



COMPARATIVE STUDY BETWEEN CLEAR CORNEAL SMALL INCISION CATARACT SURGERY & CONVENTIONAL PHACOEMULSIFICATION

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ABSTRACT

Purpose: To compare the outcomes of clear corneal small incision cataract surgery with that of conventional phacoemulsification

Methods: This was a prospective study, in which 50 eyes of 50 patients of senile cataract (Up to Grade III nuclear sclerosis) were operated. Cataract associated with glaucoma, corneal pathology, other ocular problem e.g., uveitis, trauma, pseudoexfoliation syndrome etc., & retinal pathology were excluded from study.

Cases were selected on alternate basis to have cataract extraction through a temporal clear corneal incision for right eye & nasal for left eye using either clear corneal small incision cataract surgery through a 3.5 mm incision (25 eyes) or conventional phacoemulsification through a 3.5 mm incision (25 eyes). The phacoemulsification system for cataract surgery was Infiniti Vision System (Alcon, USA) and the intraocular lens used was acrylic foldable lens in all patients.

Assessed parameters were-1) Uncorrected & best corrected visual acuity, 2) Surgically induced astigmatism, 3) Intraoperative & post-operative complications.

Results: The mean uncorrected visual acuity (UCVA) of clear corneal SICS group at 1st post-operative day, 1st week, 4th week and 6th week were 0.74±0.30, 0.61±0.29, 0.35±0.27 & 0.31±0.27, respectively. Similarly, for phacoemulsification group the mean UCVA at 1st post-operative day, 1st week, 4th week and 6th week were 0.66±0.35, 0.51±0.35, 0.30±0.24 & 0.22±0.16, respectively.

The mean best corrected visual acuity (BCVA) of clear corneal SICS group at 1st post-operative day, 1st week, 4th week and 6th week were 0.71±0.29, 0.55±0.32, 0.31±0.28 & 0.23±0.34, respectively. Similarly, for phacoemulsification group the mean BCVA at 1st post-operative day, 1st week, 4th week and 6th week were 0.54±0.37, 0.42±0.37, 0.24±0.21 & 0.16±0.13, respectively.

The mean surgically induced astigmatism (SIA) of clear corneal SICS group at 1st post-operative day, 1st week, 4th week and 6th week were 2.50±0.68, 2.01±0.52, 1.82±0.86 & 1.34±0.86, respectively. Similarly, for phacoemulsification group the mean SIA at 1st post-operative day, 1st week, 4th week and 6th week were 2.17±0.42, 1.73±0.45, 1.54±0.52 & 1.03±0.63, respectively.

Complication rates e.g., striate keratopathy, cells and flare in anterior chamber, are more for clear corneal SICS group patients than phacoemulsification group for initial 1st post op day, 1st week & 2nd week; but complications become comparable at 4th week, 6th week post op.

One patient in clear corneal SICS group had undergone pseudophakic bullous keratopathy unfortunately.

Conclusion: Although conventional phacoemulsification is a safe procedure, has faster visual rehabilitation, minimum complications. But there are no statistically significant differences between clear corneal SICS & conventional phacoemulsification in final outcomes of UCVA, BCVA, SIA & complication rates.

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INTRODUCTION

Cataract is the leading cause of visual impairment worldwide. In India, blindness due to cataract is significantly greater than in western populations according to recent studies.¹⁻⁶

Today, cataract surgery is not simply a procedure to remove the opaque lens, but aims at achieving best possible visual outcome with maximum safety and minimum invasiveness. These goals have created a trend toward a smaller wound from a 10 mm incision used for extra capsular cataract extraction (ECCE) to 2.2-2.8 mm incisions in phacoemulsification; that are associated with less surgically induced astigmatism (SIA),

better fluidics, faster recovery, and less tissue damage and inflammation.⁷

Manual SICS with rigid IOL (incision size 5.5-6.5 mm) has been already operating in high volume facilities; and has already proven to be safe, less time consuming, non-machine dependent and economic^{8,9,10}.

But the question is; if we do SICS only with clear corneal incision with foldable intraocular lens without dissecting sclera-corneal tunnel; would this smaller incision result in significantly better clinical outcomes with cost effectiveness?

