

A Comparative Study of Pre- and Post-Operative Refractive Errors in Cataract Surgery- Phacoemulsification Vs. Manual Sics In a Secondary Care Hospital

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Abstract

Introduction: Cataract surgery, today is seen as a refractive surgery. So we should be concerned not only to correct the spherical ametropia, but also the cylindrical. Cataract is the most important and significant cause of bilateral blindness in senile age group, both in India as well as on a global scale. Modern cataract surgeries with intraocular lens (IOL) have become one of the safest, most successful, simple, and consistent and most frequently performed surgeries. **Materials and Methods:** This prospective observational research design was conducted among cataract patients with age between 40 to 70 years who attended Ophthalmology OPD in Govt Medical College, Baramulla during January 2020 to December 2020. Sample size was calculated based on the study by Cook C et al, proportion of corrected visual acuities as normal in phacoemulsification group was 36% while it was 18% in SICS group during 8 weeks follow up. **Results:** In this study, 50 patients in group I and 50 patients in group II were operated for cataract by phacoemulsification and manual SICS respectively. The mean age in Phaco group was 60.72±4.31 years while mean in SICS groups was 61.91±5.36 years. Majority patients in Phaco group were males (55%) while in SICS group were females (54%). Almost equal number of cases in both the groups were operated for right and left eyes. **Conclusion:** Small-incision surgery does not need the capital investment and recurring expenditure of a phacoemulsification machine. Training in phacoemulsification surgery has a steep learning curve than small-incision cataract surgery for ophthalmic surgeons. It is recommended as an alternative procedure to phacoemulsification where the requisite equipment and expertise are not available.

Keywords: Cataract surgery, intraocular lens, SICS.

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Introduction

Cataract surgery, today is seen as a refractive surgery. So we should be concerned not only to correct the spherical ametropia, but also the cylindrical. Cataract is the most important and significant cause of bilateral blindness in senile age group, both in India as well as on a global scale[1]. Modern cataract surgeries with intraocular lens (IOL) have become one of the safest, most successful, simple, and consistent and most frequently performed surgeries. Small incision cataract surgery (SICS) is gaining popularity in developing countries as an inexpensive alternative to phacoemulsification. SICS and phacoemulsification have advantages like early visual rehabilitation, less induced astigmatism and no suture-related complications as wound constriction and closure. The surgeries are gaining attention and importance[2]. Although cataracts can be surgically removed, barriers exist that prevent patients to access surgery in many countries. When performed appropriately, cataract extraction usually improves the quality of life of the patient, reduces injury and attenuates functional decline. Cataract extraction has proven to be safe and highly successful procedure. However, it is important to ensure that surgery should be done for appropriate indications, or else vision-threatening complications can occur[3].

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Primary indication for surgery is when visual function no longer meets the patients' needs and cataract surgery will provide a reasonable likelihood of improvement or when the opacity of the lens inhibits optimal management of posterior segment disease or the lens causes medically unmanageable open-angle glaucoma.⁴ Removing visually significant cataracts not only reduces the risk of injury and improves a patients quality of life but also improvement of night vision, enhanced ability to drive, fewer falls and fractures, fewer motor vehicle accidents, better cognitive functioning on standardized test, greater ability to live independently and attenuated decline in overall functioning and well-being[5]. The present study was undertaken to compare the postoperative visual outcome in unaided and aided visual acuity and induced astigmatism in patients undergoing phacoemulsification and SICS.

Materials and Methods

This prospective observational research design was conducted among cataract patients with age between 40 to 70 years who attended Ophthalmology OPD in Govt Medical College, Baramulla during January 2020 to December 2020. Sample size was calculated based on the study by Cook C et al, proportion of corrected visual acuities as normal in phacoemulsification group was 36% while it was 18% in SICS group during 8 weeks follow up. The calculated minimum sample size was 41 in each group. So, 50 patients were selected in each group. Each patient was randomly allocated using the software research randomizer. Patients with Visually significant Cataract having visual acuity between hand movements to 6/18 on Snellen's chart and in whom IOL (intraocular lens) power is between 16-24 diopters were included in the study while patients with complicated cataract, traumatic cataract, presenile cataract, corneal diseases, pre-

