

## Research Article

# Comparison of small incision cataract surgery with conventional extra capsular cataract surgery: an evaluation from resource poor setting in India

Rubii Malhotra\*, Pragati Garg, Luxmi Singh, Simmi Chawla

Department of Ophthalmology, Era's Lucknow Medical College, Lucknow, U.P., India

**Received:** 25 April 2014

**Accepted:** 8 May 2014

**\*Correspondence:**

Dr. Rubii Malhotra,

E-mail: docrubie@hotmail.com

© 2014 Malhotra R et al. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

### ABSTRACT

**Background:** Cataract is the chief cause of avoidable blindness in the developing countries of the world including India. These patients can regain normal sight with the help of cataract surgery, which has undergone many advances and Small Incision Cataract Surgery (SICS) has gained wide acceptance world over as the surgical method requires minimal infrastructure. The present study compares its safety profile for the patients as well as acceptability amongst the doctors performing conventional Extra Capsular Cataract Extraction (ECCE) surgery in peripheral resource poor settings.

**Methods:** All patients having cataract were examined prior to surgery and were randomized in two groups: group I - small incision cataract surgery and group II - conventional extra capsular cataract extraction surgery with posterior capsular intra ocular lens implantation. The various intra and post-operative complications were evaluated.

**Results:** 252 eyes of 252 patients were enrolled with 121 patients in group I and 131 patients in group II and intra-operative and post-operative complications compared. Intra-operatively difficulty in nucleus delivery was higher in group I (12.3%) whereas repeated iris protrusion (12.5%) and posterior capsular rent (8.3%) was higher in group II. Postoperatively, on day 1 striate keratopathy was commoner in group I (20.6%) whereas uveitis was seen more commonly (26.7%) in group II. At 6 weeks, surgically induced astigmatism was higher (61%) in group II as compared to group I (35%).

**Conclusion:** SICS is a safe and acceptable alternative to conventional ECCE in a peripheral teaching setup.

**Keywords:** Cataract, Complication, Intraoperative, Post-operative, Small incision

### INTRODUCTION

Cataract is the chief cause of avoidable blindness in India and throughout the world.<sup>1</sup> There are an estimated 9-12 million blind in India, half of which can be attributed to cataract.<sup>2</sup> It is estimated that another three million develop visually disabling cataracts each year.<sup>3</sup> Surgery for cataract has undergone many advances, all for the benefit of patients by way of giving least surgically induced astigmatism and early rehabilitation. Small Incision Cataract Surgery (SICS) has gained wide

acceptance world over as one of the latest surgical methods, being beneficial in terms of low cost, flat learning curve, minimal post-operative astigmatism and early rehabilitation. Above all it is easily adaptable by most of the Extra Capsular Cataract Extraction (ECCE) surgeons at their existing set up.

As any surgery can be associated with some complications, the same is true with SICS as well and the present study is a comparative evaluation of various complications (intraoperative and postoperative) of the

two procedures as well as an assessment of the safety profile of both.

**METHODS**

The study was a prospective randomized single center comparative interventional study, conducted in the eye department of Era’s Lucknow medical college in semi urban part of northern India, over a period of two years between August 2010 to July 2012. All 368 patients irrespective of their age, sex, religion or nuclear sclerosis grade, who attended the outpatient department of our hospital, were told about the study protocol in detail and informed consent was taken. There were 35 patients who did not give consent, 4 of these patients refused and opted for phacoemulsification. After a written informed consent, patients were evaluated pre-operatively for the suitability of the surgery. The preoperative evaluation included detailed history and examination- involving visual acuity, slit lamp examination, applanation tonometry, indirect ophthalmoscopy and intraocular lens (IOL) power calculation using SRK 2 formula. Patients having any ocular co-morbidity capable of compromising vision; those needing combined surgical procedures or with the axial length of the eyeball more than 26 mm; were not included in the study. In all there were 81 patients who had ocular morbidity and were excluded from the study (Table 1).