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Is it possible to give better visual outcome & lower complications as in conventional phacoemulsification without being machine dependent?

This study was performed to compare the outcomes of clear corneal small incision cataract surgery through 3.5 mm clear corneal incision with foldable intraocular lens (no sclero-corneal tunnel has been dissected) with that of conventional phacoemulsification through 3.5 mm clear corneal incision with foldable intraocular lens.

METHODS

In a prospective clinical trial, 50 eyes of 50 patients were enrolled to undergo cataract surgery. After explaining the study, surgical procedures, and possible complications, an informed consent was obtained and patients were alternatively allocated to group ‘A’ clear corneal SICS & group ‘B’ phacoemulsification.

Patients having senile cataract (Up to Grade 3 Nuclear sclerosis) had selected for both groups.

Cataract associated with glaucoma, corneal pathology, any other ocular problem e.g., uveitis, trauma, pseudoexfoliation syndrome etc. & retinal pathology were excluded.

Before surgery, all patients underwent a complete ophthalmic examination including UCVA, BCVA by Snellen’s chart, Intraocular pressure (IOP) by applanation tonometer, anterior segment examination by slit lamp, keratometry by Bausch & Laumbkeratometer, axial length & intraocular lens power by A-scan biometer.

Follow-up examinations were performed at 1st post-operative day, 1st week, 4th week and 6th week after surgery. UCVA, BCVA, SIA & complications were assessed in all follow-up sessions.

Surgical Technique

All surgeries were performed by the same surgeon under local anesthesia after pupillary dilation with tropicamide 1% and phenylephrine hydrochloride 2.5% eye drops. Proper sterile precautions were taken including use of antiseptics like povidone-iodine. A 2.8 mm metal tip knife was used for clear corneal incision (superio-temporal in right eye & nasal in left eye) for entry into anterior chamber; Then 3.5 mm metal tip extender knife is used for incision enlargement for both groups. 0.5 mm clear corneal tunnel is made in all patients of both groups. One side port was created at about 90° apart using a 1.2 mm clear cut side port knife. The ophthalmic viscoelastic device was used in both groups; and a continuous curvilinear capsulorhexis of approximately 5.0 mm was created. After hydrodissection & hydrodelineation, phacoemulsification was performed by Alcon infiniti machine. Settings were adjusted according to nucleus density.

In clear corneal SICS, nucleus is delivered into anterior chamber; phacofratured into 2-3 pieces & viscoexpressed outside.

Proper Irrigation & aspiration has done for cortex removal. After filling the anterior chamber with viscoelastic, a foldable acrylic intraocular lens with the recommended injector system was implanted into the eye with the same incision. Finally, viscoelastic was removed with the irrigation/aspiration tip and the wound was hydrated. Any case of intraoperative complication was recorded.

RESULTS

In 50 patients of our study, 31(62%) were male and 19(38%) were female. Patient’s preoperative data are shown in Table-1

Table 1

	Group ‘A’ (Clear corneal SICS)	Group ‘B’ (Phacoemulsification)
AGE (YEARS)	40.96±13.76	56.08±9.76
UCVA (LOG MAR)	1.06±0.43	1.03±0.43
BCVA (LOG MAR)	0.94±0.44	0.85±0.39

Visual Acuity

The results of UCVA and BCVA evaluation are summarized in table 2 & 3, respectively.

There was no significant difference in UCVA as well as BCVA between the two groups at any follow-up session (P≥0.05).

Table 2

Mean UCVA (Log MAR) ± SD At Different Follow Up Period			
Follow UP Period	GROUP ‘A’ (Clear corneal SICS)	GROUP ‘B’ (Phacoemulsification)	Two Tailed Significance (P Value)
1 ST POD	0.74±0.30	0.66±0.35	0.55
1 ST WEEK	0.61±0.29	0.51±0.35	0.39
4 TH WEEK	0.35±0.27	0.30±0.24	0.62
6 TH WEEK	0.31±0.27	0.22±0.16	0.27

