

Cataract Surgery by small incision a better alternative to phacoemulsification- A comparative study

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Abstract

Introduction: The World Health Report estimated that there were 19.34 million people who are bilaterally blind from age-related cataract. The number of blind people in the world and the proportion due to cataract is increasing due to: population growth will increase to around 800 million in 2020 improve, the degree of visual loss. Our study was to evaluate SICS as a substitute to Phacoemulsification by comparing clinical parameters, astigmatism, visual acuity and post-operative complications.

Materials and Methods: This is a prospective study of 30 patients, assigned for cataract surgery by small incision (15 cases) and Phacoemulsification (15cases).Patients were selected evaluated and IOL power calculation was done by using SRK II formula. 30 subjects were chosen who were above age of 50yrs.

Results: Mean Pre-operative Astigmatism in both SICS group and Phacoemulsification group is 0.68D, and Mean Post-operative Astigmatism SICS group and Phacoemulsification group is 1.68D and 1.65D respectively. In both cataract surgery by small incision and Phacoemulsification statistically significant post-operative shift to ATR Astigmatism was 86.70% and 76.70%. At 6 weeks follow up, >90.00% patients in the Phacoemulsification group as well in the SICS group had BCVA of better than or equal to 6/18. The post-operative complications are and corneal oedema, Striate Keratopathy and Post operative anterior Uveitis in both SICS and Phacoemulsification groups respectively.

Conclusion: Cataract surgery by small incision wound healing is fast, postoperative complications are few and less frequent follow-ups and minimal damage to coreneal endothelium. So MSICS has an edge over phacoemulsification, because off its low cost and least learning curve.

Introduction

In India blindness due to cataract is a big problem. According to WHO cataract is responsible for 51% of world blindness, which represents about 20 million people (2010). Although cataracts can be surgically removed, in many countries barriers exist that prevent patients to access surgery. Cataract remains the leading cause of blindness.

The World Health Report published in 1998 estimated that there were 19.34 million people who are bilaterally blind from age-related cataract. This represented 43% of all blindness. The number of blind people in the world and the proportion due to cataract is increasing due to: population growth will increase to around 800 million in 2020.¹ A study estimated 3.8 million persons become blind from cataract each year in India (approximate 95% confidence limits: 3 to 4.5 million). The reasons why the estimates are considered as minima, and their implications concerning future national planning of ophthalmic service²

The Government of India has now laid down a target for reduction in the prevalence of blindness to 0.8% by the end of the Tenth Five-Year Plan and to 0.5% by 2010.³

Cataract surgery is the most common procedure and is also cost-effective. This year, more than 20 million will be performed worldwide, according to estimates. In spite of these impressive statistics, the number of patients visually handicapped by cataract globally increases every year³ Extra capsular Phacoemulsification is a mechanically assisted extra capsular technique of cataract extraction surgery. Work pressure on ophthalmologists was is more due to surgical volume⁴ However, the Small Incision Cataract Surgery is the surgery of choice. The advantages of SICS as a low-cost technique makes it an alternative, especially in a developing country like India without compromising quality of medical care. This study was taked to compare parameters like astigmatism, visual acuity and post-operative complications in both the groups.

Materials and Methods

This study of comprising of 30 patients, out of which 15 patients undergone cataract surgery small incision and 15 patients phacoemulsification. The study was conducted at Chamarajanagara Medical College, Chmarajanagara,

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Karnataka. Patients were selected evaluated with detailed history and clinical examination IOL power calculation was done by using SRK II formula. 30 subjects were chosen above age of 50yrs. People with cataract and less than 50 years along with patients with traumatic and congenital cataract were excluded from the study

Procedure

Pupil was dilated with short acting mydriatic cycloplegic and topical NSAID drops were instilled to maintain the mydriasis and antibiotic drops were instilled one day prior to surgery. With aseptic precautions, after cleaning was done. Scleral incision was made. Scleral tunnel incision was made with crescent blade. CCC was made hydro procedures were carried out and nucleus delivered with sandwich method. Cortical wash done and rigid IOL was inserted into the bag and AC reformation was done. Sub conjunctival injection of steroid and antibiotic was given. Follow up was done at first day, 1 week, 2 weeks, and 6 weeks. Topical steroid antibiotic combination was tapered over a period of 6 weeks.