**Table 1: Reasons for exclusion from the study.**

	Number
<b>Ocular morbidity</b>	
Corneal opacity	14
Pterygium with opacity	10
Glaucoma	14
Uveitis	05
Complicated cataract	03
Traumatic cataract	15
High myopia	04
Optic atrophy	03
Squint	03
ARMD	10
<b>Total</b>	<b>81</b>
<b>Refusal</b>	
Not willing to participate	31
Wanted phacoemulsification	04
<b>Total</b>	<b>35</b>

After pre-surgical evaluation all patients were randomized into two groups. Allocation of treatment groups was done strictly according to the computer generated randomization table. Group I included patients who underwent Small incision cataract surgery and group II included patients with conventional extra capsular cataract extraction surgery. In the SICS (group I), there were 121 patients and in ECCE (group II), 131 patients. In both techniques a 3 piece rigid PMMA Posterior Chamber Intraocular Lens (PCIOL) was implanted.

**Surgical technique**

In SICS, a 5.5-6.5 mm. frown shaped incision was made 2.0-2.5 mm posterior to the superior limbus at the margin, followed by a perpendicular groove half the depth of scleral thickness. Entry into Anterior chamber was made with 3.2 mm keratome, envelope/canopener capsulotomy was done and internal incision extended (approximately 25% larger than external incision), followed by hydro dissection and rotation of nucleus. Nucleus delivery was done by irrigating wire vectis. Remaining cortical matter was aspirated by manual irrigation-aspiration technique and then rigid 3 piece IOL was implanted.

In conventional ECCE, 9-10 mm incision was given at limbus and envelope/canopener capsulotomy done followed by nucleus delivery by pressure and counter pressure method; rigid IOL was implanted following cortical cleaning, and wound closed by 10-0 interrupted sutures with knots buried at the corneal end. All the cases included for study were operated by a single competent surgeon to avoid the surgeon related confounding factors.

All patients were assessed intraoperatively, immediate post operatively (day 1), at 1 week and 6 weeks post operatively. The various intra and post-operative complications assessed were wound leak, striate keratopathy, descemet’s membrane detachment, iridodialysis, zonular dehiscence, posterior capsular rent, corneal endothelial decompensation and post-operative uveitis. Postoperative visual outcome, ocular discomfort and induced postoperative astigmatism too were studied and evaluated.

**Statistical analysis**

SPSS version 15 was used for statistical analysis and P value <0.05 was considered statistically significant.

**RESULTS**

252 eyes of as many patients who underwent surgery were analysed in our study. In Group I (SICS) there were 121 patients and in Group II (ECCE) 131 patients with females being more in both the groups, 55% and 60% in group I and II respectively. The mean age of patients operated in both the group was 55 ± 10 years. The intra operative and immediate post-operative complications are as given in table 2 and 3 respectively. In intraoperative complications the difficulty in nucleus delivery was higher in group I (12.3%) which was statistically significant (P <0.005) as compared to group II whereas repeated iris protrusion was recorded higher (12.5%) in group II. The posterior capsular rent in group I occurred in less than half the number of patients as compared to group II i.e. 3.3% vs. 8.3%. There were marginal differences in rest of the intraoperative complications as shown in Table 2.

**Table 2: Intra operative complications.**

Intraoperative complications	SICS (Group I) (n=121)	ECCE (Group II) (n=131)	P value
Difficulty in nucleus delivery	15 (12.3%)	4 (3.0%)	0.005
Posterior capsular rupture	4 (3.3%)	10 (8.3%)	0.126
Hyphaema	4 (3.3%)	3 (2.3%)	0.626
Corneal (Generalized) haze	3 (2.4%)	1 (0.7%)	0.285
Superior iridodialysis	2 (1.6%)	1 (0.7%)	0.521
Zonular dehiscence	1 (0.8%)	4 (3.0%)	0.194
Repeated iris protrusion	1 (0.8%)	16 (12.5%)	0.0001
Descemet membrane detachment	2 (1.6%)	1(0.7%)	0.521

P value <0.05: Statistically significant

On the 1<sup>st</sup> post-operative day striate keratopathy was the commonest complication observed in group I, 20.6% as compared to 12.2% in group II whereas uveitis was the commonest complication seen in 26.7% in group II as compared to 16.6% in group I (Table 3).

