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VISUAL OUTCOMES FOLLOWING MANUAL SMALL INCISION CATARACT SURGERY USING CLEAR CORNEAL TEMPORAL INCISION: A PROSPECTIVE CLINICAL STUDY

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ABSTRACT

Background: Cataract remains the leading cause of reversible blindness worldwide, particularly in low- and middle-income countries where access to advanced surgical technologies may be limited. Manual small incision cataract surgery (MSICS) is a cost-effective and widely practiced technique that provides excellent visual outcomes comparable to phacoemulsification.

Materials and Methods: A prospective interventional clinical study was conducted on **50 eyes of 50 patients** with age-related senile cataract who underwent temporal clear corneal MSICS at the Department of Ophthalmology, Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar, between July 2024 and December 2025. Preoperative assessment included measurement of uncorrected visual acuity (UCVA), best-corrected visual acuity (BCVA), slit-lamp biomicroscopy, keratometry, intraocular pressure, and fundus examination.

Results: The mean age of the study population was 64.8 ± 7.5 years, with females comprising 56% of participants. Mean UCVA improved significantly from 1.18 ± 0.26 logMAR preoperatively to 0.10 ± 0.08 logMAR at three months ($p < 0.001$). Mean BCVA improved from 0.94 ± 0.22 logMAR preoperatively to 0.04 ± 0.05 logMAR at the final follow-up ($p < 0.001$). At three months, 90% of patients achieved a BCVA of 6/9 or better, including 54% attaining 6/6 vision.

Conclusion: Temporal clear corneal manual small incision cataract surgery is a safe, effective, and economical technique that provides excellent visual rehabilitation with minimal surgically induced astigmatism and a low rate of postoperative complications.

Keywords: Cataract; Manual small incision cataract surgery; Temporal clear corneal incision; Visual outcome; Surgically induced astigmatism; Best-corrected visual acuity; Refractive outcome.

INTRODUCTION

Cataract remains the leading cause of reversible blindness and visual impairment worldwide, accounting for a substantial proportion of preventable blindness, particularly in low- and middle-income countries. Despite remarkable advances in ophthalmic surgery, cataract continues to pose a major public health challenge because of increasing life expectancy, population aging, and unequal access to surgical care. According to the World Health Organization (WHO), cataract is responsible for millions of cases of blindness globally, emphasizing the importance of timely surgical intervention for restoring vision and improving quality of life.[1] Cataract surgery is among the most frequently performed surgical procedures worldwide and has evolved significantly over the past several decades, transitioning from large-incision extracapsular cataract extraction to minimally invasive techniques that provide faster visual rehabilitation and superior refractive outcomes.[2] These advancements have substantially improved postoperative visual acuity, patient satisfaction, and overall surgical safety while reducing complication rates.[3]

Among the currently available surgical techniques, Manual Small Incision Cataract Surgery (MSICS) has emerged as an effective, economical, and reliable alternative to phacoemulsification, particularly in developing countries where access to sophisticated surgical equipment may be limited. MSICS combines the advantages of a self-sealing scleral or corneal tunnel with manual nucleus delivery, eliminating the need for expensive phacoemulsification machines while maintaining excellent postoperative outcomes.[4] Numerous studies have demonstrated that MSICS provides visual results comparable to phacoemulsification, especially in patients with advanced or dense cataracts, while offering additional benefits such as shorter operative time, lower surgical cost, reduced dependence on technology, and suitability for high-volume cataract surgery programs.[5] Consequently, MSICS continues to play a pivotal role in national blindness control programs across many resource-constrained regions.

The success of cataract surgery is influenced by multiple factors, including surgical technique, incision architecture, intraocular lens implantation, surgeon expertise, postoperative care, and pre-existing ocular conditions. Among these variables, the location and configuration of the surgical incision have received considerable attention because they directly affect wound stability, surgically induced astigmatism (SIA), corneal biomechanics, postoperative inflammation, and speed of visual recovery.[6] A well-constructed incision minimizes corneal distortion, maintains anterior chamber stability during surgery, promotes rapid wound healing, and contributes to excellent refractive outcomes. Therefore, optimizing incision placement has become an important consideration in modern cataract surgery.

