

Original Research Article

Comparative study between conventional extra capsular cataract extraction versus manual small incision cataract surgery

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ABSTRACT

Background: Recent reports indicate that both manual small incision cataract surgery and extra capsular cataract excision surgery with posterior chamber intraocular lens implantation are safe and effective for treatment of cataract surgery, however, manual small incision cataract surgery gives better uncorrected vision. Objectives of the study were to compare intraoperative and postoperative complications, to compare induced astigmatism and to compare the visual rehabilitation.

Methods: This is a prospective study of 100 consecutive patients assigned to undergo conventional extra capsular cataract excision surgery (50 cases) and manual small incision cataract surgery (50 cases). Study was done for a period of two years at a tertiary care referral hospital. Institutional Ethics Committee permission was taken. Also the informed consent was obtained from each patient.

Results: In conventional ECCE, the most common surgically induced astigmatism was WTR in 73.4% of cases with mean of 2.79 D \pm 1.3 on first day. 70% of cases with mean 2.1 D \pm 1.28 and 64% of cases with mean of 1.86 D \pm 1.14 at six weeks. ATR was common in MSICS group, 83.67% of cases with mean of 1.5 D \pm 0.72 on first day, 86% of cases with mean of 1.03 D \pm 0.6 at one week and 88% of cases with mean of 1.27 D \pm 0.81 at six weeks. The induced astigmatism was less in MSICS group compared to ECCE group at first day but after six weeks there was no much significant difference found. Early visual recovery was better in MSICS group

Conclusions: MSICS has definitive advantages over conventional ECCE in terms of early visual rehabilitation, minimal surgically induced astigmatism; no suture related complications and reduced surgical time.

Keywords: Astigmatism, Complications, Visual acuity

INTRODUCTION

In India, there are 12.5 million blind and it is estimated that 50% to 80% of them are blind due to cataract.^{1,2} In addition to backlog, an additional 3.8 million become blind each year due to cataract against 2.7 million cataract surgeries done every year.³

Conventionally, in the last 25-30 years extra capsular cataract extraction with posterior chamber intraocular lens implantation was considered an effective means of

restoring visual function and improving vision related quality of life in developing countries. However, it has its own problems related to wound suturing with its associated complications and late visual rehabilitation.⁴ However there are concern that the method used to remove the nucleus in manual small incision cataract surgery may be more traumatic to corneal endothelium than conventional extra capsular cataract excision surgery.⁵ Recent reports indicate that both manual small incision cataract surgery and extra capsular cataract excision surgery with posterior chamber intraocular lens

implantation are safe and effective for treatment of cataract surgery, however, manual small incision cataract surgery gives better uncorrected vision.⁶ But conventional ECCE main advantage is that in some cases it can provide a greater margin of safety, in cases in which nuclear cataract, the pupil dilates poorly, posterior synechiae are present or zonular integrity is in question. Some surgeons have a greater margin of safety with the extra capsular procedure.⁷

In this context, manual small incision cataract surgery is gaining popularity in developing countries as an inexpensive alternative to phacoemulsification.⁸ In spite of the fact that manual small incision cataract surgery can be cost effective procedure, more research on the outcomes of manual small incision cataract surgery is warranted.⁹

With the existing facilities in our country extra capsular cataract excision surgery / intraocular lens implantation and manual phaco seems to be the most commonly preferable techniques. So, the present study has been taken up comparing the advantages / disadvantages of standard conventional extra capsular cataract excision surgery technique / manual phaco techniques. Following criteria were studied. Intra operative and post-operative complications, post-operative inflammation, astigmatism induced and drift and visual rehabilitation.

METHODS

This is a prospective study of 100 consecutive patients assigned to undergo conventional extra capsular cataract excision surgery (50 cases) and manual small incision cataract surgery (50 cases). Study was done for a period of two years at a tertiary care referral hospital. Institutional Ethics Committee permission was taken. Also, the informed consent was obtained from each patient.

Patients were admitted one day before the surgery. Detailed history was taken of each patients and thorough anterior segment examination was performed using slit lamp. Visual acuity was checked with Snellen's visual acuity chart and pinhole improvement was noted. After pupillary dilatation, detailed fundus direct ophthalmoscopy examination and retinoscopy was done, lenticular opacity was assessed and graded. Intra ocular pressure was measured with Schiottz tonometer and patency of lacrimal system were checked. Keratometry was carried out using the Bausch and Lomb keratometer. Axial length was measured by a Sonomed A-scan unit and intra ocular lens power was calculated using SRK II formula. Routine investigations were done to rule out diabetes, hypertension.

