

Research Article

Visual Outcomes and Intraocular Pressure Control Following Manual Small Incision Cataract Surgery in Patients with Lens-Induced Glaucoma: A Prospective Analytic Study from a Tertiary Care Center in Rajasthan, India

Dr. Abhilasha Kumari^{1*}, Dr. Archana Garg², Dr. Urvashi Meena³, Dr. Rakesh Porwal⁴, Dr. Ram Swaroop Harsoliya⁵, Dr. Rajesh Kumari Saini⁶, Dr Ankur Kumar⁷

^{1*}3rd year Resident, Department of Ophthalmology, JLN Medical College, Ajmer.

²Professor, Department of Ophthalmology, JLN Medical College, Ajmer.

³Assistant Professor, Department of Ophthalmology, JLN Medical College, Ajmer.

⁴Senior Professor and Head, Department of Ophthalmology, JLN Medical College, Ajmer.

⁵Professor, Department of Ophthalmology, JLN Medical College, Ajmer.

⁶Associate Professor, Department of Ophthalmology, JLN Medical College, Ajmer.

⁷Assistant Professor, Department of Ophthalmology, JLN Medical College, Ajmer.

Corresponding Author: Dr. Abhilasha Kumari

3rd year Resident, Department of Ophthalmology, JLN Medical College, Ajmer.

Received: 08.05.26, Revised: 07.06.26, Accepted: 06.07.26

ABSTRACT

Background: Lens-induced glaucoma (LIG) is a vision-threatening secondary glaucoma associated with advanced cataract. Prompt surgical intervention is essential to reduce intraocular pressure (IOP), relieve symptoms, and restore visual function. Manual Small Incision Cataract Surgery (MSICS) remains a preferred treatment option in resource-limited settings because of its safety, effectiveness, and cost-efficiency.

Objective: To evaluate visual outcomes and IOP control following MSICS in patients with lens-induced glaucoma.

Methods: A hospital-based prospective analytic study was conducted in the Department of Ophthalmology, Jawaharlal Nehru Medical College, Ajmer, Rajasthan, from June 2024 to December 2025. Forty patients diagnosed with lens-induced glaucoma who underwent MSICS were included. Demographic characteristics, clinical presentation, preoperative findings, visual acuity, and IOP measurements were recorded. Patients were followed on postoperative day 1, week 1, month 1, and month 3. Statistical analysis was performed using SPSS version 26.

Results: The mean age of patients was 64.1 ± 8.9 years, with females accounting for 60% of cases. Phacomorphic glaucoma was the most common subtype (75%), followed by phacolytic glaucoma (20%). Mean IOP decreased significantly from 40.3 ± 6.2 mmHg at presentation to 19.5 ± 5.57 mmHg at three months postoperatively. Visual acuity improved substantially following surgery. At presentation, all patients had BCVA below 3/60, whereas at three months, 80% achieved BCVA of 6/36 or better. The majority of patients demonstrated satisfactory visual rehabilitation and effective IOP control.

Conclusion: MSICS is a safe and effective surgical modality for the management of lens-induced glaucoma. Early intervention provides significant improvement in visual acuity and long-term reduction of intraocular pressure, thereby minimizing the risk of irreversible glaucomatous damage.

Keywords: Lens-Induced Glaucoma, Manual Small Incision Cataract Surgery, Phacomorphic Glaucoma, Intraocular Pressure, Visual Outcome, Cataract Surgery.

INTRODUCTION

Lens-induced glaucoma (LIG) represents a group of secondary glaucomas resulting from pathological changes in the crystalline lens that interfere with aqueous humor dynamics and cause elevation of intraocular pressure (IOP). Despite advances in cataract surgical services,

LIG remains an important cause of ocular morbidity and preventable blindness in developing countries. Delayed presentation of mature and hypermature cataracts continues to be common in rural and socioeconomically disadvantaged populations, leading to acute rises in IOP and severe visual impairment (4-6).

Globally, glaucoma is one of the leading causes of irreversible blindness and poses a significant public health burden. In India, glaucoma contributes substantially to visual disability. Lens-induced glaucoma accounts for a considerable proportion of secondary glaucomas in developing nations, where access to timely cataract surgery remains limited. Phacomorphic and phacolytic glaucoma are the most frequently encountered subtypes, although lens particle and phacotopic glaucomas may also occur (5,7,8).