Traditionally, superior scleral tunnel incisions have been widely employed in MSICS because of their familiarity among surgeons and excellent wound integrity. However, superior incisions may induce greater postoperative astigmatism due to gravitational forces, eyelid pressure, and the biomechanical effects exerted on the superior cornea during healing. These factors may delay visual rehabilitation and compromise uncorrected visual acuity in the early postoperative period.[7] In contrast, temporal incisions have gained increasing popularity because they are positioned farther from the visual axis and are subjected to less eyelid pressure, thereby reducing surgically induced corneal flattening. As a result, temporal incisions are associated with lower postoperative astigmatism, earlier refractive stability, and faster visual recovery.[8]

The clear corneal temporal incision represents a further refinement in cataract surgery. Unlike scleral tunnel approaches, clear corneal incisions are entirely located within the corneal tissue and are generally self-sealing, allowing sutureless surgery with minimal tissue trauma. These incisions facilitate quicker wound healing, reduced conjunctival manipulation, shorter operating time, decreased postoperative discomfort, and rapid restoration of vision.[9] The temporal location further minimizes changes in corneal curvature, thereby improving uncorrected postoperative visual acuity and reducing dependence on corrective spectacles. Additionally, temporal clear corneal incisions provide superior surgical ergonomics in patients with deep-set eyes, prominent brows, or limited neck mobility, making them particularly advantageous in selected clinical situations.[10]

Visual outcome remains the principal indicator of success following cataract surgery. Parameters commonly used to assess visual outcomes include uncorrected visual acuity (UCVA), best-corrected visual acuity (BCVA), refractive error, surgically induced astigmatism, corneal clarity, wound integrity, postoperative complications, and patient-reported quality of vision.[3] Modern cataract surgery aims not only to remove the opaque crystalline lens but also to achieve rapid visual rehabilitation with minimal refractive error and maximum patient satisfaction. Consequently, evaluating the influence of incision type on postoperative vision has become increasingly relevant in contemporary ophthalmic practice.

Several comparative studies have demonstrated favorable visual and refractive outcomes with temporal incisions, yet variations in surgical technique, patient characteristics, cataract density, follow-up duration, and outcome measures continue to produce heterogeneous findings. Moreover, evidence specifically evaluating clear corneal temporal incisions in MSICS remains relatively limited compared with studies involving phacoemulsification. Therefore, prospective clinical studies are essential to generate evidence regarding the safety, efficacy, refractive stability, and visual performance associated with this surgical approach under routine clinical conditions.[5]

In view of these considerations, the present prospective clinical study aims to evaluate the visual outcomes following Manual Small Incision Cataract Surgery using a clear corneal temporal incision. By systematically assessing postoperative visual acuity and clinical outcomes over the follow-up period, this study seeks to provide evidence regarding the effectiveness of this incision technique in achieving optimal visual rehabilitation. The findings may assist ophthalmic surgeons in selecting the most appropriate surgical approach, improving postoperative refractive outcomes, and enhancing the quality of cataract care, particularly in high-volume surgical centers and resource-limited healthcare settings.

MATERIALS AND METHODS

Study Design and Setting

This prospective, interventional, single-arm clinical study was conducted in the Department of Ophthalmology at Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar, Punjab, India. The study was carried out over a period of 18 months from July 2024 to December 2025 after obtaining approval from the Institutional Ethics Committee. The study adhered to the principles of the Declaration of Helsinki. Written informed consent was obtained from all participants before enrolment.

Study Population

A total of 50 consecutive patients (50 eyes) diagnosed with visually significant age-related senile cataract and scheduled for Manual Small Incision Cataract Surgery (MSICS) were included in the study.