All patients received antibiotic eye drops hourly one day before the surgery. Tablet acetazolamide 250 mg was given one tablet in the previous night and one tablet in morning per the surgeon's preference. All patients

received oral antibiotic, ciprofloxacin 500 mg twice daily or ofloxacin 200 mg twice daily for five days starting one day prior to the surgery.

Preoperative adequate mydriasis was achieved with instillation of Tropicamide 0.8% with phenylephrine 5%, cyclopentolate 1% and flubriprofen 0.03% eye drops one hour prior to surgery for every 15 minutes. Cataract patients above 40 years were included in this study. Pediatric cataract, traumatic cataract, complicated cataract, cataract associated with glaucoma and cases with corneal disorders were excluded. All cases were done under local peribulbar anesthesia. Under aseptic precautions eye was draped, a wire speculum was placed and superior rectus bridle suture was passed and clamped to the towel.

Conventional extra capsular cataract excision surgery technique

A fornix based conjunctival flap was made and superficial scleral vessels were cauterized with either ball point thermal cautery or with wet field bipolar cautery. Mid limbal incision was made from 11 O' clock to 2 O' clock (the incision length range between 10-12 mm) and anterior chamber entered with 11 number blade and is filled with viscoelastic substance. Can opener capsulotomy be performed. Incision was extended on either side using corneal scissors and nucleus delivered by pressure counter pressure technique. Cortical matter aspiration was done with the help of Simcoe canula. Anterior chamber was formed with; viscoelastic substance and 6 to 7 m PMMA modified C sulcus. Viscoelastic substance was aspirated and chamber reformed with ringer lactate solution. Wound was closed with either five interrupted sutures using 8-0 virgin silk, 9-0 or 10-0 nylon or continuous suture with 10-0 nylon.

Manual small incision cataract surgery technique

A fornix based conjunctival flap for superior tunnel was made. Superficial scleral vessels were cauterized. The extent of incision on the sclera was marked with calipers. A 6 mm / 6.5 mm length straight or frown incision was made on the sclera 1.5 to 2 mm away from the limbus. Sclerocorneal tunnel was constructed using crescent knife. The dissection into clear cornea was up to 1.5 mm in front of the limbus. A side port entry was made with paracentesis knife 2-3 clock hours away from the primary incision. Anterior chamber filled with viscoelastic substance through the side port. A continuous curvilinear capsulotomy or can opener capsulotomy was performed. With penetrating angled keratome anterior chamber was entered at the anterior limit of the tunnel and extended to the periphery using blunt tipped keratome. Hydro dissection was performed in cases where continuous curvilinear capsulotomy was done. Nucleus prolapsed into the anterior chamber and delivered out using sandwich technique or using irrigating vectis. Cortical matter aspirated with simcoe canula, a 6 to 6.5 mm

PMMS IOL was implanted in the bag in CCC cases, in the ciliary sulcus for can opener cases.

Anterior chamber was formed with ringer lactate and is made tight intentionally to close the valve. Side port opening was sealed by stromal hydration. Wound was checked for any leakage with blunt instrument by pressing over cornea at various places. Conjunctiva and tenon's capsule were brought to place and cooptation cautery was performed. Intra operative complications were noted. A detailed post-operative examination of patients was done 1st day, 1-2 weeks and 6-8 week. The examination included checking visual acuity, keratometry slit lamp biomicroscopy, direct ophthalmoscopy and post-operative complications were noted. At the end of six weeks a final best corrected subjective refraction was performed and the spectacles prescribed. All the changes in keratometry readings were recorded and tabulated for each corresponding period. SIA was calculated using algebraic method.

Statistical analysis

The student's independent t-test was used to estimate the statistical significance of the difference in the mean age of patients in the two study groups. The chi-square with Yates correction for continuity was used to assess the statistical significance of the difference between the two study groups.

RESULTS

Total number of complications was almost similar in both the groups i.e. 9 in CECEST and 10 in MSICST groups and hence not statistically significant. No group reported premature AC entry and scleral flap button hole. Iris prolapse was seen only in CECEST group. Iridodialysis was seen in only MSICST group. Vitreous loss, PC rent, retained cortex, constricted pupil was seen in both the groups.

Table 1: Comparison of intra operative complications in two groups.

