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PHACOEMULSIFICATION VERSUS SMALL INCISION CATARACT SURGERY -A SURGICAL OPTION FOR IMMATURE CATARACT IN DEVELOPING COUNTRIES

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Abstract

Introduction: Several studies have shown comparable visual outcomes of SICS and phacoemulsification. Phacoemulsification is the standard surgical procedure for cataract in developed countries whereas the technique of cataract extraction varies in developing countries. Since the last decade small incision cataract surgery (SICS) has become a popular technique of cataract surgery in India and other developing countries. Anecdotally, it is believed that SICS is the appropriate technique for mature cataracts and phacoemulsification emulsification is more suitable for immature cataracts. Several comparable studies have shown similar visual outcome of the two surgical techniques but none of those previous studies had compared the surgical procedures on phacoemulsification suitable immature cataracts.

Objective: To compare the safety and efficacy of different types of surgical procedures (phacoemulsification versus SICS) for cataract surgery in immaturecataract.

Material and methods: A prospective randomized controlled trial was carried out involving 339 and 394 patients with immature senile cataract selected for phacoemulsification and SICS, respectively.

Statistics: Mean values with standard deviations were calculated. P value of less than 0.05 was considered significant.

Results: There was no difference between the groups in terms of gender, age, and pre-operative visual acuity ($p = 0.227$). In group A, and in group B nearly 24.7% and 22.4% respectively of patients had good visual outcome (6/6-6/18). Poor outcome (unaided visual acuity <6/18) was noticed in 75.3% patients from group A and in 77.6% patients from group B.

Statistics: Data were computed and analyzed using the SPSS software program vs 23. The p value of < 0.05 was considered significant.

Conclusion: There was no significant difference in visual outcome on first post-operative day in between phacoemulsification and SICS technique. However, performing SICS was significantly faster. Small incision cataract surgery with implantation of rigid PMMA lens is a suitable surgical technique to treat immature cataract in developing countries.

Keyword: Phacoemulsification, SICS, IOL, Cataract, Surgery, Visual Acuity.

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INTRODUCTION

Cataract is the leading cause of blindness in the world causing more than 18 million bilateral blindness. [1] Most of these blind people reside in developing countries. [2] Insufficient financial resources, inaccessibility, and lack of awareness about existing eye care facilities are some of the barriers underprivileged people face in utilizing available eye care services in these countries. [3] Phacoemulsification is the standard surgical procedure for cataract in developed countries whereas the technique of cataract extraction varies in developing countries. [4] Since the last decade small incision cataract surgery (SICS) has become a popular technique of cataract surgery in India and other developing countries. [5] Anecdotally, it is believed that SICS is the appropriate technique for mature cataracts and phacoemulsification emulsification is more suitable for immature cataracts. Several comparable studies have shown similar visual outcome of the two surgical techniques [6] but none of those previous studies had compared the surgical procedures on phacoemulsification suitable immature cataracts. This prospective randomized controlled trial was done to compare the efficacy of these two methods of cataract extraction on phacoemulsification suitable immature cataract in developing countries.

MATERIAL AND METHOD

Study design A randomized clinical trial was conducted at Department of ophthalmology, Era University Lucknow, for a period of 1 year. (1st January 2019 to 31st January 2020). **Inclusion and exclusion criteria:** All patients underwent slit lamp examination; suitable immature senile cataracts were included for this study. Immature cataract was defined as nucleus sclerosis up to 2 +, cortical cataract 2 + and posterior sub-capsular cataract of any grade. All other types of cataracts were excluded from this study. An informed consent was obtained from all the patients before including them in the study. Ethical clearance was obtained from the Institutional Research Committee. **Intervention:** An automated Keratometer was used for the purpose of keratometry and a A-Scan ultrasound (Nidek) for the purpose of axial length measurement. The power of the intra-ocular lens was calculated with the modified SRK II formula. After pupil dilatation with tropicamide and phenylephrine eye drops, a retrobulbar injection was given in sitting position and the patient requested to press the eyeball with the palm of the hand over a piece of a cotton gauge to soften the eyeball. Preoperative povidone iodine 5 % solution was used for disinfection of the periocular skin area. **Study variables:** Intraoperative/ postoperative complications, postoperative uncorrected visual acuity and surgery-induced astigmatism on the first postoperative day. Postoperative uncorrected visual acuity was taken with a Snellen chart at a 6-meter distance.

RESULTS

733 patients consented for the study, 339 were operated with the phacoemulsification technique (Group A) and 394 were operated with the SICS technique (Group B). Baseline characteristics were similar in both groups as shown in Table 1.

Table 1 Baseline characteristics

Variables	Phacoemulsification (Group A) n=339	SICS (Group B) n=394	P value
Age (Mean ± SD)	62.3±8.9	60±18.3yr	
Male	46.9 %	46.4 %	0.157

Visual Acuity before surgery was shown in Table 2. There were not significantly different between both the groups.