Only one eye per patient was enrolled to avoid inter-eye correlation. Consecutive eligible patients attending the outpatient department during the study period were recruited until the desired sample size was achieved.

Sample Size

The study included 50 eyes undergoing temporal clear corneal MSICS. Since this was a prospective clinical evaluation designed to assess postoperative visual outcomes following a standardized surgical technique, all eligible consecutive patients during the study period were included.

Eligibility Criteria

Inclusion Criteria

Patients fulfilling all of the following criteria were enrolled:

- Age ≥50 years.
- Age-related senile cataract causing visual impairment.
- Planned elective Manual Small Incision Cataract Surgery.
- Ability to comply with scheduled postoperative follow-up visits.
- Provision of written informed consent.

Exclusion Criteria

Patients with any of the following conditions were excluded:

- Traumatic, congenital, developmental, complicated or secondary cataract.
- Previous ocular surgery including cataract, glaucoma or refractive surgery.
- Corneal opacity, keratoconus, corneal ectasia or previous keratoplasty.
- Active ocular surface disease.
- Uveitis.
- Pseudoexfoliation syndrome with zonular instability.
- Mature glaucoma or filtering bleb.
- Significant retinal pathology limiting postoperative visual recovery (age-related macular degeneration, diabetic macular edema, retinal detachment, advanced diabetic retinopathy).
- Optic nerve disorders affecting visual acuity.
- Uncontrolled diabetes mellitus or uncontrolled systemic hypertension.
- Intraoperative complications requiring conversion to another surgical technique.

Preoperative Assessment

All patients underwent a standardized ophthalmic examination before surgery.

The following parameters were recorded:

- Detailed demographic profile
- Medical and ocular history
- Uncorrected Distance Visual Acuity (UDVA)
- Best Corrected Distance Visual Acuity (BCDVA)
- Manifest refraction
- Slit-lamp biomicroscopy
- Cataract grading using Lens Opacities Classification System III (LOCS III)
- Intraocular pressure measured using Non-contact Tonometry
- Keratometry using NIDEK ARK-1 Auto Refractometer/Keratometer
- Axial length and intraocular lens power calculation using optical biometry
- Dilated fundus examination using indirect ophthalmoscopy and slit-lamp biomicroscopy with a +90 D lens.

Visual acuity measurements were converted into logarithm of the minimum angle of resolution (logMAR) units for statistical analysis.

Surgical Technique

All surgeries were performed by a single experienced cataract surgeon to eliminate inter-surgeon variability.

Following peribulbar anesthesia using 2% lignocaine with hyaluronidase, a 5.5-mm self-sealing temporal clear corneal incision was fashioned approximately 1.0–1.5 mm anterior to the limbus.

A side-port incision was created followed by injection of a cohesive ophthalmic viscosurgical device into the anterior chamber. Continuous curvilinear capsulorhexis measuring approximately 5.5–6.0 mm was performed, followed by hydrodissection and hydrodelineation.

The nucleus was prolapsed into the anterior chamber and delivered using an irrigating wire vectis with viscoexpression. Residual cortical matter was removed using a Simcoe irrigation–aspiration cannula.

A rigid posterior chamber polymethyl methacrylate (PMMA) intraocular lens was implanted into the capsular bag. Thorough removal of viscoelastic material was performed before reforming the anterior chamber with balanced salt solution. Stromal hydration was carried out to ensure watertight closure of the corneal incision. No sutures were required in any patient.

Subconjunctival gentamicin and dexamethasone injections were administered at the conclusion of surgery, followed by application of an eye pad.

Postoperative Treatment

All patients received a standardized postoperative regimen consisting of

- Topical moxifloxacin 0.5% four times daily for two weeks.
- Prednisolone acetate 1% eye drops tapered over six weeks.
- Nepafenac 0.1% three times daily for four weeks.
- Lubricating eye drops as required.

Compliance with medications was assessed during follow-up visits.

