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Original Research Article

A Comparative Study of Preoperative and Postoperative Refractive Errors in Cataract Surgery: Phacoemulsification versus Manual SICS in a Tertiary Care Hospital

Deepak Kumar[1], Deepankar Sinha[2], Kumari Sandhaya[3], Uday Narayan Singh[4]

[1]Senior Resident, Department of Opthalmology, Jawaharlal Nehru Medical College and Hospital, Bhagalpur, Bihar, India

[2]Senior Resident, Department of Opthalmology, Jawaharlal Nehru Medical College and Hospital, Bhagalpur, Bihar, India

[3]Senior Resident, Department of Opthalmology, All India Institute of Medical Sciences, Kalyani, West Bengal, India

[4]Professor, Department of Opthalmology, Jawaharlal Nehru Medical College and Hospital, Bhagalpur, Bihar, India

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Corresponding Author: Dr. Kumari Sandhaya

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Abstract:

Background: Cataract surgery is a prevalent procedure aimed at restoring vision in patients with cataracts. Phacoemulsification and Manual Small Incision Cataract Surgery (SICS) are the two primary techniques used. Phacoemulsification is often favored for its minimal invasiveness and superior outcomes, while Manual SICS is valued for its cost-effectiveness and simplicity. This study compared the preoperative and postoperative refractive errors, visual acuity, and patient satisfaction between Phacoemulsification and Manual SICS.

Methods: A total of 100 patients undergoing cataract surgery were randomly assigned to either the Phacoemulsification group (n=50) or the Manual SICS group (n=50). Refractive errors were measured using autorefractor and subjective refraction preoperatively and at postoperative week 1 and month 1. Visual acuity was assessed using logMAR charts, and patient satisfaction was evaluated using a Likert scale. Statistical analysis was performed using SPSS version 23.0.

Results: The Phacoemulsification group demonstrated significantly better postoperative refractive outcomes, with a mean refractive error of -0.30 D at month 1 compared to -0.80 D in the Manual SICS group ($p<0.01$). Visual acuity was also superior in the Phacoemulsification group, with a mean logMAR score of 0.10 compared to 0.25 in the Manual SICS group ($p<0.01$). Patient satisfaction scores were higher in the Phacoemulsification group, with 40% rating their satisfaction as very high, compared to 14% in the Manual SICS group ($p<0.01$). The rate of postoperative complications was lower in the Phacoemulsification group.

Conclusion: Phacoemulsification is associated with better refractive outcomes, superior visual acuity, and higher patient satisfaction compared to Manual SICS. The lower complication rate further supports the efficacy of Phacoemulsification as a preferred technique.

Recommendations: Based on the study findings, Phacoemulsification should be considered the preferred method for cataract surgery where resources permit, given its advantages in refractive correction and patient satisfaction. Manual SICS remains a viable alternative in resource-limited settings.

Keywords: Phacoemulsification, Manual Small Incision Cataract Surgery, Refractive Errors, Visual Acuity, Patient Satisfaction.

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Introduction

Cataract surgery remains one of the most commonly performed surgical procedures worldwide, aimed at restoring vision in patients with cataract-induced visual impairment. The two predominant techniques for cataract extraction are Phacoemulsification and Manual Small Incision Cataract Surgery (SICS). Each method has distinct advantages and challenges, impacting postoperative outcomes and patient satisfaction.

Phacoemulsification has become the gold standard in modern cataract surgery due to its minimally invasive nature and superior outcomes. This technique utilizes ultrasonic energy to fragment the cataractous lens, allowing for its removal through a small incision. Recent studies have underscored the benefits of Phacoemulsification, highlighting its efficacy in achieving excellent refractive outcomes and faster visual recovery. A study reported that

Phacoemulsification consistently resulted in better postoperative visual acuity and less postoperative inflammation compared to other methods [1]. Additionally, advancements in phacoemulsification technology, such as the introduction of femtosecond lasers, have further improved the precision and outcomes of this procedure [2].

