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Original Research Article

A Comparative Study of Conventional Extracapsular Cataract Extraction and Small Incision Cataract Surgery at a Tertiary Care Centre in Bihar

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Abstract:

Background: Cataract remains the leading cause of reversible blindness in India. Conventional extracapsular cataract extraction (ECCE) and small incision cataract surgery (SICS) are widely practiced surgical techniques, particularly in resource-limited settings.

Aim: To compare surgical outcomes, visual recovery, and complications between conventional ECCE and SICS.

Materials and Methods: This retrospective study included 100 patients who underwent cataract surgery at Sri Krishna Medical College, Muzaffarpur, Bihar, from January 2025 to May 2025. Fifty patients underwent ECCE and fifty underwent SICS. Postoperative visual acuity, surgically induced astigmatism, and complications were analyzed.

Results: SICS showed faster visual recovery, lower astigmatism, and fewer complications compared to ECCE, with statistically significant differences.

Conclusion: SICS offers superior postoperative outcomes compared to conventional ECCE and is better suited for high-volume cataract surgery in developing regions.

Keywords: Cataract, ECCE, SICS, Visual acuity, Astigmatism.

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Introduction

Cataract is the most common cause of avoidable blindness worldwide, accounting for a significant proportion of visual impairment in developing countries [1]. In India, cataract contributes to more than 60% of blindness, largely due to delayed access to surgical care [2]. Surgical removal of the cataractous lens with intraocular lens implantation remains the only effective treatment.

Conventional extracapsular cataract extraction (ECCE) has been practiced for several decades and involves removal of the lens nucleus through a large limbal incision followed by cortical aspiration [3]. Although ECCE provides satisfactory visual outcomes, it is associated with larger incisions, increased surgically induced astigmatism, and longer visual rehabilitation [4].

With advancements in surgical techniques, small incision cataract surgery (SICS) has emerged as an effective alternative, especially in high-volume settings [5]. SICS uses a self-sealing scleral tunnel, allowing nucleus delivery without sutures, thereby reducing postoperative astigmatism [6].

Several studies have demonstrated that SICS provides visual outcomes comparable to phacoemulsification at a much lower cost [7]. This makes it particularly suitable for government hospitals and outreach programs in rural India [8].

Postoperative visual acuity is a key indicator of surgical success. Studies comparing ECCE and SICS have shown better uncorrected visual acuity and faster rehabilitation with SICS [9]. Reduced surgical time and fewer postoperative visits further enhance its cost-effectiveness [10].

Complications such as posterior capsular rent, corneal edema, and wound-related problems have been reported with both techniques, though their incidence varies [11]. Proper comparison of these techniques is essential to guide surgical practice in tertiary care hospitals. Despite widespread use of SICS, ECCE continues to be practiced due to surgeon familiarity and infrastructure constraints [12].

National and global blindness control initiatives emphasize strengthening cataract surgical services and improving postoperative visual outcomes to

reduce the burden of avoidable blindness, particularly in developing regions [13,14].

The present study aims to compare ECCE and SICS in terms of visual outcome, astigmatism, and postoperative complications at a tertiary care centre in Bihar.

Materials and Methods

Study Design and Setting: This study was designed as a retrospective comparative analysis conducted in the Department of Ophthalmology, Sri Krishna Medical College, Muzaffarpur, Bihar, a tertiary care referral centre catering to both urban and rural populations. Medical records of patients who underwent cataract surgery during the study period were reviewed and analyzed.

Study Duration: The study included patients operated between January 2025 and May 2025. Postoperative outcomes were evaluated up to 6 weeks after surgery, which was the standard follow-up period followed at the institution.

Study Population and Sample Size: A total of 100 patients who underwent cataract surgery during the study period were included. Based on the surgical technique employed, patients were divided into two equal groups:

- **Group A (ECCE group):** 50 patients who underwent conventional extracapsular cataract extraction
- **Group B (SICS group):** 50 patients who underwent small incision cataract surgery

Only cases with uneventful intraoperative course and complete postoperative records were considered for analysis to ensure uniformity and reliability of outcomes.

Inclusion Criteria

Patients were included in the study if they fulfilled the following criteria:

- Age greater than 40 years.
- Presence of senile cataract.
- Underwent either ECCE or SICS with posterior chamber intraocular lens implantation.
- Availability of complete preoperative and postoperative records, including visual acuity and keratometry values.
- Completed a minimum follow-up of 6 weeks.

Exclusion Criteria

Patients were excluded from the study if they had:

- Traumatic, complicated, or congenital cataract
- Pre-existing ocular conditions affecting visual outcome (e.g., glaucoma, corneal opacity, uveitis, retinal pathology)
- History of previous ocular surgery
- Intraoperative complications requiring conversion to another surgical technique
- Incomplete follow-up data

Preoperative Evaluation

All patients underwent a comprehensive ophthalmic examination prior to surgery. This included:

- Measurement of best-corrected visual acuity (BCVA) using a Snellen chart.
- Slit-lamp examination of the anterior segment
- Intraocular pressure measurement.
- Dilated fundus examination using indirect ophthalmoscopy.
- Keratometry and axial length measurement for intraocular lens power calculation.