The pathophysiology of LIG varies according to subtype but ultimately results in impaired aqueous outflow and elevated IOP. Phacomorphic glaucoma develops due to pupillary block caused by an intumescent cataractous lens, whereas phacolytic glaucoma results from leakage of lens proteins and obstruction of the trabecular meshwork. Sustained elevation of IOP can rapidly lead to optic nerve damage, corneal edema, and irreversible visual loss if not treated promptly (4,5).

Definitive management of LIG involves removal of the pathological lens. Manual Small Incision Cataract Surgery (MSICS) is widely utilized in developing countries because it is cost-effective, technically versatile, and suitable for advanced cataracts associated with glaucoma. Previous studies have demonstrated favorable visual outcomes and effective IOP reduction following cataract extraction in patients with LIG (10,11). However, regional data from Rajasthan remain limited.

The present study was therefore undertaken to evaluate visual outcomes and intraocular pressure control following MSICS in patients with lens-induced glaucoma treated at a tertiary care teaching hospital in Rajasthan. The findings are expected to contribute valuable evidence regarding the effectiveness of MSICS in managing this potentially blinding condition.

MATERIALS AND METHODS

Study Design and Setting

A hospital-based prospective analytic study was conducted in the Department of Ophthalmology, Jawaharlal Nehru Medical College and Associated Group of Hospitals, Ajmer, Rajasthan, India. The study was carried out from June 2024 to December 2025 after obtaining approval from the Institutional Ethics Committee.

Study Population

Patients diagnosed with lens-induced glaucoma (LIG) who presented to the ophthalmology outpatient department and fulfilled the eligibility criteria were enrolled consecutively. A total of 40 patients were included in the study.

Inclusion Criteria

- Patients diagnosed with lens-induced glaucoma.
- Patients undergoing Manual Small Incision Cataract Surgery (MSICS).
- Patients willing to provide written informed consent.

Exclusion Criteria

- Glaucoma other than lens-induced glaucoma.
- History of previous ocular surgery.
- Uncontrolled systemic illness likely to affect surgical outcomes.

Preoperative Evaluation

All patients underwent comprehensive ophthalmic examination, including visual acuity assessment, slit-lamp biomicroscopy, Goldmann applanation tonometry, fundus examination, keratometry, and B-scan ultrasonography whenever posterior segment visualization was obscured. Demographic data, duration of symptoms, presenting complaints, lens status, and anterior segment findings were documented.

Preoperative Management

Patients presenting with markedly elevated IOP received medical treatment consisting of intravenous mannitol, oral acetazolamide, topical beta-blockers, corticosteroids, and cycloplegics as required. Surgery was performed after adequate IOP reduction and stabilization of ocular condition.

Surgical Technique

All patients underwent Manual Small Incision Cataract Surgery under local anesthesia. A self-sealing sclero-corneal tunnel was constructed, followed by capsulotomy, hydrodissection, nucleus delivery, cortical aspiration, and intraocular lens implantation whenever feasible. In selected cases, alternative lens fixation techniques or aphakia were necessary due to intraoperative findings.

Follow-Up

Patients were evaluated on postoperative day 1, week 1, month 1, and month 3. Visual acuity,

intraocular pressure, anterior segment findings, and postoperative complications were recorded at each visit.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using SPSS version 26. Quantitative

variables were expressed as mean $\pm$ standard deviation, whereas categorical variables were expressed as frequencies and percentages. Student's t-test and analysis of variance were used to compare mean values. A p-value <0.05 was considered statistically significant.

RESULTS

Table 1. Baseline Demographic and Clinical Characteristics of Patients (n=40)

Variable	Value
Mean Age (years)	64.1 $\pm$ 8.9
Female	24 (60%)
Male	16 (40%)
Duration 3–7 days	22 (55%)
Pain, Redness, Watering	40 (100%)
Headache	21 (52.5%)
Nausea/Vomiting	15 (37.5%)

Table 2. Distribution of Lens-Induced Glaucoma Subtypes

Subtype	N (%)
Phacomorphic Glaucoma	30 (75%)
Phacolytic Glaucoma	8 (20%)
Lens Particle Glaucoma	1 (2.5%)
Phacotopic Glaucoma	1 (2.5%)

Table 3. Preoperative Ocular Characteristics

Variable	N (%)
Grade 1 Corneal Edema	6 (15%)
Grade 2 Corneal Edema	16 (40%)
Grade 3 Corneal Edema	18 (45%)
Shallow Anterior Chamber	31 (77.5%)
Lens Particles/Flare	9 (22.5%)
Mid-dilated Sluggish Pupil	28 (70%)
Mature Cataract	30 (75%)
Hypermature Cataract	8 (20%)

