

To Compare Post-Operative Corneal Endothelial Cell Count in Mini-Extracapsular Cataract Extraction and Manual Small Incision Cataract Surgery

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Abstract: ***Aim:** To compare the endothelial cell count following Mini- Extracapsular cataract extraction versus Manual small incision cataract surgery. **Material and Methods:** In this prospective, randomized study, 60 patients with senile cataract presenting to Outpatient Department of Subharti Hospital, Meerut were divided into two groups of 30 each: group A patients underwent Mini-Extracapsular cataract extraction while group B patients underwent Manual small incision cataract surgery with Posterior chamber intraocular lens implantation (PCIOL). Patients were followed up at 1st week, 1st, 2nd, 3rd month postoperatively. Endothelial cell count using specular microscope and BCVA were assessed on each follow up visit. **Observation and Result:** The difference in post-operative ECC and BCVA between Mini-ECCE and MSICS groups was not statistically significant ($P > 0.05$) at 3 month postoperatively. There was an endothelial cell loss of 7.5% and 7.8 % in Mini-ECCE and MSICS groups, respectively. **Conclusion:** As both the groups showed comparable endothelial cell loss and BCVA in post-operative period. The present study concluded that the two techniques do not differ significantly in endothelial cell loss, best corrected visual acuity at three months, postoperatively.*

Keywords: Mini-Extracapsular cataract extraction, Manual Small incision cataract surgery, Endothelial cell count, Visual acuity

1. Introduction

Cataract is the chief cause of avoidable blindness in India and throughout the world⁽¹⁾. It is defined as opacification of the lens and its capsule that may lead to loss of vision. Cataract can result from many conditions, the most common being the natural ageing process. This is a result of degenerative changes on the specific lens proteins within the lens which are altered leading to gradual clouding of lens. The mean endothelial count in the normal adult cornea ranges from 1500-2500 cells/mm², and the count continues to decrease with age⁽²⁾.

The study of morphology and endothelial cell density can be performed through specular microscopy. Endothelial changes are considered an important parameter to evaluate trauma and to estimate the safety of a surgical technique⁽³⁾.

In developing countries such as India, where there is a cataract backlog, the conventional Extracapsular cataract extraction (ECCE) and Manual small-incision cataract surgery (MSICS) promises to be a viable cost-effective alternative to Phaco-emulsification⁽⁴⁾. Mini-ECCE is a modified form of ECCE (Extracapsular Cataract Extraction) in which the size of the proposed incision is comparable to MSICS (Manual Small Incision Cataract Surgery).

1.1 Aims and Objectives

To compare the endothelial cell count following Mini-Extracapsular cataract extraction versus Manual small incision cataract surgery.

A prospective randomized control study including 60 patients from Outpatient Department of Ophthalmology was conducted at Subharti Medical College, Meerut from September 2017 till April 2019. All patients underwent detailed preoperative evaluation including vision, refraction, anterior and posterior segment evaluation. Age matched randomization was done and patients were divided in two groups of 30 each-

Group A- Patients undergoing Mini- extracapsular cataract extraction (Mini-ECCE) with PCIOL implantation.

Group B- Patients undergoing Manual small incision cataract surgery (MSICS) with PCIOL implantation.

Both the surgeries were performed by the same surgeon.

Inclusion Criteria

Patients with senile cataract between 40-70 years

Exclusion Criteria

- 1) Developmental cataract
- 2) Traumatic or complicated cataract
- 3) Subluxated lens
- 4) Lens induced glaucoma
- 5) Pre-operative endothelial cell count less than 1500 cells/mm²
- 6) Any pre-existing corneal opacity
- 7) Patients with Diabetes or Uncontrolled Hypertension
- 8) Intra-operative posterior capsular rupture
- 9) Previous intra-ocular and refractive surgery

2. Material and Methods

3. Pre-Operative Evaluation

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History

Examination

- 1) Visual acuity
- 2) Slit lamp evaluation
- 3) Grading of cataract using (LOCS III)
- 4) Intra-ocular pressure was recorded using non-contact tonometer.
- 5) Examination of the posterior segment was done by direct ophthalmoscope and by slit lamp using +90D Volk lens.
- 6) Endothelial cell count and cell density was done using a non-contact specular microscope (TOPCON SP 3000P)

All patients underwent complete ophthalmic examination followed by measurement of endothelial cell count by non-contact specular microscope at baseline (pre-operatively) and post-operatively at 1 week, 1 month, 2 months & 3 months.

Statistical Analysis

Statistical analysis was performed on an intent-to-treat basis using IBM, SPSS Statistics version 25 (IBM Inc.). Independent t-tests were performed to ensure group similarities at baseline; the assumptions of performing t-tests were met. Chi-square tests were used for proportions. A p-value less than 0.05 was considered statistically significant.

4. Observation and Results

- The Mean age of patients in Mini-ECCE group was 59.13 ± 5.71 and MSICS group was 58.2 ± 7.94 , respectively. There were 15 (50%) males and 15 (50%) females in Mini ECCE group. 16 (53.3%) males and 14 (46.7%) females in MSICS group.
- The mean pre-operative endothelial cell count in Mini-ECCE group was 1847.10 ± 139.60 cells/mm². The mean pre-operative endothelial cell count in MSICS group was 1862 ± 123.32 cells/mm², respectively.

Table 1 shows comparison of pre-operative endothelial cell count (ECC) between the two groups.