Follow-up Schedule

Patients were examined on

- Postoperative Day 1
- Week 1
- Month 1
- Month 3

At each visit, the following assessments were performed:

- Uncorrected Distance Visual Acuity (UDVA)
- Best Corrected Distance Visual Acuity (BCDVA)
- Slit-lamp examination
- Corneal wound assessment
- Anterior chamber reaction
- Intraocular pressure
- Keratometry
- Manifest refraction
- Posterior segment evaluation after pupillary dilatation

Outcome Measures

Primary Outcome

The primary outcome measure was improvement in postoperative visual acuity, assessed using:

- Uncorrected Distance Visual Acuity (UDVA)
- Best Corrected Distance Visual Acuity (BCDVA)

at one and three months after surgery.

Secondary Outcomes

Secondary outcome measures included

- Refractive outcome
- Surgically induced astigmatism (SIA)
- Corneal wound integrity
- Early postoperative complications
- Late postoperative complications
- Need for spectacle correction
- Time to visual rehabilitation

Surgically induced astigmatism was calculated using vector analysis with the SIA Calculator Version 2.1.

Statistical Analysis

Data were entered into Microsoft Excel and analysed using IBM SPSS Statistics version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation (SD), whereas categorical variables were presented as frequencies and percentages.

Normality of data distribution was assessed using the Shapiro–Wilk test. Changes in postoperative visual acuity and refractive parameters across follow-up visits were analysed using repeated-measures analysis of variance (ANOVA) for normally distributed variables or the Friedman test for non-parametric data. Pairwise comparisons were performed using Bonferroni correction where appropriate.

Associations between categorical variables were analysed using the Chi-square test or Fisher's exact test. A two-sided P-value <0.05 was considered statistically significant.

RESULTS

A total of 50 eyes of 50 patients with senile cataract underwent Manual Small Incision Cataract Surgery (MSICS) using a clear corneal temporal incision. All patients completed the scheduled postoperative follow-up visits up to three months. No intraoperative conversion to another surgical technique was required.

Table 1: Baseline demographic and clinical characteristics of study participants (n = 50)

Variable	Value
Age (years), Mean ± SD	64.8 ± 7.5
Age range (years)	52–81
Male, n (%)	22 (44.0)
Female, n (%)	28 (56.0)
Right eye, n (%)	27 (54.0)
Left eye, n (%)	23 (46.0)
Nuclear sclerosis Grade II, n (%)	12 (24.0)
Grade III, n (%)	26 (52.0)
Grade IV, n (%)	12 (24.0)
Preoperative UCVA (logMAR), Mean ± SD	1.18 ± 0.26
Preoperative BCVA (logMAR), Mean ± SD	0.94 ± 0.22

Table 1 presents the baseline demographic and clinical characteristics of the study population. A total of 50 patients with senile cataract underwent manual small incision cataract surgery using a temporal clear corneal incision. The mean age of the participants was 64.8 ± 7.5 years (range: 52–81 years). Females constituted 56.0% (n = 28) of the study population, while males accounted for 44.0% (n = 22). The right eye was operated in 54.0% of patients and the left eye in 46.0%. Grade III nuclear sclerosis was the most common cataract grade, observed in 52.0% of patients, followed by Grade II (24.0%) and Grade IV (24.0%). The mean preoperative uncorrected visual acuity (UCVA) was 1.18 ± 0.26 logMAR, whereas the mean best-corrected visual acuity (BCVA) was 0.94 ± 0.22 logMAR, indicating significant visual impairment before surgery.