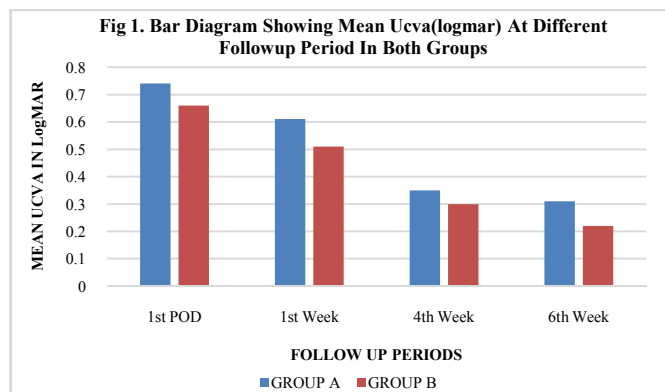
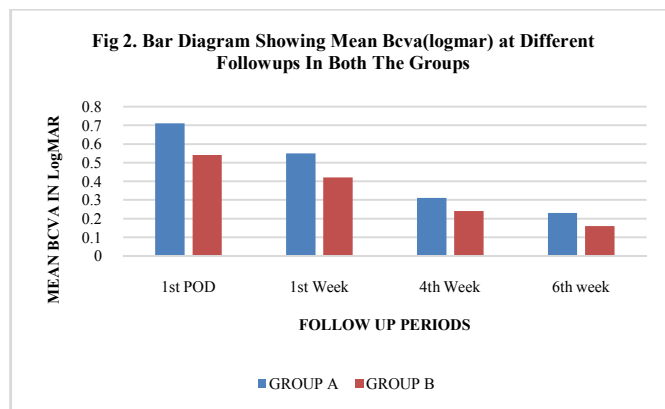


Table 3

Mean BCVA (Log MAR) ± SD AT Different Follow Up Periods			
Follow up Period	GROUP ‘A’ (Clear corneal SICS)	GROUP ‘B’ (Phacoemulsification)	Two Tailed Significance (P Value)
1 ST POD	0.71±0.29	0.54±0.37	0.15
1 ST WEEK	0.55±0.32	0.42±0.37	0.22
4 TH WEEK	0.31±0.28	0.24±0.21	0.42
6 TH WEEK	0.23±0.34	0.16±0.13	0.33

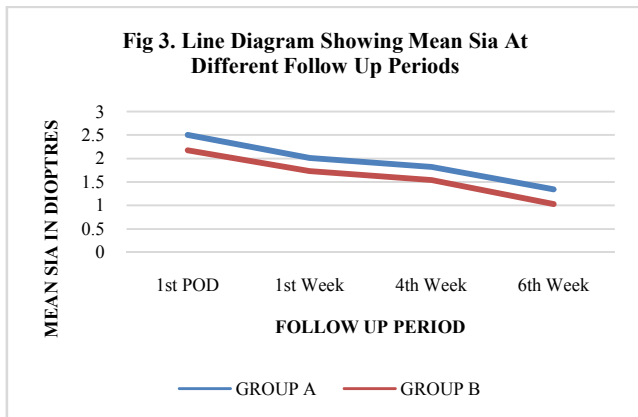


Surgically Induced Astigmatism (SIA)

There was no statistically significant difference in SIA between the two groups at any follow-up time.

Table 4

Mean Sia (Diopter) ± SD at Different Follow up Periods			
Follow up Period	GROUP 'A' (Clear corneal SICS)	GROUP 'B' (Phacoemulsification)	Two Tailed Significance (P VALUE)
1 ST POD	2.50±0.68	2.17±0.42	0.15
1 ST WEEK	2.01±0.52	1.73±0.45	0.16
4 TH WEEK	1.82±0.86	1.54±0.52	0.14
6 TH WEEK	1.34±0.86	1.03±0.63	0.06



Complications- No intraoperative complication was recorded in any patient. Postoperatively complication rates were more in group 'A' clear corneal SICS than group 'B' phacoemulsification for 1st & 2nd weeks; striate keratopathy being the most common & conjunctival hyperemia being the second. But complication rates were same for both groups at 6th week follow up. Anterior chamber leak, intraocular lens dislocation did not report for any patient in any group at any follow up period.

One patient in clear corneal SICS group developed pseudophakic bullous keratopathy unfortunately; for which he has registered for corneal transplantation at our center.