**Table 3: Postoperative complication as on 1<sup>st</sup> postoperative day.**

Complications	SICS (Group I) (n=121)	ECCE (Group II) (n=131)	P value
Striate keratopathy	25 (20.6%)	16 (12.2%)	0.07
Corneal edema	4 (3.3%)	01 (0.7%)	0.157
Wound leak	0 (-)	04 (3.0%)	0.042
Uveitis	20 (16.6%)	35 (26.7%)	0.047
Raised IOP	2 (1.6%)	06 (4.5%)	0.176
Decreased IOP	10 (8.2%)	3 (2.2%)	0.034

P value <0.05: Statistically significant

At the end of 1<sup>st</sup> week, all the immediate post-operative corneal complications resolved completely leaving the cornea clear in the two groups. Persistent anterior uveitis was seen in 19.04% (25 eyes) of eyes in group II as compared to 6.61% (8 eyes) of eyes in group I and this difference was statistically significant (P <0.02). In more patients of group II the postoperative ocular discomfort persisted for longer period, i.e., till 6<sup>th</sup> postoperative week; 45.8% as compared to 8.3% in group I and this again was statistically significant (P <0.0001). Surgically induced astigmatism, an important determining factor for final visual outcome, was significantly higher, 61% in group II as against 34.7% in group I (P <0.0001). The unaided final visual acuity was better in group I than in group II with 29.7% having VA of <6/18 in group I as compared to 67.2% in group II and this difference was statistically significant (Table 4).

**Table 4: Postoperative complications after six weeks.**

Complications	SICS (Group I) (n=121)	ECCE (Group II) (n=131)	P value
Wound leak	NIL	1 (0.7%)	0.315
Persistent ocular discomfort (watering, grittiness)	10 (8.3%)	60 (45.8%)	<0.0001
Uveitis	NIL	5 (3.8%)	0.023
Unaided visual acuity <6/18	36 (29.7%)	88 (67.2%)	<0.0001
Astigmatism >1.5 D	42 (34.7%)	80 (61.1%)	<0.0001

P value <0.05: Statistically significant

## DISCUSSION

Surgery related complications and perioperative difficulties in both, SICS and ECCE, groups occur either singularly or in combination. Intra-operative repeated iris protrusion was exclusively seen in group II because of large non sealing limbal incision. None of the patients had iris prolapsed following the surgery. Descemet's membrane detachment was seen in 2 cases of group I and 1 case of group II which may be because of more anteriorly placed entry into the anterior chamber in group I especially so if the direction of entry is not proper or blunt instruments are used. Descemet's membrane detachment can result in postoperative corneal oedema as proposed by Mackool et al.<sup>6</sup> and the corneal haze, seen in 1.6% cases of group I in our study could be attributed to it, which with proper repositioning of Descemet's membrane perioperatively passed off completely with passage of time.

Regarding the incidence of posterior capsular rent intra-operatively SICS had an added advantage with minimal chances of posterior capsular rent; possibly because of the self-sealing surgical wound and the surgery being performed in a closed chamber, providing enough space for maintenance of chamber for manipulation while doing irrigation aspiration procedure. Our study showed similar results as found by Parikshit<sup>4</sup> and Blumenthal,<sup>5</sup> in their study. This also provides the reason for minimal chances of vitreous loss even if posterior capsular rent occurs. Superior iridodialysis met in 2 cases of group I was due to iris capture in irrigating vectis where pupillary dilatation was inadequate and it is very much avoidable by maintaining adequate mydriasis during surgery.

Wound sealing in small incision cataract surgery is very stable and there are minimal chances of wound leak in it because of valvular flap effect between two lips of the scleral wound. In the present study wound leak was observed in three cases of group II because of possible inadvertent defective wound suturing but was absent in group I. Striate keratopathy was more common in group I but it was self-limiting and cleared off within a week's time which may be attributed to probable corneal rubbing

during nucleus delivery as supported by Gogate<sup>4</sup> in his study. The endothelial cell loss is reported to be almost equal in the two groups which is comparable to study done by Gogate et al.<sup>7</sup> Therefore the short-lived corneal edema met in group I can not be attributed solely to more endothelial cell loss.