Complications	Conventional extra capsular cataract excision surgery technique (CECEST)	Manual small incision cataract surgery technique (MSICST)
Premature AC entry	00	00
Scleral flap button hole	00	00
Iris prolapse	01	00
Iridodialysis	00	01
Hyphaema	01	01
Difficulty in delivery of nucleus	00	01
Constricted pupil	01	01
Retained cortex	02	02
PC rent	02	02
Vitreous loss	01	01
Descemets membrane stripping	01	01
Total number of complications	09	10

Table 2: Comparison of post-operative complications in two groups.

Complications	Conventional extra capsular cataract excision surgery technique (CECEST)	Manual small incision cataract surgery technique (MSICST)
Wound leak	00	00
Striate keratitis	00	00
Iris prolapsed	01	00
Posterior capsule opacity	01	01
Cystoids macular edema	02	02
Secondary glaucoma	00	00
Total number of complications	04	03

Post operatively also total number of complications was similar in both the groups i.e. 4 in CECEST and MSICST groups, thus not found to be statistically significant. No group reported wound leak and striate keratitis. Iris prolapsed was reported only in CECEST group. Secondary glaucoma was not reported in any group.

Cystoids macular edema and posterior capsular opacity was reported in both the groups.

Statistically highly significant ($p < 0.01$) difference of post-operative astigmatism was found between both the groups for 1st day and after 1st week but no significant (p

= 0.06) was found after 6 weeks. Post operatively majority of patients had WTR astigmatism, 33 patients at day 1, 33 patients after one week and 29 patients after six

weeks in CECCE group and ATR astigmatism in MSICS group, 38 patients on day 1, 44 patients after one week and 46 after six weeks.

Table 3: Pattern of post-operative astigmatism in both the groups.

Post-operative day	Type of astigmatism	CECCEST		MSICST	
		Number (%)	Mean±SD	Number (%)	Mean±SD
1st day	ATR	16 (32.65%)	2.43±1.54	38 (77.55%)	1.15±0.72
	WTR	33 (67.75%)	2.82±1.02	06 (12.25%)	1.13±1.43
	NOA	00	00	05 (10.2%)	-
	Amount of astigmatism	-	2.69±1.21	-	1.032.69±1.210.86
1-2 weeks	ATR	17 (34%)	2.54±1.28	44 (88%)	1.23±0.77
	WTR	33 (66%)	2.13±1	03 (06%)	0.92±0.63
	NOA	-	-	03 (06%)	-
	Amount of astigmatism	-	2.27±1.11	-	1.14±0.79
6-8 weeks	ATR	20 (40%)	1.90±1.24	46 (92%)	1.5±0.89
	WTR	29 (58%)	1.78±0.97	03 (06%)	0.53±0.41
	NOA	01 (02%)	-	01 (02%)	-
	Amount of astigmatism	-	1.80±1.1	-	1.42±0.91

Table 4: Surgery induced astigmatism.

Type	Astigmatism	CECCE			MSICS		
		1 st day	1-2 weeks	6 weeks	1 st day	1-2 weeks	6 weeks
ATR	0.01-1	2	5	8	33	27	20
	1.01-2	3	2	4	6	13	19
	2.01-4	5	5	5	2	3	5
	>4.01	1	1	0	0	0	0
WTR	0.01-1	3	9	9	6	6	4
	1.01-2	9	6	10	0	0	1
	2.01-4	18	19	12	2	1	0
	>4.01	6	1	1	0	0	0
NOA	0	2	2	1	0	0	1

Statistically highly significant difference ($p < 0.01$) was observed between both the groups at 1st day and 1st week but the difference became only marginally significant ($p = 0.02$) after six weeks. In CECCE group, most of the patients had surgery induced astigmatism of type WTR in

36 patients at day one, 35 patients at one week and 32 patients after six weeks. First day the post-operative surgically induced astigmatism was less in MSICS group compared to CECCE group but after six weeks, there was no much difference seen.

Table 5: Comparison of post-operative visual acuity in both the groups.

Type of surgery	Visual acuity	1 st day		1-2 weeks		6-8 weeks	
		UCVA	BCVA	UCVA	BCVA	UCVA	BCVA
CECCE	>6/9	0	2	0	28	03	38
	6/12 to 6/18	01	20	14	15	29	12
	6/24-6/36	17	20	31	07	16	00
	<6/60	32	08	05	00	02	00
MSICS	>6/9	02	21	04	38	04	44
	6/12 to 6/18	15	15	26	10	34	06
	6/24-6/36	25	12	18	02	12	00
	<6/60	08	02	02	00	00	00

Statistically highly significant difference ($p < 0.01$) was observed between both the groups at first day and after first week but no significant difference was seen after six weeks ($p = 0.38$) for uncorrected visual acuity and for best corrected visual acuity. There were significantly more patients with un-aided vision of 6/18 or better in MSICS group than in CECCE group. 34% at first day, 60% after first week and 76% after six weeks and in MSICS group compared to only 2% at first day, 48% after first week and 64% after six weeks attained vision of 6/18 or better.

