E-ISSN 2250-0944
ISSN 2250-1150
doi: 10.31838/ijprt/16.01.651

Research Article

Comparative Evaluation of Visual Outcomes, Intraocular Pressure Control, and Complications Following Temporal Manual Small Incision Cataract Surgery Versus Phacoemulsification in Eyes with Previous Trabeculectomy

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Received: 01.05.2026 Revised: 30.05.2026 Accepted: 29.06.2026

ABSTRACT

Background: Cataract formation is a common late complication following trabeculectomy and may adversely affect visual function in glaucoma patients. Cataract surgery in eyes with previous trabeculectomy requires careful surgical planning to preserve filtering bleb function and maintain intraocular pressure (IOP) control. Temporal Manual Small Incision Cataract Surgery (MSICS) and temporal phacoemulsification are commonly performed procedures; however, comparative evidence regarding their outcomes in post-trabeculectomy eyes remains limited.

Aim: To compare visual outcomes, intraocular pressure control, keratometric changes, and complications following temporal MSICS and phacoemulsification in eyes with previous trabeculectomy.

Methods: This prospective interventional study included 60 patients with visually significant cataract and prior trabeculectomy. Patients were allocated into two groups: Group A underwent temporal MSICS (n=30), while Group B underwent temporal phacoemulsification (n=30). Best-corrected visual acuity (BCVA), intraocular pressure, keratometry readings, and surgical complications were evaluated preoperatively and during postoperative follow-up.

Results: The mean age of participants was 62.01 ± 7.8 years. Both groups demonstrated a transient rise in IOP on postoperative day 1, followed by stabilization near preoperative values by one month. Significant keratometric changes were observed in both groups ($p<0.01$). Visual acuity improved substantially in both groups; however, phacoemulsification showed comparatively better visual recovery at one month. Intraoperative complications occurred more frequently in the MSICS group than in the phacoemulsification group.

Conclusion: Both temporal MSICS and phacoemulsification are safe and effective procedures for cataract extraction in eyes with previous trabeculectomy. Phacoemulsification provides superior visual rehabilitation with fewer complications while maintaining satisfactory postoperative IOP control.

Keywords: Trabeculectomy, Cataract Surgery, Phacoemulsification, Manual Small Incision Cataract Surgery, Intraocular Pressure, Visual Outcome.

INTRODUCTION

Glaucoma is a chronic progressive optic neuropathy characterized by degeneration of retinal ganglion cells, retinal nerve fiber layer thinning, optic disc changes, and corresponding visual field defects. It remains one of the leading causes of irreversible blindness worldwide and poses a significant public health challenge. According to global estimates, the prevalence of glaucoma among individuals aged 40–80 years is approximately 3.54%, and the burden of disease is expected to increase

substantially with the aging population, particularly in developing countries (1). In India, glaucoma affects a considerable proportion of the adult population, with prevalence estimates ranging from 2.7% to 4.3%, making it one of the major causes of irreversible visual impairment (2–4).

The primary goal of glaucoma management is to reduce intraocular pressure (IOP), the most important modifiable risk factor associated with disease progression. Treatment options include topical antiglaucoma medications, laser procedures, and surgical interventions. Trabeculectomy remains the gold standard filtering surgery for patients with glaucoma inadequately controlled by medical therapy. The procedure lowers IOP by creating an alternative aqueous outflow pathway through a subconjunctival filtering bleb, thereby preserving visual function and slowing disease progression (5,6).

Despite its effectiveness, trabeculectomy is associated with several long-term complications, among which cataract formation is particularly common. Cataract progression has been reported in a substantial proportion of patients following filtering surgery. Several mechanisms contribute to cataract development, including postoperative inflammation, prolonged hypotony, shallow anterior chamber formation, corticosteroid use, and altered aqueous humor dynamics. Posterior subcapsular cataract is frequently observed, although progression of nuclear sclerosis has also been reported (5,7).

Cataract surgery in eyes with previous trabeculectomy presents unique clinical challenges. Surgical manipulation may compromise bleb function, induce inflammation, and affect postoperative IOP control. Therefore, preservation of the filtering bleb while achieving optimal visual rehabilitation remains the principal objective of cataract extraction in such patients. Temporal surgical approaches are generally preferred because they avoid disturbance of the superior conjunctiva and reduce the risk of bleb failure (5,7).

Temporal Manual Small Incision Cataract Surgery (MSICS) and phacoemulsification are the two most commonly employed surgical techniques for cataract extraction in post-trabeculectomy eyes. Temporal MSICS is cost-effective and particularly advantageous in dense cataracts; however, the larger scleral tunnel incision may induce greater postoperative inflammation and surgically induced astigmatism. In contrast, phacoemulsification utilizes a smaller clear corneal incision, resulting in reduced tissue trauma, faster visual recovery, lower postoperative inflammation, and potentially improved preservation of bleb function (8,9).