The pattern of IOP variations in the immediate postoperative period i.e. rise of IOP in eyes with sutures (group II) and drop of IOP in SICS; in present study is akin to findings reported by Das et al.<sup>8</sup> In contrast to other studies conducted by Ruite et al,<sup>9</sup> and Gogate et al;<sup>10</sup> in our study we had more cases of post-operative uveitis on day 1 in group II (26.7%) as compared to group I (16.7%) which can be explained by more number of cases with intraoperative iris prolapse in group II. Persistent ocular discomfort for longer duration was present in group II (45.8% cases), due to longer incision size and presence of sutures which can be an impediment in early rehabilitation. Minassian et al.,<sup>11</sup> Ruit et al.<sup>12</sup> and Venkatesh et al.<sup>13</sup> in their studies concluded that SICS gives lesser postoperative astigmatism and better final uncorrected visual acuity in greater proportion of patients which is supported by in our study as well. Gogate et al.<sup>14</sup> in their study stated that the average cost of both the surgeries is almost the same, which is supported by our study.

Thus the foregoing study suggests that, in wake of added advantage of lesser intraoperative and postoperative complications, early rehabilitation and cost effectiveness, SICS is a better and safer alternative to ECCE and very much acceptable as an alternative where phacoemulsification setups are either not available or possible. Surgeons doing ECCE can very well adapt to this procedure as this has comparatively flatter learning curve and also not dependent on machines which are difficult to arrange in peripheral areas of resource poor countries.

## ACKNOWLEDGEMENTS

Sincerely thankful to the principal; research cell of the institute and Mr Zeeshan for the statistical analysis.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the institutional ethics committee*

## REFERENCES

1. Thylefors B, Negrel AD, Pararajasegaram R, et al. Global data on blindness. *Bull World Health Organ*. 1996;74:319-24.

2. Dandona L, Dandona R, Naduvilath T, et al. Is current eye care policy focus almost exclusively on cataract adequate to deal in India? *Lancet*. 1998;351:1312-6.
3. Minnassian DC, Mehra V. 3.8 million blinded by cataract each year; projections from the first epidemiological study of incidence of cataract blindness in India. *Br J Ophthalmol*. 1990;74:341-3.
4. Gogate PM. Small incision cataract surgery: complications and mini review. *Indian J Ophthalmol*. 2009;57:45-9.
5. Blumenthal N. Small incision method of extra capsular cataract extraction using selective hydrodissection. *Ophthalm Surg*. 1992;23(10):699-701.
6. Mackool RJ, Holtz SJ. Descemet's membrane detachment. *Arch Ophthalmol*. 1977;94:459-63.
7. Gogate PM, Deshpande M, Wormald RP, et al. ECCE compared with manual SICS in community Eye care setting in western India. A randomized control trial. *Br J Ophthalmol*. 2003;87:667-72.
8. Das H, Das BP, Panda A. Pattern of intra ocular pressure changes following manual small incision cataract surgery. *Kathmandu Univ Med J (KUMJ)*. 2005 Oct-Dec;3(12):340-4.
9. Ruite S, Tabin GC, Nissman, et al. Low cost, high volume ECCE with PC IOL implantation. *Ophthalmol*. 1999;106:1887-992.
10. Gogate PM, Deshpande M, Wormald RP, et al. Extra capsular cataract surgery compared with Manual small incision cataract surgery in community eye care setting in Western India: a randomized controlled trial. *Br J Ophthalmol*. 2003;87:667-72.
11. Minassian DC, Rosen P, Dart JKG, et al. Extracapsular cataract extraction compared with small incision surgery by phacoemulsification: a randomized trial. *Br J Ophthalmol*. 2001;85:822-9.
12. Ruit S, Tabin G, Chang D, et al. A prospective randomized clinical trial of phacoemulsification vs. manual sutureless small incision extra capsular cataract surgery in Nepal. *Am J Ophthalmol*. 2007;143:32-8.
13. Venkatesh R, Das M, Prasanth S, et al. Manual small incision cataract surgery in eyes with white cataracts. *Indian J Ophthalmol*. 2005;53:173-6.
14. Gogate PM, Deshpande, Wormald RP. Is manual small incision cataract surgery affordable in the developing countries? A cost comparison with extra capsular cataract extraction. *Br J Ophthalmol*. 2003;87:843-6.

DOI: 10.5455/2349-3259.ijct20140503

**Cite this article as:** Malhotra R, Garg P, Singh L, Chawla S. Comparison of small incision cataract surgery with conventional extra capsular cataract surgery: an evaluation from resource poor setting in India. *Int J Clin Trials* 2014;1:10-3.