Table 4. Best Corrected Visual Acuity during Follow-up

BCVA	Baseline	Week 1	Month 1	Month 3
6/6–6/12	0	0	5 (12.5%)	13 (32.5%)
6/18–6/36	0	10 (25%)	17 (42.5%)	19 (47.5%)
6/60–3/60	0	16 (40%)	14 (35%)	5 (12.5%)
<3/60	40 (100%)	14 (35%)	4 (10%)	3 (7.5%)

Table 5. Mean Intraocular Pressure during Follow-up

Follow-up	Mean IOP (mmHg)
Presentation	40.3 $\pm$ 6.2
Post-medical treatment	27.3 $\pm$ 6.85
Postoperative Day 1	24.7 $\pm$ 7.13
Week 1	23.4 $\pm$ 6.56
Month 1	21.3 $\pm$ 5.87
Month 3	19.5 $\pm$ 5.57

DISCUSSION

Lens-induced glaucoma remains an important cause of preventable visual loss in developing countries where delayed presentation of mature and hypermature cataracts is still common. In the present study, the mean age of patients was 64.1 ± 8.9 years, with most patients belonging to the elderly age group. This finding is consistent with the age-related nature of cataract formation and lens-induced glaucoma. Similar age distributions have been reported in previous studies, which observed that lens-induced glaucoma predominantly affects older individuals presenting with advanced cataracts (1,2). The higher frequency of disease among elderly patients emphasizes the importance of timely cataract detection and surgical intervention before the development of secondary glaucoma.

A female predominance was observed in the present study, with females accounting for 60% of patients. Similar observations have been documented in Indian studies, suggesting that women often present later due to socioeconomic factors, reduced healthcare accessibility, and lack of awareness regarding cataract surgery. These findings highlight the need for community-based screening programs and targeted interventions aimed at improving access to ophthalmic care among vulnerable populations.

Phacomorphic glaucoma was the most common subtype, accounting for 75% of cases, followed by phacolytic glaucoma (20%). Similar findings have been reported in previous studies, which also identified phacomorphic glaucoma as the predominant presentation of lens-induced glaucoma (3,9). The predominance of phacomorphic glaucoma may be attributed to delayed presentation of intumescent cataracts resulting in pupillary block and secondary angle closure. The relatively lower frequency of lens particle and phacotopic glaucoma in the present study is also in accordance with previously published literature.

The clinical presentation observed in this study reflects the acute and severe nature of lens-induced glaucoma. All patients presented with pain, redness, and watering, while headache and nausea/vomiting were common associated symptoms. Most patients had significant corneal edema, shallow anterior chambers, and markedly elevated intraocular pressure at presentation. Such findings are characteristic of advanced lens-induced glaucoma and indicate delayed healthcare-seeking behavior, particularly among rural populations.

One of the principal findings of the present study was the significant improvement in visual acuity following Manual Small Incision Cataract Surgery. At presentation, all patients had visual acuity worse than 3/60, whereas at three months postoperatively, 80% achieved visual acuity of 6/36 or better. These results are comparable with previous studies that demonstrated substantial visual rehabilitation following MSICS in patients with advanced cataracts and associated ocular morbidity (12,13). The marked visual improvement observed in the present study confirms that timely removal of the cataractous lens can successfully restore useful vision in most patients.

Intraocular pressure control following surgery was equally encouraging. Mean IOP decreased from 40.3 ± 6.2 mmHg at presentation to 19.5 ± 5.57 mmHg at three months postoperatively. The majority of patients achieved satisfactory IOP control during follow-up without the need for long-term antiglaucoma medications. Similar postoperative reductions in IOP have been reported in previous studies evaluating cataract extraction procedures (14,15). The sustained reduction in IOP observed in the present study demonstrates that removal of the pathological lens effectively addresses the underlying mechanism responsible for aqueous outflow obstruction.

The majority of patients underwent successful cataract extraction with satisfactory postoperative recovery. Surgical outcomes were generally favorable, and significant visual rehabilitation was achieved in most cases. Previous studies have emphasized that careful surgical planning and appropriate MSICS techniques can minimize intraoperative and postoperative complications even in advanced cataracts (11). The findings of the present study further support the continued use of MSICS as a safe, practical, and cost-effective procedure for managing lens-induced glaucoma, particularly in resource-constrained settings.