Several studies have compared MSICS and phacoemulsification in terms of visual outcomes, postoperative astigmatism, complication rates, and surgical safety. Although both procedures provide satisfactory long-term visual rehabilitation, phacoemulsification has generally been associated with faster visual recovery and fewer intraoperative complications (8–12). However, evidence comparing these two techniques specifically in eyes with previous trabeculectomy remains limited, particularly in the Indian population.

Therefore, the present study was undertaken to compare temporal MSICS and temporal phacoemulsification in patients with previous trabeculectomy and to evaluate their effectiveness with respect to visual outcomes, intraocular pressure control, keratometric changes, and postoperative complications.

MATERIALS AND METHODS

Study Design and Setting

A hospital-based prospective interventional comparative 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 over a period of 18 months after obtaining approval from the Institutional Ethics Committee.

Study Population

Patients presenting with visually significant cataract and a previous history of trabeculectomy were screened for eligibility. A total of 60 eyes of 60 patients fulfilling the inclusion and exclusion criteria were enrolled in the study.

Sample Size

Based on previous published literature and assuming 95% confidence level with 80% study power, a sample size of 30 patients in each group was calculated.

Inclusion Criteria

- Age >40 years.
- History of previous trabeculectomy.
- Visually significant cataract with BCVA <20/40.
- Willingness to participate in the study and provide informed consent.

Exclusion Criteria

- Active ocular infection or inflammation.
- Previous ocular surgery other than trabeculectomy.
- Uncontrolled glaucoma despite antiglaucoma medications.
- Significant retinal or optic nerve pathology affecting visual outcome.

Study Groups

Participants were allocated into two groups:

Group A (n=30): Temporal Manual Small Incision Cataract Surgery (MSICS)

Group B (n=30): Temporal Phacoemulsification with foldable intraocular lens implantation

Preoperative Evaluation

All patients underwent detailed ophthalmic evaluation including:

- Best corrected visual acuity (BCVA)
- Refraction
- Slit lamp biomicroscopy
- Intraocular pressure measurement
- Gonioscopy
- Fundus examination
- Visual field analysis whenever feasible
- Optical coherence tomography (OCT) assessment
- Keratometry

Surgical Technique

Temporal Manual Small Incision Cataract Surgery

A temporal self-sealing scleral tunnel incision was fashioned followed by continuous curvilinear capsulorhexis, hydrodissection, manual nucleus delivery, cortical aspiration, and posterior chamber intraocular lens implantation.

Temporal Phacoemulsification

A temporal clear corneal incision was created followed by capsulorhexis, hydrodissection, and phacoemulsification of the nucleus, cortical aspiration, and implantation of a foldable posterior chamber intraocular lens.

Follow-up

Patients were examined at:

- Postoperative Day 1
- End of Week 1
- End of Month 1

During each visit, BCVA, IOP, keratometry findings, and complications were documented.

Outcome Measures

Primary Outcomes

- Visual outcome (BCVA)
- Intraocular pressure control

Secondary Outcomes

- Keratometric changes
- Intraoperative complications
- Early postoperative complications

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using appropriate statistical software. Continuous variables were expressed as mean ± standard deviation, whereas categorical variables were expressed as frequency and percentage. Independent t-test, paired t-test, and Chi-square/Fisher's exact test were applied as appropriate. A p-value <0.05 was considered statistically significant.

RESULTS

Table 1. Baseline Characteristics of Study Participants

Variable	Temporal MSICS (n=30)	Phacoemulsification (n=30)	p-value
Mean Age (years)	62.4 ± 9.8	61.6 ± 5.21	0.708
Male Gender	17 (56.6%)	18 (60.0%)	1.000
Female Gender	13 (43.3%)	12 (40.0%)	
Right Eye	10 (33.3%)	12 (41.7%)	1.000
Left Eye	20 (66.7%)	18 (58.3%)	
Duration since Trabeculectomy (months)	44.6 ± 49.2	56.4 ± 71.3	0.458

Baseline Characteristics

A total of 60 patients were included in the study, with 30 patients in each group. The mean age was comparable between the two groups (p=0.708). Male predominance was observed in both groups. Left eye involvement was more frequent than right eye involvement. The mean duration since trabeculectomy did not differ significantly between the groups.

Table 2. Comparison of Intraocular Pressure (Mmhg)

Follow-up	Temporal MSICS	Phacoemulsification
Preoperative	14.9 ± 2.19	14.6 ± 2.74
Day 1	16.1 ± 2.45*	16.5 ± 1.77*
Week 1	14.5 ± 1.46	14.3 ± 2.19
Month 1	14.4 ± 1.87	14.2 ± 1.83

*Significant increase compared with baseline ($p<0.05$)

Intraocular Pressure Outcome

Both groups demonstrated a transient postoperative rise in IOP on the first postoperative day. However, IOP values gradually returned to near preoperative levels by one week and remained stable at one month. No significant long-term deterioration in pressure control was observed in either group.