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Table 2: Preoperative Visual Acuity

Variables	Phacoemulsification (Group A) n=339		SICS (Group B) n=394		P value
	Frequency	Percent	Frequency	Percent	
1/60	11	2.8	12	3.5	0.227
6/18	19	4.8	17	5.0	
6/24	75	19.0	78	23.0	
6/36	198	50.3	134	39.5	
6/60	80	20.3	89	26.3	
FC	4	1.0	3	.9	
PL+	7	1.8	6	1.8	
Total	394	100.0	339	100.0	

Mean intraocular lens power was similar in both groups, phacoemulsification group: 22.02 ± 1.31 D and SICS group: 22.2 ± 1.8 D. There was no intraoperative complication between both groups. There were 7.4% post-operative complication in phacoemulsification and 6.3% complication in SICS and these values were significantly different ($p<0.05$). All patients with corneal edema responded to treatment with antibiotic and steroid (Ciprofloxacin and Dexamethasone) containing eye drops and were discharged on the third post-operative day. (Table 3).

Table 3: Intra-operative findings

Variables	Phacoemulsification (Group A) n=339	SICS (Group B) n=394	P value
Mean IOL power	22.02 ± 1.31 D	22.2 ± 1.8 D	
Intra-operative Complications	Nil	Nil	
Post- Operative Complications	**7.4%**	**6.3%**	**0.007**

Postoperatively, uncorrected visual acuity was measured on the first postoperative day at 7 a.m. immediately after removal of the eye pad. In group A, s and in group B nearly 24.7% and 22.4% respectively of patients had good visual outcome (6/6-6/18). Poor outcome (unaided visual acuity <6/18) was noticed in 75.3% patients from group A and in 77.6% patients from group B.

Table 4: Visual outcome on the first postoperative day

Variables	Phacoemulsification (Group A) n=339		SICS (Group B) n=394		P value
	Frequency	Percent	Frequency	Percent	
6/12	40	10.2	66	19.5	
6/18	57	14.5	10	2.9	
6/24	11	2.8	107	31.6	
6/36	265	67.3	131	38.6	
6/9	21	5.3	25	7.4	

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Total	394	100.0	339	100.0	0.0655

DISCUSSION

Only immature cataracts were included in this study, so the outcomes cannot be generalized for all types of cataract. Operated patients were advised to apply antibiotic and steroid containing (Ciprofloxacin and Dexamethasone) eye drops regularly on a tapering regime for six weeks. It is a common tendency that though we advise our patients to review after six weeks, almost all patients who have good vision do not come for follow-up. Due to this, long-term follow-up outcome could not be evaluated in this study. SICS could be performed on all randomly selected cases for SICS. After the phacoemulsification procedure a 5 mm optic PMMA lens was implanted and after the fishhook SICS surgery a 6 mm optic PMMA lens was implanted. Usually in SICS surgery, the internal opening of the sclero-corneal wound is larger than the outer opening, but as all the surgeries were performed on immature cataract, nucleus could be removed through the 6 mm internal opening. So, the size of internal and external openings for SICS was the same in this study. On the first post-operative day, 25% patients in had a good visual outcome. Mean visual outcome and mean induced both groups had poor outcome. keratometric astigmatism were comparable in both groups on the first post-operative day. A frown shaped temporal incision of 1mm size difference with phacoemulsification (5mm incision) and with SICS (6 mm incision) techniques resulted in almost similar visual outcome with equal amount of postoperative astigmatism. Mean surgery time was 10 minutes in group A and 7 minutes and 20 seconds in group B. Mean surgery time of more than 6 minutes was observed in 85% of patients in group A and 11 % of patients in group B (P value <0.00004). Shorter into nucleus extraction time compared to phacoemulsification of nucleus, faster epinucleus removal and faster cortex aspiration by simcoe cannula compared to irrigation and aspiration cannula resulted in faster surgery by the SICS method.

Though the cost difference between the phacoemulsification and SICS with rigid lens is very low [7] in high volume set up, consumable cost of phacoemulsification surgery with a rigid PMMA lens is higher due to increased use of visco elastics and irrigating solution.

Phacoemulsification has a long learning curve, requires expensive equipment's, has a high consumable cost, and needs expensive foldable lenses to maximize the benefit associated with the small incision. [8] Despite these facts, there is a growing demand for phacoemulsification surgery in the developing world and many patients are willing to pay more for it. [9] 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. The cost of phacoemulsification is higher than the SICS. The cost associated with phacoemulsification hand pieces, phacoemulsification tips, sleeves, irrigation, and aspiration cannulas are high and increase the fixed cost and consumable cost associated with phacoemulsification. Reusable tubings, cassettes, phacoemulsification tips and hand pieces can help to lower the cost of phacoemulsification surgery. There are certain guidelines given by the company about the maximum number of autoclaving cycles for the tubings, tips and hand pieces. Often these accessories are autoclaved and reused many more times than recommended. [9] Only in a very few ophthalmic theatres in developing countries do they change phacoemulsification hand pieces, phacoemulsification tips, sleeves and tubings for each surgery. [8] Various practices like changing only the tips and sleeves between surgery and dipping phacoemulsification tips and cannulas in antiseptic solution after each surgery are common practices in developing countries to cut down the cost. But none of the above-mentioned procedures meet the recommended sterilization standards and therefore, should be avoided. [8] Easily available, inexpensive surgical instruments allow surgeons to follow standard recommended procedures of sterilization for SICS whereas the same is not true for phacoemulsification.

This study clearly shows that there is no additional visual and surgical benefit on the first postoperative day with phacoemulsification technique with rigid IOLs as compared to SICS with rigid IOLs.

CONCLUSION

There is no significant difference in visual outcome on the first postoperative day between phacoemulsification and SICS techniques. Performing SICS is significantly cheaper and faster. SICS with implantation of rigid PMMA lens is a suitable alternative option for the treatment of immature senile cataracts.

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