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Comparitive Analysis of Phacoemulsification with Rigid IOL and SICS in Camp Patients

Rupali Tyagi[1], Vatsala Vats[2], Manisha Gupta[3]

Abstract

Objective: To make a comparative analysis of clear corneal phacoemulsification (PHACO) with rigid intraocular lens (IOL) and small incision cataract surgery (SICS) in camp patients reporting from hilly areas of Uttrakhand in terms of safety, efficacy and final visual outcome. *Design:* Retrospective study *Material and Methods:* A total of 214 patients of senile cataract were enrolled in this study conducted in ophthalmology department SGRRIM & HS, Dehradun, India over a period of twelve months. The participants were divided into PHACO and SICS as group A and group B respectively. The final outcome measures were the uncorrected visual acuity (UCVA) on day one, best corrected visual acuity (BCVA) at six weeks, the surgical induced astigmatism (SIA) at six weeks, the intraoperative and postoperative complications. *Results:* Post-operative UCVA at day one was 6/18 or better in group A (72 of 104 eyes - 69.2%) as compared to group B (20 of 112 eyes -18.2%) and statistically significant ($p < 0.001$). The post operative BCVA at 6 weeks follow up revealed overall good visual outcome between 6/6 - 6/9 with PHACO group (76 of 104eyes -73.1%) showing better results than SICS (55 of 110 eyes -50.0%) group. ($p < 0.001$) The mean SIA at the end of six weeks in Group A (PHACO) was 1.10 ± 0.51, and in Group B (SICS) was 1.22 ± 0.42. ($p = 0.065$). Overall incidence of intra operative complications was 8.7% in group A and 13.6% in group B. ($p<0.619$). *Conclusions:* Although both surgical techniques are sutureless, safe and effective for visual rehabilitation of cataract patients in camps, our study shows PHACO group demonstrating better final visual outcome as compared to SICS group. However, there was no significant difference in terms of surgically induced astigmatism and the complication profile.

Keywords: Camp; Visual Acuity; Astigmatism; Phacoemulsification.

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Introduction

Phacoemulsification with foldable intraocular lens is time tested now for senile cataract in modern era of ophthalmology still manual small incision cataract surgery (SICS) is preferred choice in developing countries for high volume camps being cheaper and non machine dependent [1]. Blindness due to cataract is associated with considerable disability resulting in large socioeconomic consequences [2,3]. Majority of camp patients coming from hilly region are either daily wage workers or farmers or old women with household responsibilities, are poor in follow ups but at the same time they do expect quick recovery. This category of rural and illiterate patients pose special challenge to the surgeon. As astigmatism is an important issue with clear corneal phacoemulsification (PHACO) and rigid intraocular lens (IOL) implantation in camps, apart from cost factor and learning curve, it does not seem to have much impact on final functional vision which remains the main concern of the patient.

To our knowledge not many studies have been

Author Affiliation: [1,2]Assistant Professor [3]Professor, Dept. Ophthalmology, Shri Guru Ram Rai Institute of Medical and Health Sciences (SGRRIM & HS), Dehradun, Uttrakhand 248001, India.

Corresponding Author: Vatsala Vats, Assistant Professor, Dept. Ophthalmology, Shri Guru Ram Rai Institute of Medical and Health Sciences (SGRRIM & HS), Dehradun, Uttrakhand 248001, India.

E-mail: vatsym@gmail.com

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done in this region on such patients travelling down all the way to Doon valley from hilly terrains of Uttrakhand in the hope of visual rehabilitation. Most of the patients were from Pauri Garhwaal district. Though it is a small study, we have made an honest effort to make a comparative assesment of clear corneal PHACO and manual SICS techniques in camp patients in terms of final visual outcome, post operative astigmatism, intraoperative and postoperative complications.

Materials and Methods

A retrospective study was conducted in the ophthalmology department of SGRRIMHS Dehradun, India on patients of senile cataract who were operated over a period of twelve months from September 2017 to August 2018. The complete data was obtained from central record section and refraction registers maintained in the out patient department after permission granted by hospital research committe.