Table 2: Improvement in visual acuity following temporal clear corneal MSICS

Follow-up	UCVA (logMAR) Mean ± SD	BCVA (logMAR) Mean ± SD	p value*
Preoperative	1.18 ± 0.26	0.94 ± 0.22	—
Day 1	0.54 ± 0.18	0.36 ± 0.14	<0.001
Week 1	0.31 ± 0.15	0.20 ± 0.09	<0.001
Month 1	0.18 ± 0.10	0.10 ± 0.06	<0.001
Month 3	0.10 ± 0.08	0.04 ± 0.05	<0.001

Table 2 demonstrates the changes in uncorrected and best-corrected visual acuity at different postoperative follow-up visits. Both UCVA and BCVA showed progressive improvement from the first postoperative day onwards. The mean UCVA improved from 1.18 ± 0.26 logMAR preoperatively to 0.10 ± 0.08 logMAR at three months. Similarly, the mean BCVA improved from 0.94 ± 0.22 logMAR before surgery to 0.04 ± 0.05 logMAR at the final follow-up. Repeated measures ANOVA demonstrated that the improvement in visual acuity at each postoperative visit was statistically significant compared with the preoperative values ($p < 0.001$), indicating excellent visual rehabilitation following temporal clear corneal MSICS.

Table 3: Distribution of postoperative best corrected visual acuity

BCVA at 3 months	Number	Percentage
6/6	27	54.0
6/9	18	36.0
6/12	4	8.0
6/18	1	2.0
Worse than 6/18	0	0

Table 3 shows the distribution of best-corrected visual acuity at three months after surgery. More than half of the patients (54.0%) achieved a BCVA of 6/6, while 36.0% attained 6/9 vision. Only four patients (8.0%) had a final BCVA of 6/12, and one patient (2.0%) achieved 6/18. None of the patients had a postoperative BCVA worse than 6/18. Overall, 90.0% of the operated eyes achieved a BCVA of 6/9 or better, demonstrating favorable visual outcomes following surgery.

Table 4: Changes in keratometric astigmatism and surgically induced astigmatism

Parameter	Mean ± SD
Preoperative corneal astigmatism (D)	0.89 ± 0.48
Month 1 postoperative astigmatism (D)	1.14 ± 0.41
Month 3 postoperative astigmatism (D)	1.08 ± 0.39
Surgically induced astigmatism (Month 3) (D)	0.58 ± 0.29
Range of SIA (D)	0.10–1.38

Table 4 summarizes the changes in corneal astigmatism and surgically induced astigmatism following temporal clear corneal MSICS. The mean preoperative corneal astigmatism was 0.89 ± 0.48 D, which increased slightly to 1.14 ± 0.41 D at one month and stabilized at 1.08 ± 0.39 D by the third postoperative month. The mean surgically induced astigmatism at three months was 0.58 ± 0.29 D, with values ranging from 0.10 D to 1.38 D. These findings indicate that the temporal clear corneal incision produced only minimal postoperative corneal astigmatic changes.

Table 5: Postoperative complications

Complication	Number	Percentage
Mild corneal edema (Day 1)	6	12.0
Anterior chamber reaction	4	8.0
Transient rise in IOP	2	4.0
Posterior capsular opacification	1	2.0
Wound leak	0	0
Endophthalmitis	0	0
IOL decentration	0	0
Persistent corneal edema	0	0

Table 5 presents the postoperative complications encountered during the follow-up period. Mild corneal edema on the first postoperative day was the most frequent complication and was observed in 12.0% of patients. Mild anterior chamber reaction occurred in 8.0%, while transient elevation of intraocular pressure was noted in 4.0% of cases. Posterior capsular opacification developed in 2.0% of patients during follow-up. No patient developed wound leak, persistent corneal edema, intraocular lens decentration, or postoperative endophthalmitis. Overall, postoperative complications were infrequent, self-limiting, and managed successfully without affecting the final visual outcome.