Manual SICS, on the other hand, is characterized by a larger incision compared to Phacoemulsification. Despite its lower cost and effectiveness in settings with limited resources, Manual SICS generally results in a longer recovery period and can be associated with higher rates of postoperative complications [3]. Recent research has examined the comparative effectiveness of Manual SICS and Phacoemulsification, noting that while Manual SICS remains a viable option in certain contexts, it tends to show less favorable outcomes in terms of visual acuity and refractive error correction [4].

The choice between Phacoemulsification and Manual SICS often depends on various factors including patient characteristics, surgeon expertise, and available resources. Understanding the relative advantages of these techniques is crucial for optimizing patient outcomes and enhancing the quality of care provided. Recent literature has emphasized the importance of evaluating these surgical methods not only in terms of clinical efficacy but also considering patient satisfaction and complication rates [5].

This study aims to evaluate the preoperative and postoperative refractive errors in patients undergoing cataract surgery by two different methods: Phacoemulsification and Manual Small Incision Cataract Surgery (SICS).

Methodology

Study Design: A comparative observational study.

Study Setting: The study took place at Jawahar Lal Nehru Medical College and Hospital, Bhagalpur, Bihar, India, spanning from January 2023 to May 2023 (6 months).

Participants: The study included a total of 100 participants who underwent cataract surgery at the specified medical institution.

Inclusion Criteria

- Patients aged 40 to 80 years.
- Diagnosed with cataracts requiring surgical intervention.
- Willing to provide informed consent for participation.
- No previous history of ocular surgery.

Exclusion Criteria

- Patients with pre-existing corneal or retinal pathology.
- Those with significant ocular comorbidities (e.g., glaucoma, diabetic retinopathy).
- Patients with systemic diseases that could affect the study outcomes (e.g., uncontrolled diabetes, autoimmune disorders).

Bias: To minimize selection bias, randomization was used to assign participants to the Phacoemulsification group or the Manual SICS group. Additionally, data analysis was performed by a statistician blinded to the surgical method used.

Data Collection: Data were collected at three time points: preoperative, postoperative week 1, and postoperative month 1. The primary outcome measure was the refractive error, assessed using an autorefractor and subjective refraction. Secondary measures included visual acuity and patient satisfaction.

Procedure

1. Preoperative Assessment:
   - Detailed ocular examination including visual acuity, slit-lamp examination, intraocular pressure measurement, and fundus examination.
   - Measurement of preoperative refractive error using an autorefractor.
   - Random assignment to either the Phacoemulsification group or the Manual SICS group.
2. Surgical Procedure:
   - Both surgeries were performed by experienced ophthalmic surgeons under standardized conditions.
   - Phacoemulsification group underwent cataract extraction using the phacoemulsification technique.
   - Manual SICS group underwent cataract extraction using the manual small incision cataract surgery technique.
3. Postoperative Follow-up:
   - Refractive error measurement at postoperative week 1 and month 1.
   - Visual acuity assessment and patient satisfaction survey at each follow-up visit.

Statistical Analysis: Data were entered into SPSS version 23.0 for statistical analysis. Descriptive statistics summarized baseline characteristics and outcomes. Comparative analysis between the two groups was conducted using the Chi-square test for categorical variables and the independent t-test for

continuous variables. A p-value of less than 0.05 was considered statistically significant.

Result

The study included 100 participants, with 50 assigned to the Phacoemulsification group and 50 to the Manual SICS group. The mean age of participants was 65.4 years (range 40-80 years). The gender distribution was similar in both groups, with 54% males and 46% females.

Table 1: Demographic and Baseline Characteristics

Characteristic	Phacoemulsification (n=50)	Manual SICS (n=50)	p-value
Age (mean ± SD)	65.8 ± 8.5	65.0 ± 9.1	0.72
Male (%)	28 (56%)	26 (52%)	0.68
Female (%)	22 (44%)	24 (48%)	0.68
Preoperative Refractive Error (D)	-3.25 ± 1.20	-3.30 ± 1.15	0.89

The primary outcome measure was the change in refractive error from preoperative to postoperative periods. Both groups showed significant improvement in refractive errors postoperatively. The mean refractive error at postoperative month 1 was significantly better in the Phacoemulsification group compared to the Manual SICS group.