A total of 214 eyes of 214 patients were reviewed out of which 104 patients underwent phacoemulsification and 110 patients were operated with SICS technique, assigned as group A and group B respectively. The inclusion criteria for selection were all cases of senile cataract with different grades of nuclear sclerosis including brown cataracts and hypermature cataracts as well, with clear corneas and no or minimal (0.25D—0.5D) preoperative astigmatism. All patients were between the age group of 50-85 yrs. Exclusion criterion were glaucomatous eyes, corneal dystrophies, posterior segment pathology and patients with previous history of trauma or surgery. Patients who were lost in follow up and cases in which PHACO was converted to SICS due to extension of capsulorrhexis were also not included in present study. All the patients underwent complete ophthalmological evaluation including slitlamp examination, ophthalmoscopy, tonometry, keratometry and biometry. (USG-Ascan) The preoperative patients data was recorded in terms of age, sex, BCVA, grade of nuclear sclerosis (NS), Keratometry (K1 and K2) values, axial lenghth (Axl), IOL power and intraocular pressure (IOP).

Patients in Group A were operated by clear corneal superior incision on the same PHACO machine (Alcon Laureatte) with an incision size of 2.8 mm, which was enlarged to 6 mm at the end of surgery. Patients in Group B were operated by SICS technique with a scleral tunnel of 6 mm to 7 mm incision size. A rigid 6 mm optic IOL (PMMA) was implanted in both the groups. All the selected cases were done by the same surgeon (author) to avoid intrasurgeon variation .The final outcome measures of the study were uncorrected visual acuity (UCVA) at day one ,best corrected visual acuity (BCVA) at week 6, surgical induced astigmatism (SIA) at week 6, intaoperative and postoperative complications. As long term follow up was not done, posterior capsular opacification was excluded from postoperative evaluation parameters.

Results

We used chi-square test for analysis of various parameters and statistical significance was set at 95% confidence intervals, that is at a p-value of < 0.05 for comparison between two groups. Grouped vertical bar charts were used to illustrate final outcome measures.

Table 1 summarizes the comparison of the 2 groups (Group A: PHACO < n = 104 > and Group B: SICS < n = 110>) based on various clinical characteristics. The mean age of the sample was 61.77 ± 7.74 years, with majority of patients in their sixth decade of life and a male preponderance (116 males and 98 females) and there was no significant difference between two groups as far as age and gender is concerned. ($t = 3.743$, $p < 0.001$). However there was a difference between the two groups in terms of grade of nuclear sclerosis (NS), group A having significantly less mature cataracts (65.4% of NS+1 to NS+2) than group B (45.5% NS+3 to NS+4). ($p< 0.001$) The preoperative visual acuity was comparable between two groups and majority were in category of moderate visual impairment with BCVA between 6/6 to 6/24. (65.4% in group A and 54.5% in group B) There was no patient in PHACO group with visual acuity less than 3/60 compared to 20 (18.2%) in SICS group who were practically blind as per WHO classification. ($\chi 2 = 21.319$ $p < 0.001$).

Table 1: Socio-demographic and clinical variables

Variables	Group A PHACO (n = 104)	Group B SICS (n = 110)	Comparison (statistic, p-value)
	Mean (SD) or N (%)	Mean (SD) or N (%)	Independent sample t-test, Chi-squared test
Age (years)*	63.73 (6.59)	59.91 (8.30)	t = 3.743, p < 0.001
Gender			

Male	56 (53.8%)	60 (54.5%)	$\chi2 = 0.011$
Female	48 (46.2%)	50 (45.8%)	$p = 0.514$
Grade of Cataract*			
NS +1 to NS +2	68 (65.4%)	30 (27.3%)	
NS +3 to NS +4	32 (30.8%)	50 (45.5%)	$\chi2 = 41.121$
Brown Cataract	4 (3.8%)	10 (9.1%)	$p < 0.001$
Hypermature Cataract	0 (0%)	20 (18.2%)	
Preoperative Best-Corrected Visual Acuity			
6/6-6/18	4 (3.8%)	5 (4.5%)	
6/24-6/36	68 (65.4%)	60 (54.5%)	$\chi2 = 21.319$
6/60-3/60	32 (30.8%)	25 (22.8%)	$p < 0.001$
<3/60	0 (0%)	20 (18.2%)	
K1*	43.80 (1.72)	43.22 (1.51)	$t = 2.627, p = 0.009$
K2*	44.23 (1.78)	43.35 (1.50)	$t = 3.906, p < 0.001$
Axial Length (mm)	22.43 (0.96)	22.42 (1.12)	$t = 0.081, p = 0.936$
IOL Power (D)*	22.10 (2.25)	22.80 (1.78)	$t = -2.529, p = 0.012$
Intraocular Pressure	13.26 (3.20)	13.54 (3.56)	$t = -0.418, p = 0.677$