existing infections of eye, glaucoma, uveitis, dry eyes, pterygium. Suffering with any systemic disorder and undergone intraocular surgery before were excluded from the study. Informed consent was taken from all patients included in study. In all cases a detailed record was maintained regarding age, pain, trauma, systemic illness etc. Associated symptoms like redness, lacrimation, and photophobia etc., were also noted. Ophthalmic examinations like visual acuity in both unaided and best corrected eye, ocular examination, intraocular tension, slit lamp examinations, keratometry, auto-refractometry, A-Scan, direct/ indirect Ophthalmoscopy, lacrimal sac patency, B scan, OCT disc and macula and Schirmer's test were done when required. Lab investigations like CBC, RFT, FBS, PPBS, Serum electrolytes, HIV, HbsAg were done. Patients were randomized into two groups. Group I went for Phacoemulsification while Group II went for manual small incision cataract surgery SICS.

Data was entered in Microsoft excel and was analysed using SPSS version 20.0. The qualitative data was represented in the form of frequency and percentage and the quantitative data in the form of mean and standard deviation. Comparison of mean score before treatment and after treatment was done with repeated measures ANOVA and p value less than 0.05 was considered as statistically significant and Comparison of mean score between the two groups were measured by unpaired t test.

Results

In this study, 50 patients in group I and 50 patients in group II were operated for cataract by phacoemulsification and manual SICS respectively. The mean age in Phaco group was 60.72±4.31 years while mean in SICS groups was 61.91±5.36 years. Majority patients in Phaco group were males (55%) while in SICS group were females (54%). Almost equal number of cases in both the groups were operated for right and left eyes. (Table 1).

Table 1: Age Distribution

		Type of surgery		P
		Phaco	SICS	
Age in years				
41-50	Count	0	3	0.085
	%	0%	6%	
51-60	Count	28	18	
	%	56%	36%	
61-70	Count	22	29	
	%	44%	58%	

Table 2: Gender Distribution

		Type of surgery		P
		Phaco	SICS	
Gender				
Female	Count	23	27	0.203
	%	46%	54%	
Male	Count	27	23	
	%	54%	46%	

Table 3: Side of eye

		Type of surgery		P
		Phaco	SICS	
Side of eye				
Left	Count	22	23	0.67
	%	44%	46%	
Right	Count	28	26	
	%	56%	52%	

There was no significant difference in unaided visual acuity at preoperative period. After surgery it was improved in Phaco group as compared to SICS group at postoperative day 1, day 3, day 7 and at 2 weeks. Later on at postoperative period of 4 weeks, 6 weeks and 3 months there was no significant difference in unaided visual acuity between phaco and SICS groups while there was no significant

difference in best corrected visual acuity at preoperative period. After surgery it was improved in Phaco group as compared to SICS group at postoperative day 1, day 3, day 7 and at 2 weeks and 6 weeks. Later on at postoperative period at 3 months there was no significant difference in unaided visual acuity between phaco and SICS groups.

Table 4: Comparison of Unaided Visual Acuity and Best Corrected Visual Acuity at Different Intervals of Time in Both the Groups

			Visual Acuity Unaided		P	BCVA		P
			Phaco	SICS		Phaco	SICS	
Preoperative	6/12-6/18	Count	1	2	0.391	14	11	0.33
		%	1%	4%		28%	22%	
	6/24-6/60	Count	30	28		31	31	
		%	60%	57%		63%	63%	
	<6/60	Count	19	19		5	7	
		%	39%	39%		9%	15%	
POD 1	6/6-6/9	Count	14	5	26	11	0.002	0.01
		%	28%	10%	53%	21%		
	6/12-6/18	Count	24	21	22	27		
		%	48%	42%	45%	54%		