Table 2: Refractive Errors

Time Point	Phacoemulsification (D)	Manual SICS (D)	p-value
Preoperative	-3.25 ± 1.20	-3.30 ± 1.15	0.89
Postoperative Week 1	-0.50 ± 0.80	-1.20 ± 0.95	<0.01
Postoperative Month 1	-0.30 ± 0.60	-0.80 ± 0.85	<0.01

Visual acuity was assessed using Snellen charts and converted to logarithm of the minimum angle of resolution (logMAR) for statistical analysis. The Phacoemulsification group demonstrated better visual acuity outcomes compared to the Manual SICS group at both postoperative week 1 and month 1.

Table 3: Visual Acuity

Time Point	Phacoemulsification (logMAR)	Manual SICS (logMAR)	p-value
Preoperative	0.70 ± 0.20	0.72 ± 0.25	0.78
Postoperative Week 1	0.20 ± 0.15	0.35 ± 0.18	<0.01
Postoperative Month 1	0.10 ± 0.12	0.25 ± 0.15	<0.01

Patient satisfaction was assessed using a 5-point Likert scale (1=very dissatisfied, 5=very satisfied). The Phacoemulsification group reported higher satisfaction scores compared to the Manual SICS group.

Table 4: Patient Satisfaction

Satisfaction Level	Phacoemulsification (n)	Manual SICS (n)	p-value
Very Dissatisfied	1	3	0.04
Dissatisfied	2	5	0.04
Neutral	7	10	0.04
Satisfied	20	25	0.04
Very Satisfied	20	7	0.04

The rate of intraoperative and postoperative complications was low in both groups. However, the Manual SICS group had a slightly higher incidence of postoperative complications, including corneal edema and postoperative inflammation.

Table 5: Complications

Complication	Phacoemulsification (n)	Manual SICS (n)	p-value
Corneal Edema	2	6	0.12
Postoperative Inflammation	3	8	0.10
Cystoid Macular Edema	1	2	0.50

Discussion

The comparative study evaluated refractive outcomes, visual acuity, and patient satisfaction between Phacoemulsification and Manual Small Incision Cataract Surgery (SICS) in 100 patients undergoing cataract surgery.

The study found significant differences in postoperative refractive errors between the two surgical methods. The Phacoemulsification group

exhibited superior outcomes, with a mean postoperative refractive error of -0.30 D at one month compared to -0.80 D in the Manual SICS group. This suggests that Phacoemulsification leads to better refractive correction and less residual refractive error compared to Manual SICS.

Visual acuity, measured in logMAR, was also notably better in the Phacoemulsification group. At postoperative month 1, the Phacoemulsification group had a mean logMAR score of 0.10, indicating clearer vision, compared to 0.25 in the Manual SICS group. This highlights that patients undergoing Phacoemulsification generally achieve better visual outcomes.

Patient satisfaction scores revealed that those who underwent Phacoemulsification were significantly more satisfied with their outcomes. The majority of Phacoemulsification patients rated their satisfaction as very high (20 patients), while fewer Manual SICS patients reported similar levels of satisfaction (7 patients). This suggests that Phacoemulsification is not only more effective in terms of clinical outcomes but also preferred by patients.

Both surgical methods had low complication rates; however, the Manual SICS group had a slightly higher incidence of postoperative issues such as corneal edema and inflammation. While these complications were not severe, they were more frequent compared to the Phacoemulsification group.

Overall, the results suggest that Phacoemulsification offers better refractive outcomes, superior visual acuity, and higher patient satisfaction compared to Manual SICS. The lower rate of postoperative complications associated with Phacoemulsification further supports its advantages over Manual SICS for cataract surgery.

A prospective comparative study evaluated the visual outcomes and refractive errors in 246 eyes undergoing either phacoemulsification or manual small incision cataract surgery (SICS). The study found that on the first postoperative day, 74% of phacoemulsification patients had uncorrected visual acuity (UCVA) better than or equal to 6/18 compared to 58.5% in the SICS group. Best corrected visual acuity (BCVA) at one month was similar in both groups, but phacoemulsification showed significantly better outcomes in postoperative cylindrical refraction at both one week and one month [6].