NS: Nuclear Sclerosis; K1, K2: Keratometry, IOL: Intraocular lens

Parameters; * = statistically significant difference

Table 2: Final outcome measures

Variables	Group A PHACO (n = 104)	Group B SICS (n = 110)	Comparison (statistic, p-value)
	Mean (SD) or N (%)	Mean (SD) or N (%)	Independent sample t-test, Chi-squared test
Post-operative Uncorrected Visual Acuity at Day 1*			
6/6-6/18	72 (69.2%)	20 (18.2%)	$\chi2 = 56.842$
6/24-6/60	32 (30.8%)	90 (81.8%)	$p < 0.001$
<6/60	0 (0%)	0 (0%)	
Post-operative Best-Corrected Visual Acuity at Week 6*			
6/6-6/9	76 (73.1%)	55 (50.0%)	
6/12-6/18	28 (26.9%)	35 (31.8%)	$\chi2 = 23.995$
6/24-6/60	0 (0%)	20 (18.2%)	$p < 0.001$
<6/60	0 (0%)	0 (0%)	
Surgically Induced Astigmatism (Dioptre)	1.10 (0.51)	1.22 (0.42)	$t = -1.858, p = 0.065$

Parameters; * = statistically significant difference

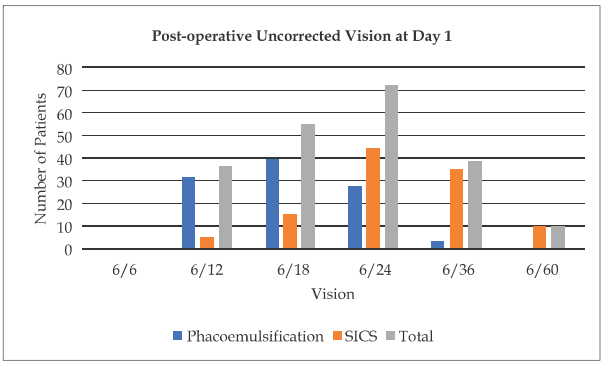

Fig. 1: comparison of post operative UCVA at day 1

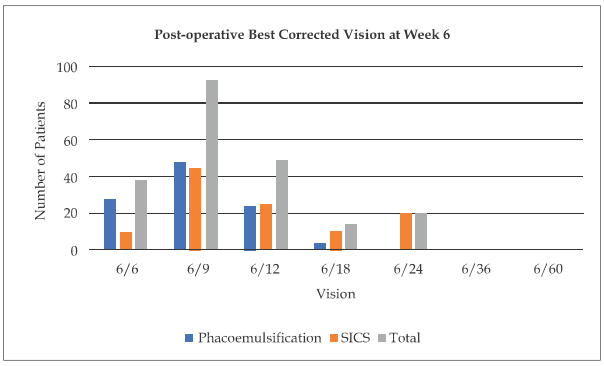

Fig. 2: comparison of post operative BCVA at week 6

Table 2 describes the final outcome measures .Postoperative UCVA at day one (Fig. 1) was 6/18 or better in group A (72 of 104 eyes - 69.2%) as compared to group B (20 of 112 eyes -18.2%) and this difference between two groups was statistically significant ($p < 0.001$). The postoperative BCVA at 6 weeks follow up (Figure-2) revealed overall good visual outcome (6/6-6/9) with group A (76 of 104 eyes-73.1%) showing better results compared to group B (55 of 110 eyes-50.0%). None of the patients in either group had poor outcome (<6/60) ($p < 0.001$). The mean surgically induced astigmatism (SIA) at the end of six weeks (Figure-3) in Group A (PHACO) was 1.10 ± 0.51, compared to 1.22 ± 0.42 in Group B (SICS) but statistically not significant ($p = 0.065$).