	6/24-6/60	Count	12	24		1	12	
		%	24%	48%		2%	25%	
POD 3	6/6-6/9	Count	15	7	0.002	30	15	0.001
		%	30%	14%		60%	31%	
	6/12-6/18	Count	25	23		20	27	
		%	51%	47%		40%	55%	
6/24-6/60	Count	9	20	0	7			
	%	19%	39%	0%	14%			
POD7	6/6-6/9	Count	16	9	0.037	31	22	0.01
		%	32%	18%		62%	43%	
	6/12-6/18	Count	25	26		19	27	
		%	50%	53%		38%	54%	
6/24-6/60	Count	9	15	0	2			
	%	18%	29%	0%	3%			
POD 2 weeks	6/6-6/9	Count	19	10	0.019	40	23	0.003
		%	37%	20%		69%	47%	
	6/12-6/18	Count	26	30		15	25	
		%	52%	61%		31%	50%	
6/24-6/60	Count	5	9	0	2			
	%	11%	19%	0%	3%			
POD 4 weeks	6/6-6/9	Count	20	13	0.054	36	30	0.098
		%	41%	25%		73%	61%	
	6/12-6/18	Count	25	30		14	19	
		%	49%	61%		27%	37%	
6/24-6/60	Count	5	7	0	1			
	%	10%	14%	0%	2%			
POD 6 weeks	6/6-6/9	Count	23	15	0.102	40	33	0.047
		%	45%	31%		80%	66%	
	6/12-6/18	Count	23	28		10	16	
		%	47%	56%		20%	32%	
6/24-6/60	Count	4	6	0	1			
	%	8%	13%	0%	2%			
POD 3 weeks	6/6-6/9	Count	25	17	0.09	41	39	0.514
		%	49%	34%		82%	78%	
	6/12-6/18	Count	22	28		9	10	
		%	44%	56%		18%	21%	
6/24-6/60	Count	4	5	0	1			
	%	7%	10%	0%	1%			

Table 5: Comparison of Mean Sphere and Mean Astigmatism between Both the Groups

Time Interval	Type of Surgery	Sphere			Astigmatism		
		Mean	SD	P	Mean	SD	P
Pre	SICS	2.35	0.809	0.51	0.77	0.632	0.331
	PHACO	2.28	0.697		0.685	0.672	
POD 1	SICS	0.785	0.47	0.001	1.37	0.634	0.001
	PHACO	0.425	0.33		1.035	0.632	
POD 3	SICS	0.81	0.48	0.001	1.36	0.643	0.001
	PHACO	0.425	0.33		1.005	0.49	
POD 7	SICS	0.81	0.48	0.001	1.345	0.63	0.001
	PHACO	0.425	0.33		1.005	0.49	
POD 2 WK	SICS	0.81	0.48	0.001	1.31	0.64	0.001
	PHACO	0.425	0.33		0.99	0.48	
POD 4WK	SICS	0.81	0.48	0.001	1.27	0.64	0.001
	PHACO	0.425	0.33		0.98	0.49	
POD 6 WK	SICS	0.81	0.48	0.001	1.24	0.64	0.001
	PHACO	0.425	0.33		0.97	0.50	
POD 3 Month	SICS	0.81	0.48	0.001	1.19	0.60	0.001
	PHACO	0.425	0.33		0.94	0.49	

Table 6: Comparison of Mean Astigmatism at Various Intervals in Phaco. Group and SICS Group (within Comparison)

Time Interval	Phaco. Group				SICS Group			
	Mean	SD	F	P	Mean	SD	F	P
Pre OP	0.685	0.67	433.94	0.001	0.775	0.63	506.43	0.001

POD 1	1.035	0.63			1.37	0.644		
POD 3	1.005	0.49			1.36	0.64		
POD 7	1.005	0.49			1.345	0.63		
POD 2 Wks	0.995	0.48			1.31	0.64		
POD 4 Wks	0.98	0.48			1.27	0.64		
POD 6 Wks	0.97	0.50			1.24	0.64		
POD 3 months	0.94	0.49			1.19	0.60		

Discussion

This study was conducted to compare the final unaided and aided visual acuity as well as postoperative astigmatism in phacoemulsification and manual SICS performed on cataract patients aged 40 to 70 years[6].