DISCUSSION

UCVA (Uncorrected Visual Acuity)

In our study, the mean UCVA (log MAR) of phacoemulsification group (0.22±0.16) was better than that of clear corneal SICS group (0.31±0.27) at 6th week; but the difference between the two groups was statistically insignificant at all follow-up periods (p=0.27).

Our results were consistent with those of Singh *et al* (2009)¹¹, who found that mean visual acuity of conventional phacoemulsification was 0.43±0.27 (n=93) & mean visual acuity for SICS was 0.47±0.024 (n=93) & there was no significant differences in uncorrected visual acuity between phacoemulsification & SICS (p=0.065).

Our results also showed similarity with Rengaraj Venkatesh *et al* (2014)¹², they found that at 6th week UCVA was 20/60 or better in 87.6 % patients in phacoemulsification group and 82% of patients in SICS group (p=0.10).

BCVA (Best Corrected Visual Acuity)

In our study, mean BCVA (log MAR) of phacoemulsification group (0.16±0.13) was also better than that of clear corneal SICS group (0.23±0.34) but the difference between the two

groups was statistically insignificant at all follow-up periods (p=0.33).

Our study showed similar trend to the study of Shimna Iqbal *et al* (2015)¹³, they found that at end of 6th week the BCVA comes 6/9 or 6/6 in 77.9% patients of SICS group (n=65) & 95.2 % patients in phacoemulsification group (n=65).

Our study had similar results with the study of Zhang ZY *et al* (2013)¹⁴, they have done a meta-analysis of six randomized controls trials and found that there was no significant difference between SICS and phacoemulsification regarding BCVA 6/9 or better (p=0.69) & less than 6/18 (p=0.68).

SIA (Surgically Induced Astigmatism)

In our study, SIA was calculated by SIA calculator which is based on vector analysis.

The mean SIA of conventional phacoemulsification group (1.03±0.63) was less than that of clear corneal SICS group (1.36±0.86); & the difference in surgically induced astigmatism between two groups was statistically insignificant at all follow-up periods (p=0.06)

Pallavi Patil *et al* (2014)¹⁵ did the comparative study between SICS and phacoemulsification (n=200) & found that surgically induced astigmatism is 1.08±0.52 D at 45th post op day for SICS group & 0.91±0.47 D for phacoemulsification group.

Kamal R Dodiya *et al* (2016)¹⁶ evaluated surgically induced astigmatic error for IIIrd year junior residents & found 1.27±0.84 D astigmatism among SICS patients.

Both the above-mentioned studies show similar trends for SIA as in our study.

Complications

No intraoperative complication occurs in any patient of any group, post operatively complication rates in our studies is more in clear corneal SICS group, striate keratopathy being most common followed by conjunctival hyperemia. But final complication rates are similar for both groups.

One patient in clear corneal SICS group had undergone Pseudophakic bullous keratopathy unfortunately; this was because of more phacofracture of nucleus in anterior chamber (6-8 pieces instead of 2-3 pieces).

Aravind haripriya *et al* (2012)¹⁷ evaluated overall complication rates for SICS & phacoemulsification and found that SICS has 1.01% and phacoemulsification has 1.11% overall complication rates, they also found that combined complication rates was 4.8% for phacoemulsification & 1.46% with SICS.

Parikshit gogate *et al* (2015)¹⁸ did a meta-analysis of 11 comparative studies (n=76,838) and found that there was no statistical difference in endothelial cell loss (p=0.362), intraoperative (p=0.964) & post-operative complications (p=0.362) between SICS and phacoemulsification. Similar trends were also found in our study.

CONCLUSION

Clear corneal SICS is found to be as eminent as conventional phacoemulsification in terms of final visual outcome, surgically induced astigmatism, complications.

Furthermore, not only we can implant a foldable intraocular lens in clear corneal SICS without being machine dependent

with absolutely no complications of conjunctival peritomy, bipolar cautery, sclera-corneal tunnel dissection, but also in skillful hands clear corneal SICS can be done in topical anesthesia; completely avoiding the complications of retrobulbar / periocular anesthesia as well as superior rectus bridal suture, with being very cost effective as compared to phacoemulsification.

Thus, we can conclude that clear corneal SICS can be a splendid tool for high volume cataract surgery in our country with high quality visual outcomes, minimal complications & could also be an initial surgery to a beginner ophthalmic surgeon.

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