Table 3 illustrates the complication profile in both the groups. The overall incidence of intraoperative complications was 8.7% of 104 eyes in group A as compared to 13.6% of 110 eyes in group B . The posterior capsular rent (PCR) rate was lesser in PHACO group (2.88%) compared to 4.55% in SICS group. There was one case each of nucleus drop (0.96%) and corneal burns (0.96%) in group A while none in group B. Descemets detachment and iridodialysis was seen in 0.9% of SICS group while none in PHACO group. Zonular dialysis was seen in 0.96% and 2.77% in group A and group B respectively. ($\chi2 = 5.330$ $p < 0.619$). No major postoperative complications were noticed in either group. Shallow anterior chamber was noticed in 4 (3.63%) in group B as compared to 2 (1.92%) in group A. Hyphema was noticed in 2 (1.81%) cases and iris prolapse in 1 (0.9%) case of SICS group while none in PHACO. Striate keratitis and uveitis incidence were comparable in two groups. Raised IOP was seen in one case each in both the groups. The percentage of treatable postoperative complications was 14.4% of 104 eyes in group A as compared to 19.1% of 110 eyes in group B ($\chi2 = 3.130$ $p < 0.680$).

Table 3: Complication Profile

Variables	Group A PHACO (n = 104)	Group B SICS (n = 110)	Comparison (statistic, p-value)
	N (%)	N (%)	Independent sample t-test, Chi-squared test
Intra-operative Complications			
Posterior Capsule Rent	3 (2.88 %)	5 (4.55%)	
Anterior Chamber IOL	1 (0.96%)	3 (2.72%)	
IOL in Sulcus	2 (1.92%)	2 (1.81%)	
Nucleus Drop	1 (0.96%)	0 (0%)	$\chi2 = 5.330$
Corneal Burn	1 (0.96%)	0 (0%)	$p = 0.619$
Descemet's Detachment	0 (0%)	1 (0.9%)	
Iridodialysis	0 (0%)	1 (0.9%)	
Zonular Dialysis	1 (0.96%)	3 (2.72%)	
Total	**9 (8.7%)**	**15 (13.6%)**	
Post-operative Complications			
Shallow Anterior chamber	2 (1.92%)	4 (3.63%)	
Hyphema	0 (0%)	2 (1.81%)	
Iris Prolapse	0 (0%)	1 (0.9%)	
Striate Keratitis	6 (5.76%)	8 (7.27%)	$\chi2 = 3.130$
Uveitis	6 (5.76%)	5 (4.55%)	$p < 0.680$
Raised Intraocular Pressure	1 (0.96%)	1 (0.9%)	
Total	**15 (14.4%)**	**21 (19.1%)**	

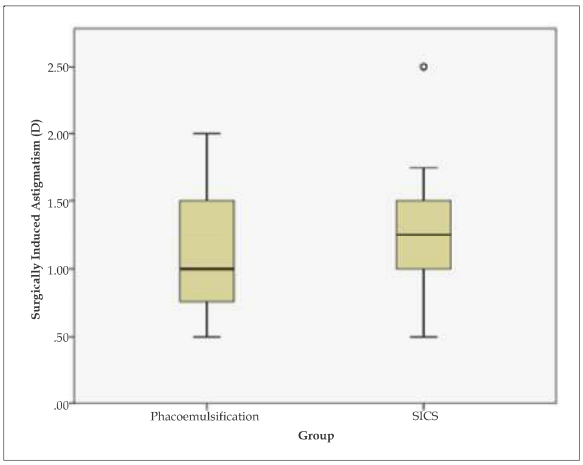

Fig. 3: comparison of SIA at week 6

Discussion

Although quite a number of similar studies have been conducted worldwide and reported in literature, we went ahead with this study with

a curiosity of results in this belt of Uttrakhand state, India. Most of the patients in our study were in sixth decade of life with male preponderance. The clinical and sociodemographic variables were comparable in both the groups. The postoperative UCVA at day one was 6/18 or better in majority of PHACO (69.2%) patients as compared to (18.2%) of SICS patients. The postoperative BCVA at 6 weeks follow up revealed overall good visual outcome (6/6 - 6/9) with again PHACO group showing better results (73.1%) than SICS (50.0%). None of the patients had poor outcome (<6/60). ($p < 0.001$) The mean SIA at the end of six weeks in PHACO group was, 1.10 ± 0.51 compared to 1.22 ± 0.42 in SICS group but statiscally not significant. ($p = 0.065$).