Table 6: Overall surgical outcome at three months

Outcome	Number	Percentage
BCVA ≥6/9	45	90.0
BCVA ≥6/12	49	98.0
SIA ≤1.0 D	46	92.0
Uneventful postoperative recovery	47	94.0
Additional intervention required	1	2.0
Patient satisfaction (Good–Excellent)	48	96.0

Table 6 summarizes the overall surgical outcomes at the end of the three-month follow-up period. A total of 90.0% of patients achieved a BCVA of 6/9 or better, while 98.0% attained a BCVA of at least 6/12. Surgically induced astigmatism of 1.0 D or less was observed in 92.0% of patients. Uneventful postoperative recovery occurred in 94.0% of cases, and only one patient (2.0%) required an additional postoperative intervention. Furthermore, 96.0% of patients reported good-to-excellent satisfaction with their postoperative visual outcome, reflecting the safety and effectiveness of temporal clear corneal manual small incision cataract surgery in the management of senile cataract.

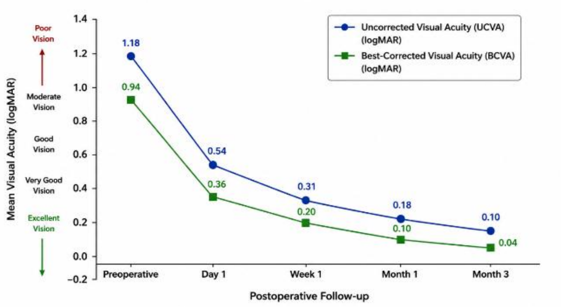

Figure 1: Progressive Improvement in Uncorrected and Best-Corrected Visual Acuity

Figure 1 illustrates the progressive improvement in both uncorrected visual acuity (UCVA) and best-corrected visual acuity (BCVA) following manual small incision cataract surgery (MSICS) using a temporal clear corneal incision. The mean UCVA improved from 1.18 ± 0.26 logMAR preoperatively to 0.54 ± 0.18 on postoperative day 1, 0.31 ± 0.15 at week 1, 0.18 ± 0.10 at one month, and 0.10 ± 0.08 at three months. Similarly, the mean BCVA improved from 0.94 ± 0.22 logMAR before surgery to 0.36 ± 0.14 on day 1, 0.20 ± 0.09 at week 1, 0.10 ± 0.06 at one month, and 0.04 ± 0.05 at the three-month follow-up. The graph demonstrates a steady decline in logMAR values over the postoperative period, indicating progressive improvement in visual acuity. Repeated measures ANOVA showed that the improvement at each postoperative visit was statistically significant compared with the preoperative values ($p < 0.001$), confirming excellent visual rehabilitation following temporal clear corneal MSICS.

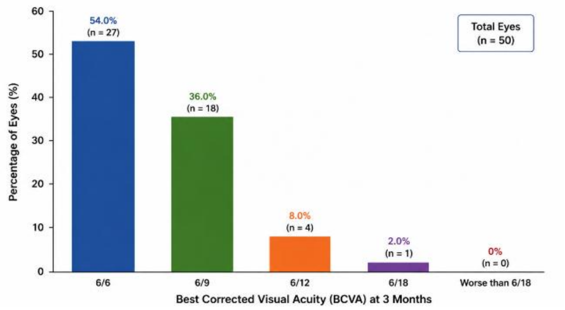

Figure 2: Distribution of Best Corrected Visual Acuity at Three Months

Figure 2 illustrates the distribution of best-corrected visual acuity (BCVA) at the three-month postoperative follow-up after temporal clear corneal manual small incision cataract surgery. More than half of the operated eyes (54.0%, n = 27) achieved a BCVA of 6/6, while 36.0% (n = 18) attained 6/9 vision. A BCVA of 6/12 was observed in 8.0% (n = 4) of patients, and only 2.0% (n = 1) achieved 6/18. No patient had a postoperative BCVA worse than 6/18. Overall, 90.0% of eyes achieved a BCVA of 6/9 or better, and 98.0% attained a BCVA of 6/12 or better, demonstrating excellent postoperative visual outcomes and effective visual rehabilitation following temporal clear corneal MSICS.