Procedure for Phacoemulsification: 15 cases were selected pre operative work up done initial surgical were same as in MSICS. Tunnelling was done with 2.6mm crescent Anterior chamber entry was done with keratome blade 6mm CCC carried out. Hydroprocedures the phaco parameters were like this:

Table

Phaco	Power	Vacuum (mm of Hg)	Flow rate
Trenching	60	100	10- 20
Quadrant emulsification	40	350-400	28 – 36

Cortical wash done rigid IOL was inserted into the bag. Subconjunctival injection of steroid and antibiotic was given. Post op follow-up was similar to MSICS

Results

A total of 30 cases of cataract that underwent surgery were studied. 15 cases underwent SICS and another 15 cases underwent Phacoemulsification. The simple subtraction method is used to calculate in where the axis not taken into consideration

Among 30 patients 7 were male and 8 were female who undergone cataract surgery with small incision. In group 6 males and 9 females undergone phacoemulsification. Among them 12 were aged between 51-70 years, 2 patients were aged between 71-80 years, and 1 was aged between 81-90 years belongs to SICS group. Among 15 patients in 15 were aged between 51-70 years, and none above 70 years belongs Phacoemulsification group.

Table 1 shows among 15 patients 3(20.00%) patients had Posterior Sub capsular Cataract and they treated with cataract surgery with small incision and 3(16.67%) treated with Phacoemulsification. 8 patients (56.67%) in cataract surgery with small incision group and 9 patients (63.33%) in Phacoemulsification group had Nuclear Sclerosis 2+ Posterior Sub capsular Cataract (PSC), NC3+PSC type of cataract respectively.

Table 1: Comparison of SICS and Phacoemulsification groups with type of cataract

Type of cataract	SICS	%	Phacoemulsification	%	Total
PSC	3	20.00	2	16.67	5
NC1	1	3.33	1	3.33	2
NC2	2	13.33	1	10.00	3
NC2+PSC	2	16.67	6	40.00	8
NC3+PSC	6	40.00	3	23.33	9
NC4+PSC	1	6.67	2	13.33	3
Total	15	100.00	15	100.00	30

Chi-square = 4.43 P = 0.48

Table 2 shows SIA in cataract surgery with small incision group, 2 patients (13.33%) had 0.5D of Astigmatism, 6 patients (36.67%) had 0.75D–1.00 D 3 patients (23.33%) had 1.25D-1.50D of Astigmatism and in 4 patients astigmatism was 1.75 Diopters–2.00 Diopters. None of the patients had more than 2.00D of Astigmatism.

SIA in Phacoemulsification group 3 patients (16.67%) patients had 0.5D of Astigmatism (86.67%), 5 patients (30.00%) had 0.75D -1.00 D (13.33%, 6 patients (40.00%) had 1.25D-1.50D of Astigmatism, and 2 patients (13.33%) had 1.75D-2.00D of astigmatism respectively.

Mean of surgery induced astigmatism was 1.17 diopters in cataract surgery with small incision group and 1.10 diopters phacoemulsification group.

Table 2: Comparison of surgery induced astigmatism in cataract surgery with small incision and phacoemulsification groups

SIA	SICS	%	Phacoemulsification	%	Total
0 – 0.5D	2	13.33	2	16.67	4
0.75-1.0D	6	36.67	5	30.00	11
1.25-1.5D	3	23.33	6	40.00	9
1.75-2.0D	4	26.67	2	13.33	6
2.25-2.5D	0	0.00	0	0.00	0
>2.5D	0	0.00	0	0.00	0
Total	15	100.00	15	100.00	30
Chi-square= 2.96 P = 0.39					

Table 3 pre-operative BCVA in SICS group, 6 patients (40.00%) had 6/60 vision, 6 patients (40.00%) had vision of CF-1M, 3 patients had CF-2M(10.00%), 2 patients had CF-3M (6.67%) and 1 patient (3.33%) had HM vision respectively.