4% of patients at first day, 8% after first week gained un-aided vision of 6/9 or better in MSICS group. None of the patients in CECCE group gained un-aided vision of 6/9 or better in the first two follow up period but 6% gained after six weeks.

DISCUSSION

Intraoperative iris prolapsed due to positive vitreous pressure is seen in conventional ECCE but not in MSICS. One case had Iridodialysis during nucleus delivery by sandwich technique and delivery of the nucleus became difficult due to constricted pupil in MSICS. No such experiences were found in case of CECCE. There was no wound leak seen in both groups post operatively. There were three cases of striate keratitis after MSICS in comparison to two cases in CECCE, but there were two cases of post-operative iritis seen in CECCE while only one case was found in MSICS. There was one case of post-operative iris prolapsed after CECCE but no case in MSICS. There were no differences in other complications.

Chakraborty S et al found two complications which occurred exclusively in MSICS procedure and those were inferior Iridodialysis.¹⁰ Gogate PM et al found that posterior capsular rent was more frequent in MSICS group compared to ECCE group. Iridodialysis was a complication seen only in the MSICS group.⁶ The mean OCTET score for intra operative complication was slightly higher for MSICS. Post-operative Descemet's operative fold was more common in MSICS group. 75.5% of patients in ECCE group did not have any complications episode in the six weeks but only 67.7% of MSICS were free of it.

The surgically induced astigmatism in CECCE group was mostly WTR contributing to 73.46% and found higher in MSICS group amounting to 83.67% at first day. After one week, 86% of ATR in MSICS and 64% of WTR in CECCE was similar. Shashana B et al observed that in post-operative period, there was lower aqueous flare.¹¹ The mean surgically induced astigmatism in MSICS group was 1.05D ATR at first month and it was 2.24 WTR in ECCE.

Kshetrapal A et al reported that 78% had astigmatism of $< 1.5D$ and only 22% had astigmatism of $> 1.5D$.¹² 81.8% obtained visual acuity from 6/6 to 6/12 at fourth week

post operatively. In the present study, 34% at first day, 60% at first week and 76% after six weeks in MSICS group and 2% at first day, 48% at first week and 64% after six weeks of CECCE had 6/18 or better vision. 100% of patients gained corrected visual acuity of 6/18 or better after six weeks. 88% of patients in MSICS group and 76% of patients in CECCE group attained 6/9 or better vision.

Xiang Q et al found that the average uncorrected visual acuity of the small incision group was significantly higher than those of the conventional large incision group.¹³ Gogate et al also indicated that 37.3% of ECCE group and 47% of MSICS group had uncorrected visual acuity of 6/18 or better after six weeks.⁶ 86.7% of ECCE and 89.9% of MSICS group had corrected post-operative vision. They also found that MSICS gave an uncorrected visual acuity of 6/18 or better in higher proportion of patients than ECCE at six weeks. Corrected visual acuity of 6/18 or better was also slightly higher in MSICS but this was not statistically significant.

The rates of intra and post-operative complications were similar in two groups except for transient post-operative corneal edema which was more common in MSICS group.⁵ Jakhanval SP et al noticed that rehabilitation time in MSICS was better in MSICS than in ECCE group.¹⁴ The study also indicated that after one week, 76% cases in MSICS had un-aided vision of 6/18 or better after one week compared to only 2% cases ECCE. In MSICS, 70% cases had final astigmatism correction of 1.5D or less after four weeks post operatively whereas in ECCE only 32% of cases could achieve this.

CONCLUSION

Manual small incision cataract surgery induces minimal amount of ATR astigmatism in early post-operative period compared to ECCE which induces moderate amount of WTR astigmatism. MSICS gives better uncorrected visual acuity in early post-operative period compared to ECCE. Corrected visual acuity is also better in MSICS group. MSICS has definitive advantages over conventional ECCE in terms of early visual rehabilitation, minimal surgically induced astigmatism; no suture related complications and reduced surgical time.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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