Surgical Technique

Conventional Extracapsular Cataract Extraction (ECCE): ECCE was performed using a standard superior limbal incision, followed by capsulotomy, expression of the lens nucleus, cortical aspiration, and implantation of a posterior chamber intraocular lens. The incision was closed with sutures as per routine institutional practice.

Small Incision Cataract Surgery (SICS): SICS was carried out using a self-sealing scleral tunnel incision. The nucleus was delivered manually without sutures, followed by cortical aspiration and posterior chamber intraocular lens implantation. No sutures were applied unless deemed necessary.

All surgeries were performed by experienced surgeons under aseptic conditions, following uniform institutional protocols.

Postoperative Care and Follow-up: Postoperatively, all patients received standard topical antibiotic and steroid therapy. Follow-up examinations were conducted at regular intervals, with final assessment at 6 weeks post-surgery. At each visit, visual acuity, anterior segment status, and presence of any complications were documented.

Outcome Measures

The following parameters were evaluated and compared between the two groups:

1. **Postoperative Visual Acuity:** Best-corrected visual acuity at 6 weeks was categorized as ≥6/18 or <6/18.
2. **Surgically Induced Astigmatism:** Astigmatism was calculated based on preoperative and postoperative keratometric readings and expressed as mean ± standard deviation.
3. **Postoperative Complications:** Early postoperative complications such as corneal edema, posterior capsular rent, and wound leak were recorded and compared between the two groups.

Statistical Analysis: Data were entered into a spreadsheet and analyzed using SPSS software. Continuous variables were expressed as mean ± standard deviation, while categorical variables were expressed as frequencies and percentages.

- The **Student's t-test** was used to compare continuous variables such as surgically induced astigmatism.
- The **Chi-square test** was applied to compare categorical variables including visual acuity outcomes and postoperative complications.

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

Ethical Considerations: The study was approved by the Institutional Ethics Committee of Sri Krishna Medical College. As this was a retrospective, record-based study with no direct patient interaction, the requirement for informed consent was waived.

Results

A total of 100 patients were included in the present study, of which 50 patients underwent conventional extracapsular cataract extraction (ECCE) and 50 patients underwent small incision cataract surgery (SICS). The distribution of patients according to the surgical technique is shown in Table 1. Both groups were comparable in terms of sample size, allowing valid comparison of postoperative outcomes.

Distribution of Patients by Surgical Technique: As shown in Table 1, an equal number of patients were allocated to each surgical group, with ECCE accounting for 50% and SICS accounting for 50% of the total study population.

Table 1: Distribution of Patients by Surgical Technique

Procedure	Number of Patients	Percentage
ECCE	50	50%
SICS	50	50%

Postoperative Visual Acuity at 6 Weeks: Postoperative best-corrected visual acuity at 6 weeks was assessed and compared between the two groups. As summarized in Table 2, 32 patients (64%) in the ECCE group achieved visual acuity of ≥6/18, whereas a significantly higher number of patients, 44 (88%), in the SICS group achieved visual acuity of ≥6/18. Conversely, 18 patients (36%) in the ECCE group had visual acuity <6/18, compared to only 6 patients (12%) in the SICS group.

Statistical analysis using the Chi-square test revealed this difference to be statistically significant ($\chi^2 = 7.11$, $p = 0.007$), indicating superior visual outcomes in the SICS group.

Table 2: Postoperative Visual Acuity at 6 Weeks

Visual Acuity	ECCE (n = 50)	SICS (n = 50)
≥6/18	32 (64%)	44 (88%)
<6/18	18 (36%)	6 (12%)

The comparative visual outcomes between the two surgical techniques are also illustrated in Figure 1, which demonstrates a higher proportion of patients attaining good postoperative vision in the SICS group.

Surgically Induced Astigmatism: The mean surgically induced astigmatism was calculated for both groups and is presented in Table 3. Patients who underwent ECCE had a mean astigmatism of 1.75 ± 0.42 diopters, whereas those in the SICS group had a significantly lower mean astigmatism of 0.92 ± 0.30 diopters.

Statistical comparison using Student's t-test showed this difference to be highly statistically significant ($t = 10.21$, $p < 0.001$), indicating that SICS resulted in substantially less postoperative astigmatism than ECCE.

Table 3: Surgically Induced Astigmatism (Mean ± SD)

Technique	Astigmatism (Diopters)
ECCE	1.75 ± 0.42
SICS	0.92 ± 0.30

The difference in mean surgically induced astigmatism between the two groups is graphically represented in Figure 2, which highlights the lower astigmatism associated with SICS.