Whereas pre-operative BCVA in Phacoemulsification group, 3 patients (23.33%) had 6/60 vision, 3 patients (23.33%) had vision of CF-1M, 4 patients had CF-2M (26.67%), 2 patients had CF-3M(13.33%) and 1 patient(10.00%) had HM vision.

Table 3: Vision in SICS and phacoemulsification groups

Pre-operative vision	SICS	%	Phacoemulsification	%	Total
6/36.	0	0.00	1	3.33	1
6-60.	6	40.00	2	23.33	8
CF1M	6	40.00	2	23.33	8
CF2M	3	10.00	4	26.67	07
CF3M	1	9.99	3	13.33	4
HM	0	0.00	2	10.00	2
Total	15	100.00	15	100.00	30
Chi-square=6.93 P = 0.07					

Table 4 shows 1st week postoperative vision in SICS group showed that 4 patients(13.33%), 1 patient had Best C corrected Visual Acuity of 6/36, 7 patients (23.33%) and 4 patients (13.33%) had 6/24, 14 patients (46.67%) and 9(30.00%) patients had 6/18, 4 patients (13.33%) and 13 patients (43.33%) had 6/12, 3 patients in Phacoemulsification group, 1 patient had CF-1M vision due to intra-op complication in SICS group

Table 4: Comparison of 1st week post-operative vision in SICS and phacoemulsification groups

1 week vision	SICS	%	Phacoemulsification	%	Total
6/36.	2	13.33	1	3.33	3
6/24.	3	23.33	2	13.33	5
6/18.	7	46.67	4	30.00	11
6/12.	2	13.33	6	43.33	8
6/9.	0	0.00	2	10.00	2
CF1M	1	3.33	0	0.00	1
Total	15	100.00	15	100.00	30
Chi-square=9.09 P = 0.01*					

*p<0.05

Table 5 In this at 6 weeks post-operative BCVA showed 6/12 vision in 12 patients (40.00%), and 4 patients (13.33%), 6/9 vision in 17 patients and 24 patients, in cataract surgery with small incision and phacoemulsification groups. 1 patient in SICS group had CF-1M vision due to posterior capsular rent as an intra-operative complication. 2 patients (6.67%) in phacoemulsification group had 6/6 vision.

Table 5: 6th week post operative vision in cataract surgery with small incision and phacoemulsification groups

6 week vision	SICS	%	Phacoemulsification	%	Total
6/36.	0	0.00	0	0.00	0
6/24.	0	0.00	0	0.00	0
6/18.	0	0.00	0	0.00	0
6/12.	6	40.00	2	13.33	8

6/9.	8	56.67	12	80.00	20
6/6.	0	0.00	1	6.67	1
CF1M	1	3.33	0	0.00	1
Total	15	100.00	15	100.00	30
Chi-square=5.53 P = 0.06					

Table 6 shows in this study, 3 patients(10.00%) and 5 patients (16.67%) had CE, 2 patient (6.67%) and patients (6.67%) had SK, 4 patients (13.33%) and 4 patients (13.33%) 2 patients (6.67%) had POAU as post- operative complication seen in cataract surgery with small incision and phacoemulsification groups respectively. 1 patient had Persistent corneal edema as Late Post-operative complication.

Table 6: Comparison of SICS and Phacoemulsification groups with early post-operative complications

Early post -operative complications	SICS	%	Phacoemulsification	%	Total
Corneal Edema	3	10.00	5	16.67	8
Strait Keratopathy	2	6.67	2	6.67	4
Post operative anterior Uveitis	4	13.33	2	6.67	6
Chi-square = 1.16 P = 0.55					

Discussion

In old age people cataract is avoidable blindness worldwide and cataract blindness is thought to be increasing by 2 million per year. With the introduction of the intraocular lens and consequent improvement in prediction of IOL power, the spherical component of patients refractive error has become reasonably predictable.

Manual SICS has evolved as an effective alternative to phacoemulsification in present times. Both phacoemulsification and manual small incision cataract surgery (SICS) achieve excellent visual outcomes with low complication rates, but SICS is less expensive and requires less technology; hence, preferred by many surgeons in the developing countries.