Table 3. Keratometric Changes at One Month

Variable	Temporal MSICS	Phacoemulsification
K1 Preoperative (D)	43.8 ± 1.74	43.7 ± 2.04
K1 Month 1 (D)	43.5 ± 1.83	43.5 ± 1.95
K2 Preoperative (D)	44.8 ± 1.55	44.8 ± 1.70
K2 Month 1 (D)	45.0 ± 1.51	45.0 ± 1.69

Keratometric Outcome

Significant postoperative keratometric changes were observed in both groups. K1 values decreased slightly, whereas K2 values increased modestly at one month, indicating surgically induced corneal curvature changes following cataract extraction.

Table 4. Intraoperative Complications

Complication	Temporal MSICS	Phacoemulsification
No complication	26 (86.6%)	29 (96.6%)
Posterior capsular rupture	2 (6.6%)	1 (3.3%)
Zonular dialysis/Aphakia	2 (6.6%)	0

Surgical Safety

Most surgeries were completed without complications. Intraoperative complications were more frequent in the MSICS group. Posterior capsular rupture was the most common complication, while zonular dialysis occurred only in the MSICS group.

Table 5. Best Corrected Visual Acuity at One Month

BCVA	Temporal MSICS (n=30)	Phacoemulsification (n=30)
6/9	2 (6.7%)	2 (6.7%)
6/12	3 (10.0%)	7 (23.3%)
6/18	4 (13.3%)	6 (20.0%)
6/24	6 (20.0%)	6 (20.0%)
6/36	4 (13.3%)	6 (20.0%)
6/60	6 (20.0%)	2 (6.7%)
<6/60	5 (16.7%)	1 (3.3%)

Visual Outcome

Both procedures resulted in substantial visual improvement during follow-up. However, the phacoemulsification group demonstrated superior visual rehabilitation at one month, with a greater proportion of patients achieving BCVA of 6/12 or better. Poor visual outcomes (<6/60) were less frequent in the phacoemulsification group.

DISCUSSION

The present prospective interventional study compared visual outcomes, intraocular pressure (IOP) control, keratometric changes, and complications following temporal Manual Small Incision Cataract Surgery (MSICS) and temporal phacoemulsification in eyes with previous trabeculectomy. Cataract formation is a

common long-term consequence of trabeculectomy, and cataract extraction in such eyes requires special attention because postoperative inflammation and surgical manipulation may adversely affect filtering bleb function and IOP control.

In the present study, the mean age of patients was 62.01 ± 7.8 years, and most participants were elderly males. These findings are consistent with those reported by Husain et al. and Shingleton et al., who observed that cataract surgery following trabeculectomy is most frequently required in older glaucoma patients (5,6). Comparable baseline characteristics between both study groups ensured appropriate comparison of surgical outcomes.

A transient increase in IOP was observed in both groups on the first postoperative day, followed by a return to near-baseline values by the first week and one month. This temporary rise may be related to retained viscoelastic material, postoperative inflammation, and transient impairment of aqueous outflow. However, the absence of significant long-term IOP elevation suggests satisfactory preservation of filtering bleb function. Similar findings were reported by Manoj et al. and Kosmin et al., who demonstrated stable postoperative IOP control following cataract surgery in trabeculectomized eyes (13,14). Casson et al. also reported that cataract extraction can be safely performed without significant compromise of long-term pressure control (7).

Keratometric evaluation showed significant postoperative changes in both groups. A mild reduction in K1 values and increase in K2 values were observed at one month, indicating surgically induced corneal remodeling. Although temporal MSICS involves a larger incision and may theoretically induce greater astigmatism, the overall keratometric changes remained clinically acceptable. Similar observations have been reported by Ruit et al. and Gogate et al., who found that both MSICS and phacoemulsification produce predictable postoperative corneal curvature changes with satisfactory visual outcomes (8,9).

The majority of surgeries in both groups were completed without complications. However, intraoperative complications were slightly more frequent in the MSICS group, with posterior capsular rupture and zonular dialysis being the most common events. Phacoemulsification demonstrated a better safety profile, likely because of smaller incision size, reduced tissue manipulation, and improved anterior chamber stability. These findings are consistent with previous studies by Gogate et al., Kamonporn and Kongsap, Khanna et al., and Haripriya et al., all of whom reported lower complication rates with phacoemulsification compared with MSICS (9–12).