Table 1: Comparison of pre-operative endothelial cell count (ECC) between the two groups

Preoperative ECC Cells/mm ²	MINI-ECCE Group (N%)	MSICS Group (N%)
1500-1700	4 (13.3)	3 (10)
1701-1900	20 (66.7)	19 (63.3)
>1901	6 (20)	8 (26.7)
Total	30 (100)	30 (100)

- The mean post-operative endothelial cell count at the end of study (3 month) in Mini-ECCE group was 1707.50 ± 134.17 cells/mm² and in MSICS group was 1716.66 ± 117.37 cells/mm².

Table 2 shows comparison of endothelial cell count between two groups at 3 month postoperative.

Table 2: Comparison of endothelial cell count between two groups at 3 month postoperative

ECC (Cells/mm ²)	MINI-ECCE Group (N%)	MSICS Group (N%)
1500-1700	15 (50)	17 (56.7)
1701-1900	13 (43.3)	11 (36.7)
>1901	2 (6.7)	2 (6.7)
Total	30 (100)	30 (100)

- The difference in endothelial cell count between Mini-ECCE and MSICS groups was not statistically significant ($p=0.790$). There was an endothelial cell loss of 7.5% and 7.8% in Mini-ECCE and MSICS groups, respectively. Fortunately, there was no major complication observed in any of the surgical techniques.
- The mean Log MAR pre-operative best corrected vision in Mini-ECCE group was 2.53 ± 1.57 and 2.12 ± 1.52 LogMAR units in MSICS group.
- The mean post-operative BCVA at 3 months in Mini-ECCE group was 0.43 ± 0.16 and 0.35 ± 0.14 Log MAR units in MSICS group.
- The difference in final best corrected vision between Mini-ECCE and MSICS groups was not statistically significant (paired t-test, $p=0.08$).

Table 3 and 4 shows comparison of pre and post-operative BCVA between the two groups.

Table 3: Comparison of pre-operative BCVA between two groups

Preoperative BCVA (Log MAR)	MINI-ECCE Group (N%)	MSICS Group (N%)
1-1.5	14 (46.7)	18 (60)
1.6-3	9 (30)	7 (23.3)
> 3.1	7 (23.3)	5 (16.7)
TOTAL	30 (100)	30 (100)

Table 4: Comparison of BCVA between the two groups at 3 month postoperatively

BCVA (Log MAR)	MINI-ECCE Group (N%)	MSICS Group (N%)
0-0.5	22 (73.3)	26 (86.7)
0.51-0.8	6 (20)	4 (13.3)
>0.81/	2 (6.7)	0
TOTAL	30 (100)	30 (100)

5. Discussion

Cataract surgery, the most commonly performed surgery, has always been associated with damage to the corneal endothelium, the layer which is so vital for keeping the cornea transparent. Alteration in corneal endothelium is considered an important parameter of surgical trauma and essential for estimating the safety of the surgical technique.

The present study compared endothelial cell counts, best corrected visual acuity and complications between Mini-ECCE (a modified form of ECCE in which the size of the section was comparable to that of SICS) and Manual small incision cataract surgery at a tertiary care center. The results of our study showed that the two techniques do not differ significantly in best corrected vision, endothelial cell loss and the complications at three months, postoperatively.

The results of our study are consistent with Shadakshari S M and Chandrakanth R⁽⁵⁾ who found the endothelial cell loss between ECCE and SICS to be 12.5% and 12.3% respectively and visual acuity of more than 20/40 in both the groups. The study concluded that the endothelial cell loss was not statistically significant in both the groups.

In a study comparing surgically induced astigmatism and endothelial cell loss after conventional ECCE, SICS and Phacoemulsification. There was an endothelial cell loss of 4.72%, 4.21%, 5.41%, respectively at 6 weeks postoperative, with no significant difference between the three groups⁽⁶⁾. Another study by Gogate et al⁽⁷⁾ who compared the safety and efficacy of SICS and ECCE in 741 patients. After 6 week follow up, the two groups did not differ significantly in terms of post-operative BCVA and complications and concluded that the two remain the safe and effective technique for treatment of cataract mainly in community eye-care settings.

The above results were comparable to our study which showed decrease in endothelial cell density of 7.5% in Mini-ECCE group and 7.8% in MSICS group at 3 month postoperatively, with no statistically significant difference between the two groups.

We also found that the difference in best corrected visual acuity between the two groups after 3 months was not statistically significant ($p=0.08$) and there were no major complications observed after any of the technique.

Our results co-relates well with the study conducted by Karki et al⁽⁸⁾. who compared visual outcome between ECCE and MSICS over 6 weeks of postoperative period, found that BCVA was 6/18 or better in 79.5% and 90.5% of patients in both the groups, respectively. They concluded that both the techniques were suitable procedures for hospital-based community cataract surgery.

As the visual outcome and endothelial cell loss were comparable with both the procedures and Mini-ECCE is less technology dependent and requires minimal instrumentation, we suggest that this technique can be a good and cost-effective alternative in remote areas or in set up like camps where procedure is done in large numbers to reduce the backlog of cataract surgeries.

6. Limitation

Small sample size of patients ($n=30$) in each group compared to other studies.

7. Conclusion

The present study concluded that there was no clinically or statistically significant difference in endothelial cell loss or visual acuity between Mini-ECCE and manual SICS.

Apart from Phacoemulsification, conventional Extra capsular cataract extraction (ECCE) and Manual small incision cataract surgery (MSICS) are two commonly performed procedures in the subcontinent. Both these techniques require minimal instrumentation, are less

technology dependent than Phaco-emulsification and can be easily performed in all set ups like eye-camps and hospital-based community cataract surgery where procedure is done in large numbers.

Therefore, Mini-ECCE technique may be suitable alternative in teaching hospitals and community eye care settings as MSICS and Phacoemulsification has a steeper learning curve.

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