Results of our study are consistent with previous reports that MSICS and Phacoemulsification

Our study is in correlation with the study. The manual SICS group with Superior straight incision showed Against the-the-rule shift in astigmatism with mean post-operative Astigmatism of 1.68 D. Phacoemulsification scleral pocket also showed. Against the-the-rule shift in astigmatism with mean post-operative Astigmatism of 1.65 D. of astigmatism respectively.

Pallvi P⁶ Mean surgically induced astigmatism 1.08 (± 0.52) D 45th postoperative days. The change from 1st to 45th day was not significant. 0.91 (± 0.47) D on 45th postoperative days, we found significant with the rule and against the rule type of astigmatism post-operatively phacoemulsification group and in superior scleral incision in small incision cataract surgery group respectively. In our study Mean surgically induced astigmatism in Small Incision Cataract Surgery group and Phacoemulsification group is 1.17D and 1.10D respectively.

George et al⁷ compared Surgically Induced Astigmatism (SIA) following MSICS and phacoemulsification (PE) in 186 eyes with nuclear sclerosis of grade 3 or less.

In our study Mean Surgically induced astigmatism was 1.17D and 1.10D in Phacoemulsification group respectively

at the end 6 weeks. SIA in SICS group, 2 patients (13.33%)

had 0.5D of Astigmatism, 11 patients (36.67%) had 0.75D – 1.00 D, 3 patients (23.33%) had 1.25D-1.50D of Astigmatism and 4 patients (26.67%) had 1.75D–2.00D of astigmatism respectively. None of the patients had more than 2.00D of Astigmatism. SIA in Phacoemulsification group 5 patients (16.67%) patients had 0.5D of Astigmatism (86.67%), 9 patients (30.00%) had 0.75D-1.00 D (13.33%), 12 patients (40.00%) had 1.25D-1.50D of Astigmatism, and 4 patients (13.33%) had 1.75D–2.00D of astigmatism respectively. Mean Surgically induced astigmatism was 1.17D and 1.10D in Phacoemulsification group.

In our study, 3 patients (10.00%) and 5 patients (16.67%) had Cornea oedema, 2 patient (6.67%) and patients (6.67%) had Straite Keratopathy, 4 patients (13.33%) and 4 patients (13.33%) 1 patient had Persistent corneal edema as Late Post-operative complication.

In a study conducted by Rohit Khanna et al⁸ surgery by resident surgeons Out of which 522 (50.7%) were done using MSICS technique and 507 (49.2%) were done by phacoemulsification. Those in the MSICS group were significantly older (age >70 years; 5.7% vs 3.4%; $p < 0.001$) and had worse preoperative visual acuity (visual acuity <6/60; 69.3% vs 40.4%; $p < 0.001$). Postoperatively, the number of patients having BCVA $\geq 6/12$ was similar in both the groups (84.3% vs 88%; $p = 0.09$). The complication rates were higher in MSICS group (15.1% vs 7.1%, $p < 0.001$).

In our study 56.6% done by cataract surgery with small incision and 83% were done by phacoemulsification. Patients who undergone SICS had better or equal to 6/18 visual acuity at 1 week. After 6 weeks more than 90% of the patients had best C corrected Visual Acuity of 6/36 in both phacoemulsification and cataract surgery with small incision groups which is of better than 6/18.

Jongsareejit A⁹ et al showed that the average total cost was 10,043.81 bath/case for MSICS and 11,590.72 bath/case for PE. After 90 days after surgery, the average VA of MSICS and PE groups were 0.83 +/- 0.225 (0.10-

1.00) and 0.76 +/- 0.268 (0.06-1.00). There was no statistically significant difference in both groups. The effectiveness of MSICS and PE methods was not significantly different, but PE method had higher costs. Therefore, SICS has better cost-effectiveness than PE thus, SICS should be a preferred cataract surgery method to PE method, based on the hospital's perspective.

In our study advantages of cataract surgery with small incision is a low-cost technique and reaches every individual and medical costs will come down in India.

Conclusion

The cataract surgery with small incision wound healing is fast postoperative complications are few and less frequent follow-ups and minimal damage to corneal endothelium. So MSICS has an edge over phacoemulsification, because of its low cost and least learning curve.

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Conflict of Interest: None.

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