In this study, there was no significant difference in unaided visual acuity or best corrected visual acuity at preoperative period but after surgery unaided visual acuity improved significantly in Phaco group postoperative day 1, day 3, day 7 and at 2 weeks and best corrected visual acuity on postoperative day 1, day 3, day 7 and at 2 weeks and 6 weeks but later on at postoperative period of 4 weeks, 6 weeks and 3 months there was no significant difference observed in unaided eye and postoperative 3 months in best corrected visual eye[7,8]. There was no significant difference in mean astigmatism between both the groups during preoperative period. Mean astigmatism was much higher in SICS group as compared to phaco group during all post-operative days and the mean differences were statistically significant. Study conducted by Harakuni U et al observed SIA on 45th post-operative day in SICS group was +0.05 while in phaco group was -0.53 and this difference was statistically significant. SIA in phaco was less compared to SICS group, showing phacoemulsification induced less post-operative astigmatism. These findings were similar to our study findings. Study conducted by Khalaf M. et al observed, at 3 months follow-up, the mean SIA was 2.08 in phaco group and in SICS group it was 2.96.

Study conducted by Singh S K et al observed mean astigmatism in phaco group was 0.11 D while in SICS group it was 0.09 D on postoperative day one[9].

Phacoemulsification has a long learning curve, requires expensive equipment. It has a high consumable cost and needs expensive foldable lenses to maximize the benefit associated with the small incision (Thomas, 2009). Despite these facts, there is a growing demand for phaco surgery in the developing world and many patients are willing to pay more for it (Thomas et al, 2008). To meet the demand and to make it affordable to the people of all socioeconomic levels, phacoemulsification is being performed with implantation of foldable and rigid IOLs as well in the developing countries[10].

Limitations

The major limitation of the study is that the results are of the 3 months follow-up. A 1-year follow-up is being done.

Conclusion

Manual small-incision cataract surgery is comparable to phacoemulsification for the rehabilitation of the patient with cataract,

Conflict of Interest: Nil

Source of support: Nil

although the phacoemulsification technique has less surgically induced astigmatism as compared to small incision cataract surgery. Manual small-incision cataract surgery is safe, fast, economical and nearly as effective.

Small-incision surgery does not need the capital investment and recurring expenditure of a phacoemulsification machine. Training in phacoemulsification surgery has a steep learning curve than small-incision cataract surgery for ophthalmic surgeons. It is recommended as an alternative procedure to phacoemulsification where the requisite equipment and expertise are not available.

References

1. Kratz RP. Teaching phacoemulsification in California and cases of phacoemulsification. In, 2000.
2. Emery JM, Paton D. eds, Current Concepts in Cataract Surgery; Selected Proceedings of the Fourth Biennial Cataract Surgical Congress, St Louis, CV Mosby Co, 1976, 121-123.
3. Kraff MC, Sanders DR, Lieberman HL. Total cataract extraction through a 3-mm incision: A report of 650 cases. *Ophthalmic Surg.* 1979; 10(2):46-54.
4. Packard RBS, Garner A, Arnott EJ. Poly-HEMA as a material for intraocular lens implantation: A preliminary report. *Br J Ophthalmol.* 1981; 65:585-587.
5. Zhou K-Y. Silicon intraocular lenses in 50 cataract cases. *Chin Med J.* 1983; 96(3):175-176.
6. Yalon M, Gold EP. Preliminary study of hydrophilic hydrogel intraocular lens implants in cats. *Am Intra-Ocular Implant Soc* 1984;10:315-317.
7. Faulkner GD. Early experience with STAAR™ silicone elastic lens implants. *Cataract Refract Surg.* 1986; 12:36-39.
8. Samuel Lear Pallin MD. Sun City, Arizona: Comparison of induced astigmatism with phacoemulsification and extracapsular cataract extraction, *Journal of cataract and refractive surgery*, 1987, 13.
9. Shahzad Iftikhar, Zeba Ilyas Matin, Asif Kiani. Outcome of phaco incision on steepest meridian in eyes with pre-existing astigmatism. *Pak J Med Sci.* 2008; 24(2):227-230.
10. Alexandre et al: Influence of corneal biomechanical properties on surgically induced astigmatism in cataract surgery, *J Cataract Refract Surg.* 2013; 39:1204-1210.