Postoperative Complications: Postoperative complications observed in both groups are detailed in Table 4. Corneal edema was the most common complication and was observed in 10 patients (20%) in the ECCE group, compared to 4 patients (8%) in the SICS group. Posterior capsular rent occurred in

4 patients (8%) in the ECCE group and 2 patients (4%) in the SICS group.

Wound-related complications were more frequent in the ECCE group, with 6 patients (12%) experiencing wound leak, whereas only 1 patient (2%) in the SICS group developed this complication.

Overall, postoperative complications were more common in the ECCE group than in the SICS group.

Table 4: Postoperative Complications

Complication	ECCE (n = 50)	SICS (n = 50)
Corneal edema	10 (20%)	4 (8%)
Posterior capsular rent	4 (8%)	2 (4%)
Wound leak	6 (12%)	1 (2%)

Figures

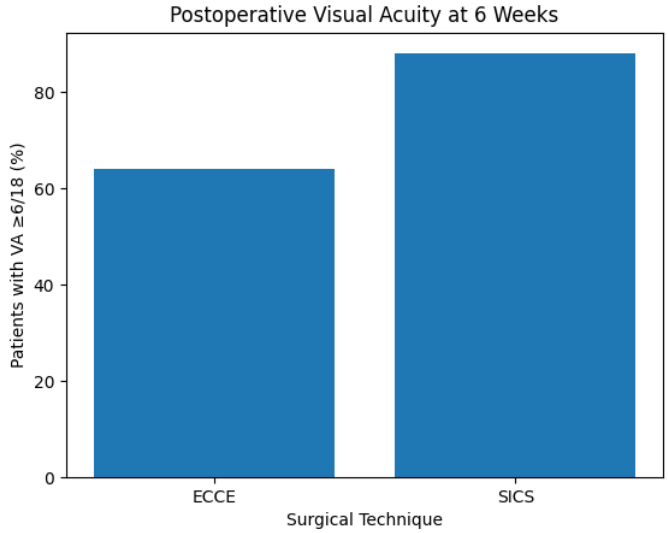

Figure 1: Comparison of postoperative visual acuity between ECCE and SICS.

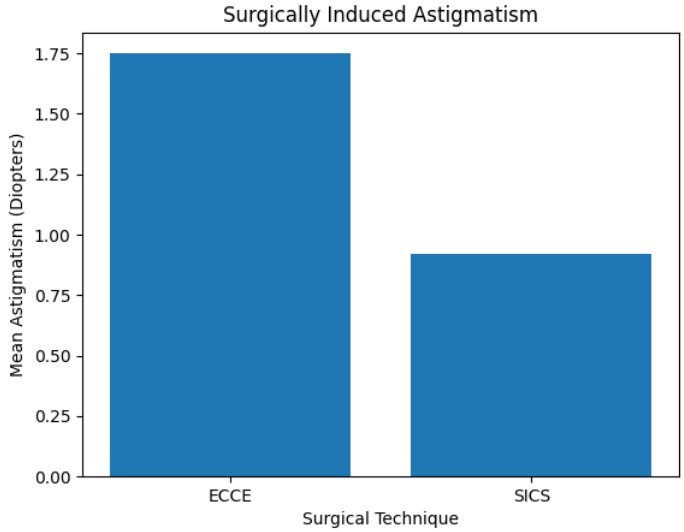

Figure 2: Comparison of mean surgically induced astigmatism between ECCE and SICS.

Discussion

The present study demonstrates that SICS provides better postoperative visual outcomes compared to conventional ECCE. A significantly higher proportion of patients in the SICS group achieved visual acuity of 6/18 or better, which is consistent with earlier studies [15].

The faster visual rehabilitation observed with SICS can be attributed to smaller, self-sealing incisions that induce less astigmatism [16]. Our findings showed significantly lower surgically induced

astigmatism in the SICS group, supporting this explanation [17].

Postoperative complications were more frequent in the ECCE group. Larger incisions and sutures in ECCE are known to increase the risk of wound-related complications and corneal edema [18]. Similar trends have been reported in other comparative studies [19].

SICS offers several advantages in high-volume cataract surgery settings, including shorter operative time and reduced dependence on costly equipment [20]. These factors are particularly relevant in government medical colleges and rural outreach programs [21].

Although phacoemulsification is considered the gold standard in developed settings, SICS provides comparable outcomes at a fraction of the cost [22]. ECCE, while effective, appears less favorable in terms of patient comfort and visual recovery [23].

The retrospective design and short follow-up period are limitations of the study. However, the findings reflect routine clinical practice and are applicable to similar tertiary care centres [24].

Overall, the study supports the gradual transition from ECCE to SICS in resource-limited settings to improve surgical outcomes and patient satisfaction [25].

Conclusion

Small incision cataract surgery is superior to conventional ECCE in terms of visual outcome, astigmatism, and postoperative complications. SICS should be preferred for cataract surgery in tertiary care hospitals in developing regions.

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