Our final outcome measures have been similar to the recent studies done. Cook C et al. have reported that there was no difference in the first day visual acuities (p=0.28) but both the UCVA and BCVA at 8 weeks were better in the eyes that had PHACO (p=0.02 and p=0.03) 4A randomised clinical trial done by Gogate PM etal. revealed 81.08% patients of the PHACO group 71.1% patients of the SICS group (P = 0.038) were better than or equal to 6/18 at the 6-week follow-up and the SIA was 1.1 D and 1.2 D, respectively. 5 Semanyenzi SE etal concluded that 'both types of surgery had similar post-operative outcome at 1, 3 and 6 months respectively (p=0.09, 0.19 and 0.12).' 6A recent study from south India has reported that on the 40th post-operative day, mean SIA in PHACO group was around 1.100476 and in SICS group, it was 1.124333 7 Another study done by Ammous I etal has shown lesser astigmatism in PHACO group (1.08 ± 0.42 D) than SICS group (1.51 ± 0.55 D) with significant difference (p=0.001).8 However some other studies were in favour of SICS like Jaya etal who reported higher SIA at the end of four weeks in PHACO group (2.06D ± 0.52D) compared to 0.98D ± 0.39 Din SICS group [9]. A prospective randomized clinical trial conducted in Nepal by Ruit S et al. concluded comparable UCVA in both groups but surgical time for SICS was much shorter. (p< .0001) [10].

The intraoperative complications in our study were more in SICS group (13.6%) as compared to PHACO group (8.7%). ($p < 0.619$) The PHACO group had three posterior capsular rents (PCR) including one nucleus drop which happened during chopping and rigid PMMA IOLs were placed in sulcus in two cases while ACIOL (Kelman multiflex) was implanted in latter case after vitrectomy. Compared to that five PCR occured in the SICS group with implantation of three ACIOLs and two PMMA IOLs placed in sulcus. Corneal burns was noted in one case in PHACO while none in SICS. One case of descemet detachment (DD) and two cases of iridodialysis (ID) occurred in group B which took place while expressing nucleus with wire vectis while none in PHACO group. Zonular dialysis (ZD) was seen in three cases of SICS which occurred while prolapsing the nucleus in anterior chamber in hard brown cataracts with weak zonules compared to one case in group A which occurred during cortical aspiration. The overall percentage of treatable postoperative complications was 14.4% in group A as compared to 19.1% in group B but statistically not significant ($p < 0.680$).

A study done by V Ramalaxmi et al. has reported 4.4% incidence in PHACO group and 10% in SICS group [7]. SE Semanyenzi and his colleagues report that the most common treatable postoperative complications were hyphema and corneal edema, with no statistically significant difference in the complications rate between both types of surgery (p=0.28) [6]. Our study showed slightly higher PCR rate in SICS group (4.55%) as compared to PHACO group (2.88%) similar to study of Naik AU etal who reported 6% and 2% in SICS and PHACO respectively [11]. Fortunately we did not have any dreaded complications like endophthalmitis or retinal detachment in either group. The complication profile comparison between two groups has been variable in various studies done so far as it all depends on the surgical competence [13,14].

Limitations of study: Since it is a retrospective study we had certain limitations, like lack of complete data in terms of specular microscopy, posterior capsular opacification and cystoid macular edema. The individual preferred technique and expertise of the surgeon also influences the final statistics.

Conclusion

Though our study has shown better outcome with phacoemulsification, we still feel patients who have to travel heights and generally lost in follow-ups, SICS technique should be preferred as far as wound safety and risk of postoperative endophthalmitis is concerned. In coming scenario with more number of trained PHACO surgeons, availability of low cost consumables, cheaper foldable IOLS and vitreoretinal backup, PHACO will turn out to be a better option in camp surgeries even in developing countries.

The authors declare no conflict of interest

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