Visual rehabilitation was significantly improved in both groups; however, patients undergoing phacoemulsification achieved comparatively better visual outcomes at one month. Faster visual recovery in the phacoemulsification group may be attributed to reduced surgically induced astigmatism, lower postoperative inflammation, and faster wound healing. Similar results have been reported by Ruit et al. and Gogate et al., who demonstrated superior early visual recovery following phacoemulsification despite comparable long-term outcomes between the two procedures (8,9). Nitikarun and Kongsap also reported favorable visual outcomes with both techniques while highlighting the advantages of phacoemulsification regarding recovery and complication profile (15).

The strengths of this study include its prospective design and direct comparison of two commonly performed cataract surgery techniques in eyes with previous trabeculectomy. However, limitations include a relatively small sample size, short follow-up duration, and single-center design. Long-term bleb morphology, endothelial cell loss, and patient-reported quality-of-life outcomes were not evaluated.

Overall, both temporal MSICS and phacoemulsification were found to be safe and effective procedures for cataract extraction in post-trabeculectomy eyes. However, phacoemulsification provided superior visual rehabilitation, fewer intraoperative complications, and satisfactory postoperative IOP control, making it the preferred surgical option whenever feasible.

CONCLUSION

Both temporal Manual Small Incision Cataract Surgery and temporal phacoemulsification were found to be safe and effective techniques for cataract extraction in eyes with previous trabeculectomy. Both procedures maintained satisfactory postoperative intraocular pressure control and preserved the functional success of the filtering bleb. Although a transient rise in IOP was observed on the first postoperative

day, pressure levels returned close to baseline during subsequent follow-up visits.

Phacoemulsification demonstrated comparatively better visual outcomes, faster visual rehabilitation, and fewer intraoperative complications than temporal MSICS. Therefore, while both procedures remain viable options in post-trabeculectomy eyes, temporal phacoemulsification may be considered the preferred technique whenever surgical expertise and resources are available.

REFERENCES

1. Tham YC, Li X, Wong TY, Quigley HA, Aung T, Cheng CY. Global prevalence of glaucoma and projections through 2040. Ophthalmology. 2014;121(11):2081-2090.
2. Dandona L, Dandona R, Srinivas M, et al. Open-angle glaucoma in an urban population in southern India. Ophthalmology. 2000;107:1702-1709.
3. Ramakrishnan R, Nirmalan PK, Krishnadas R, et al. Glaucoma in a rural population of south India. Ophthalmology. 2003;110:1484-1490.
4. Vijaya L, George R, Baskaran M, et al. Prevalence of primary open-angle glaucoma in an urban south Indian population. Ophthalmology. 2008;115:648-654.
5. Husain R, Liang S, Foster PJ, et al. Cataract surgery after trabeculectomy: the effect on trabeculectomy function. Arch Ophthalmol. 2012;130(2):165-170.
6. Shingleton BJ, Gamell LS, O'Donoghue MW, Baylus SL, King R. Long-term changes in intraocular pressure after clear corneal phacoemulsification. J Cataract Refract Surg. 1999;25(7):885-890.
7. Casson RJ, Riddell CE, Rahman R, Byles D, Salmon JF. Long-term effect of cataract surgery on intraocular pressure after trabeculectomy. J Cataract Refract Surg. 2002;28(12):2159-2164.
8. Ruit S, Tabin G, Chang D, et al. A prospective randomized clinical trial of phacoemulsification versus manual small-incision cataract surgery in Nepal. Am J Ophthalmol. 2007;143(1):32-38.
9. Gogate PM, Kulkarni SR, Krishnaiah S, et al. Safety and efficacy of phacoemulsification compared with manual small-incision cataract surgery by a randomized controlled clinical trial. Ophthalmology. 2005;112(5):869-874.
10. Kamonporn N, Kongsap P. The visual outcomes and complications of manual small incision cataract surgery and phacoemulsification: long-term results. Rom J Ophthalmol. 2021;65(1):31-37.
11. Khanna RC, Kaza S, Shantha GPS, Sangwan VS. Comparative outcomes of manual small incision cataract surgery and phacoemulsification performed by trainees. BMJ Open. 2012;2:e001035.
12. Haripriya A, Chang DF, Reena M, Shekhar M. Complication rates of phacoemulsification and manual small-incision cataract surgery. J Cataract Refract Surg. 2012;38:1360-1369.
13. Manoj B, Chako D, Khan MY. Effect of extracapsular cataract extraction and phacoemulsification performed after trabeculectomy on intraocular pressure. J Cataract Refract Surg. 2000;26(1):75-78.
14. Kosmin AS, Wishart PK, Ridges PJG. Long-term intraocular pressure control after cataract extraction with trabeculectomy: phacoemulsification versus extracapsular technique. J Cataract Refract Surg. 1998;24(2):249-255.
15. Nitikarun P, Kongsap P. A Comparative Study of Manual Small Incision Cataract Surgery Versus Phacoemulsification in Glaucoma Patients with Hard Cataract: An 18-Month Follow-Up. J Med Assoc Thai. 2025;108:755.