	0.007,944	2.71	0.0099
Recognizing faces	2.59	0.00,913	2.66	0.011
Housework	2.58	0.011,364	2.58	0.011
Cooking	2.6	0.001,485	3.27	0.010
Watching TV	3.35	0.016,248	2.38	0.0011
Driving during A day	2.93	0.012,555	2.543	0.0042
Driving at night	2.59	0.16,919	2.43	0.011
Recognizing money	2.17	0.019,747	2.37	0.032
Recognizing prices	2.81	0.00,001	5.8	0.0059
Recognizing food	2.62	0.000,059	4.2	0.0101
Recognizing objects	2.10	0.036,532	2.12	0.0382
Recognizing colors	2.92	0.000,045	4.27	0.0043

SICS: Small-incision cataract surgery, PHACO: Phacoemulsification

Table 5: Gender-wise distribution of patients

Gender	SICS (%)	PHACO (%)
Male	36	56
Female	64	44

SICS: Small-incision cataract surgery, PHACO: Phacoemulsification

Table 6: Age-wise distribution of patients

Age (in years)	SICS (%)	PHACO (%)
45-50	26	22
51-55	18	26
56-60	24	18
61-65	16	22
66-70	10	12
71-75	6	0

SICS: Small-incision cataract surgery, PHACO: Phacoemulsification

Table 7: Distribution of patients based on comorbidities

Comorbidities	SICS (%)	PHACO (%)
DM	12	10
HTN	14	6
DM and HTN	08	10
DM, HTN, and knee pain	2	0
DM, HTN, and hypothyroidism	2	0
None	62	74

SICS: Small-incision cataract surgery, PHACO: Phacoemulsification, DM: Diabetes Mellitus, HTN: Hypertension

Table 8: Distribution of patients based on cataract grades

Cataract grades	SICS (%)	PHACO (%)
Grade II	12	52
Grade III	52	40
Grade IV	36	8

SICS: Small-incision cataract surgery, PHACO: Phacoemulsification

Table 9: Distribution of patients based on cataract precursors

Cataract precursors	SICS (%)	PHACO (%)
IMSC	80	76
Subcapsular	12	22
Cortical	8	2

SICS: Small-incision cataract surgery, PHACO: Phacoemulsification, IMSC: Immature senile cataract

Table 10: Distribution of patients based on complications

Complications	SICS (%)	PHACO (%)
Corneal edema	2	6
Flare	2	0

SICS: Small-incision cataract surgery, PHACO: Phacoemulsification

III cataract followed by Grade II and Grade IV were listed in Table 8 [12].

We have also observed that 80% in SICS, 76% in PHACO came under immature senile cataract type of cataract precursor, 12% in SICS, and 22% in PHACO patients came under subcapsular cataract precursor. About 8% in SICS and 2% in PHACO come under cortical cataract precursor were listed in Table 9. This study was similar to Mohammed *et al.*, which showed 52% of patients came under cortical cataract

precursor.

Out of total operated eyes of SICS and PHACO 2%, 6% patients had post-operative corneal edema, respectively, and 2% in SICS patient had a post-operative flare complication, while no flare was observed on PHACO as listed in Table 10. A similar prospective study was conducted by Sumeet *et al.*, in the year 2016, which showed that 133 patients have post-operative corneal edema. However, both PHACO and SICS achieved excellent visual outcomes with low complication rates. This study was in accordance with a prospective randomized study conducted by Ruit *et al.*, in the year 2007.

The visual outcomes of PHACO patients who achieved BCVA between 6/12 and 6/6 on day 1, day 7, day 14, and day 30 are 60%, 84%, 86%, and 92%, respectively, whereas SICS patients who achieved BCVA between 6/12 and 6/6 on day 1, day 7, day 14, and day 30 are 48%, 56%, 56%, and 66%, respectively. Overall, the level of post-operative visual acuity in this study was significantly higher than a cross-sectional study conducted by Mohammed *et al.*, in the year 2015, where only 26.6% cataract operated patients had significant improvement. Our study showed that the patients who have undergone PHACO surgery achieved a good visual outcome than the SICS group of patients.

The strength of the NEI VFQ-25 questionnaire is that it not only measures difficulty with visual tasks but also the influence of visual impairment on social functioning, mental health, role difficulties, and dependency. This study has scored the VFQ 25 on day 7 and on day 30 in both SICS and PHACO patients and the mean value of SICS patients was found to be 54.44 and 61.48, respectively, the mean value of PHACO patients was found to be 71.21 and 73.98, respectively. Both the SICS and PHACO group of patients showed improvement in the vision from day 7 to day 30, whereas PHACO patients have statistically significant outcomes than SICS. This was in accordance with the prospective cohort study conducted by To *et al.*, in the year 2014 [13]. Our study has a zero score in driving subscale in the patients who have undergone SICS and it was similar to the study conducted by Chan *et al.*, in the year 2009, where the non-response rate was abundantly high in the driving subscale. Going out to watch movies, playing or sporting events also had a high non-responsive rate especially in older patients.

QOL after SICS and PHACO cataract surgery was improved as compared to that of before the surgery. There was a significant improvement in the vision-related QOL composite score after cataract surgery in the PHACO group of patients than the SICS group of patients. This study was in accordance with the study conducted by Maria *et al.*, in the year 2012, postulated that the degree of visual defects and QOL as perceived by patients is significantly related as the recognizing objects parameter of PHACO patients was low. Hence, the QOL remains the same before and after surgery in those particular patients.

The Morisky scale is a validated scale that has been used in various types of chronic diseases; it has the advantage of being able to be adapted to various diseases and various types of medications, with good reproducibility. We observed a statistically significant increase in the adherence rate from day 7 to day 30 in both SICS and PHACO patients. This was in accordance with the study conducted by Sanguansak *et al.*

CONCLUSION

From our study, we have concluded that PHACO is better than SICS due to its small and self-sealing incision, which requires no stitches in most cases and the patient heals faster and recovers rapidly with minimum complications.

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AUTHORS' CONTRIBUTIONS

C. Suhas Reddy helped in designing the protocol and reviewed the final report along with the manuscript.

K. Navya Sai, K. Srilekha was responsible for literature review, protocol designing, data collection, patient counseling, data analysis, manuscript writing, and editing.

K. Avanthi Priya contributed towards data collection, patient counseling, and data analysis.

CONFLICTS OF INTEREST

There are no conflicts of interest.

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