A randomized study compared postoperative astigmatism in patients undergoing manual SICS with either superior or superotemporal scleral incisions. The study concluded that superotemporal incisions resulted in significantly less postoperative against-the-rule astigmatism compared to superior incisions. Visual acuity was better in the superotemporal incision group (78% achieving better than 6/9) compared to the superior incision group (42%) at four weeks postoperatively [7].

A retrospective case study compared corneal astigmatism three months postoperatively in patients who underwent either phacoemulsification or manual SICS. Mean postoperative astigmatism was 0.34±0.11D for phacoemulsification and 0.91±0.25D for manual SICS, indicating that phacoemulsification induced significantly less astigmatism [8].

In a prospective study, 100 patients were randomized to undergo either phacoemulsification or SICS. Both techniques showed no significant differences in uncorrected visual acuity (UCVA) and best corrected visual acuity (BCVA) at six weeks postoperatively. However, the mean surgical time was significantly shorter for SICS (8.40±1.34 minutes) compared to phacoemulsification (15.97±2.02 minutes) [9].

A retrospective study analyzed the outcomes of 336 cataract surgeries, with 151 patients undergoing SICS and 185 undergoing phacoemulsification. After six weeks, visual acuity of 6/6 was achieved in 6.6% of SICS cases and 15.6% of phacoemulsification cases. According to WHO guidelines, 97.83% of phacoemulsification cases and 84.10% of SICS cases had good visual outcomes [10].

Conclusion

Phacoemulsification offers superior refractive outcomes, better visual acuity, and higher patient satisfaction compared to Manual Small Incision Cataract Surgery (SICS). The reduced rate of postoperative complications associated with Phacoemulsification further underscores its effectiveness as a preferred surgical technique. These findings suggest that, where feasible, Phacoemulsification should be the method of choice for cataract surgery to optimize patient outcomes.

References

1. Liu Y, Wang Q, Xu L. Outcomes of Phacoemulsification vs Manual Small Incision Cataract Surgery: A meta-analysis. Int J Ophthalmol. 2020;13(9):1450-6.
2. Kumar S, Sharma S, Patel R. Manual Small Incision Cataract Surgery: A comprehensive review. Br J Ophthalmol. 2019;103(6):835-40.
3. Bhattacharya S, Choudhury A, Sharma S. Comparative outcomes of Manual Small Incision Cataract Surgery and Phacoemulsification: A review. J Cataract Refract Surg. 2021; 47(4):515-22.
4. Hernandez A, Rebolleda G, Mendez C. Advances in Phacoemulsification technology:

Femtosecond laser-assisted cataract surgery. Ophthalmol Clin. 2021;34(2):145-55.
5. Singh M, Patel R, Gupta R. Patient satisfaction and complications in Phacoemulsification versus Manual SICS: A comparative study. J Ophthalmol. 2022; 2022:123456.
6. Rathi A, Singh N, Chauhan RS, Chugh J, Jain G. A comparative study to evaluate visual outcome in post-operative patients of manual small incision cataract surgery and phacoemulsification. Indian J Pathol Oncol. 2020; 06:353-358.
7. Soumyadeep H, Tapes Kanti S. A comparative study of post-operative astigmatism in superior versus superotemporal scleral incisions in manual small incision cataract surgery in a tertiary care hospital. Int J Clin Exp Ophthalmol. 2021.
8. Nair N, Divya N, Panimalar V, Veeramani A, Bhaskaran B. Comparison of postoperative corneal astigmatism in phacoemulsification and manual small incision cataract surgery. Int J Curr Pharm Res. 2020.
9. Reddy P, Ramlal E. A clinical study on phacoemulsification versus manual small incision cataract surgery in rural hospital setting. Indian J Clin Exp Ophthalmol. 2020.
10. Das S, Shergill S. Cataract surgery, their postoperative analysis, and a comparison of phacoemulsification and manual small-incision cataract surgery at a tertiary care hospital: A retrospective study. Med J Dr D.Y. Patil Vidyapeeth. 2023; 16:80-84.