The strengths of the present study include its prospective design, standardized follow-up schedule, and comprehensive evaluation of both visual and intraocular pressure outcomes. However, certain limitations should be acknowledged. Furthermore, the follow-up period was limited to three months, preventing assessment of long-term outcomes and late postoperative complications. Larger multicentric studies with longer follow-up are

recommended to validate these findings and further establish the long-term effectiveness of MSICS in lens-induced glaucoma.

CONCLUSION

Lens-induced glaucoma is a preventable cause of severe visual impairment that commonly affects elderly patients with advanced cataracts. Phacomorphic glaucoma was the predominant subtype in the present study and was frequently associated with markedly elevated intraocular pressure and poor visual acuity at presentation.

Manual Small Incision Cataract Surgery proved to be a safe and effective treatment modality for lens-induced glaucoma. Significant improvement in best-corrected visual acuity and substantial reduction in intraocular pressure were achieved following surgery. Most patients attained satisfactory visual rehabilitation and long-term IOP control. These findings support the continued use of MSICS as an effective intervention for lens-induced glaucoma, particularly in resource-limited settings where delayed cataract presentation remains common.

REFERENCES

1. Qayum S, et al. A study to evaluate visual outcome, IOP control, and complications in patients with lens induced glaucoma following manual SICS. *Indian J Clin Exp Ophthalmol.* 2016;2(2):112-114.
2. Rajkumari V, Singh Kaminibabu K, Bhabanisana RD, Victor R. Manual small incision cataract surgery in phacomorphic glaucoma: surgical technique and outcome in North-eastern India. *J Curr Glaucoma Pract.* 2013;7(2):43-48.
3. Ramakrishnan R, Maheshwari D, Kader MA, Basti S. Visual prognosis, intraocular pressure control and complications in phacomorphic glaucoma following manual small incision cataract surgery. *Indian J Ophthalmol.* 2010;58(4):303-306.
4. Pradhan D, Hennig A, Kumar J, Foster A. A prospective study of 413 cases of lens-induced glaucoma in Nepal. *Indian J Ophthalmol.* 2001;49:103-107.
5. Kulkarni VM, Sultana N, Abid AR. Lens induced glaucoma: Clinical profile and prognosis in tertiary care centre. *Indian J Clin Exp Ophthalmol.* 2023;9(4):587-592.
6. Jarwal PN. Clinical study of lens-induced glaucoma at community health center in India. *TNOA J Ophthalmic Sci Res.* 2020;58(3):162-168.
7. Vudayana D, Sativada L, Jerry P, Kolluru P. Clinical study of lens induced glaucoma at a tertiary eye care centre. *J Evid Based Med Healthc.* 2021;8:537-541.
8. Linthoingambi N, Anthony K, Madhu A. A comprehensive overview of lens induced glaucoma: trends, management strategies and visual outcome in Northeast India. *Indian J Clin Exp Ophthalmol.* 2025;11(4):752-757.
9. Sinha M, Karn MK, Mishra D, Anand A, Singh A. Analysis of clinical profile and outcome in cases of lens-induced glaucoma. *Glob J Cataract Surg Res Ophthalmol.* 2025;4:69-75.
10. Farooq S, Khan NA, Meena R, Kochar A. Phacoemulsification in phacomorphic angle closure: our experience. *Saudi J Ophthalmol.* 2023;37(2):90-93.
11. Gurung R, Hennig A. Small incision cataract surgery: tips for avoiding surgical complications. *Community Eye Health.* 2008;21(65):4-5.
12. Jha RK, Priya B, Solu TM, Patel I. Visual outcome and complications of small-incision cataract surgery. *Oman J Ophthalmol.* 2023;16(1):51-54.
13. Khan MT, Jan S, Hussain Z, Karim S, Khalid MK, Mohammad L. Visual outcome and complications of manual sutureless small incision cataract surgery. *Ophthalmologica.* 2010;26:32-38.
14. Varghese LM, Hegde V, Lukose S. Intraocular pressure changes following small-incision cataract surgeries in a tertiary care center: a prospective study. *Delta J Ophthalmol.* 2023;24(3):160-166.
15. Dimitrov PN, Mukesh BN, Taylor HR, McCarty CA. Intraocular pressure before and after cataract surgery in participants of the Melbourne Visual Impairment Project. *Clin Exp Ophthalmol.* 2001;29:128-132.