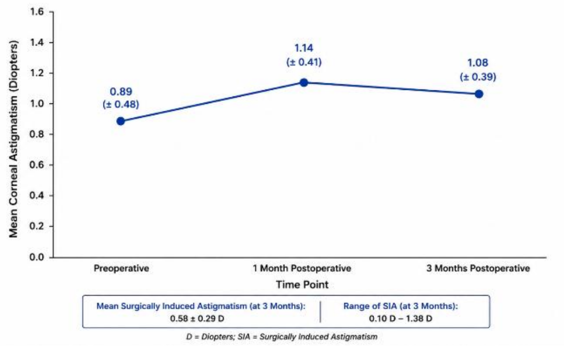

Figure 3: Changes in Corneal Astigmatism

Figure 3 illustrates the changes in mean corneal astigmatism following temporal clear corneal manual small incision cataract surgery. The mean preoperative corneal astigmatism was 0.89 ± 0.48 D, which increased slightly to 1.14 ± 0.41 D at one month after surgery and subsequently decreased to 1.08 ± 0.39 D by the three-month follow-up, indicating stabilization of corneal curvature over time. The mean surgically induced astigmatism (SIA) at three months was 0.58 ± 0.29 D, with a range of 0.10–1.38 D. The findings demonstrate that the temporal clear corneal incision produced only minimal postoperative corneal astigmatic changes, with low surgically induced astigmatism and favorable refractive stability during the follow-up period.

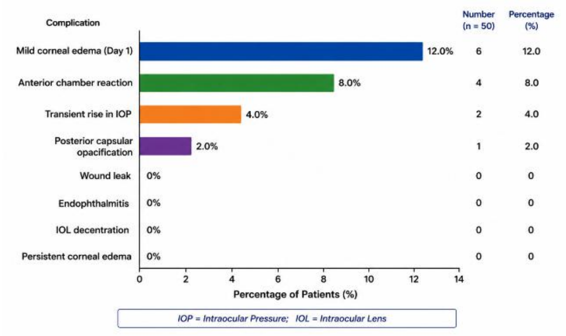

Figure 4: Postoperative Complications

Figure 4 illustrates the frequency of postoperative complications observed during the three-month follow-up period after temporal clear corneal manual small incision cataract surgery. Mild corneal edema on the first postoperative day was the most common complication, occurring in 12.0% (n = 6) of patients, followed by anterior chamber reaction in 8.0% (n = 4) and transient elevation of intraocular pressure in 4.0% (n = 2). Posterior capsular opacification developed in 2.0% (n = 1) of patients during follow-up.

DISCUSSION

The present prospective interventional study evaluated the visual outcomes following manual small incision cataract surgery (MSICS) using a temporal clear corneal incision in 50 eyes with senile cataract. Cataract remains the leading cause of reversible blindness worldwide despite significant advances in surgical techniques. Although phacoemulsification is considered the gold standard in developed countries, MSICS continues to be an effective, economical, and widely practiced technique in developing nations because of its lower cost, shorter learning curve, and excellent visual outcomes. Recent modifications in incision architecture, particularly the temporal clear corneal approach, have further enhanced postoperative visual rehabilitation by minimizing surgically induced astigmatism and promoting rapid wound healing.[11]

The demographic characteristics of the present study demonstrated a mean age of 64.8 ± 7.5 years, with the majority of patients belonging to the sixth and seventh decades of life. Females constituted 56% of the study population, while males accounted for 44%. These findings are consistent with the epidemiology of age-related cataract, which predominantly affects older individuals because of progressive biochemical and structural changes in the crystalline lens. The slightly higher proportion of female patients observed in the present study is comparable to several population-based studies that have reported greater cataract prevalence among women, possibly due to increased life expectancy, hormonal influences, nutritional factors, and differences in healthcare utilization.[12,13]

Most patients in the present study had Grade III nuclear sclerosis (52%), followed by Grade II and Grade IV cataracts. Similar distributions have been reported by Gogate et al. and Ruit et al., who observed that moderate nuclear cataracts represent the most common presentation among patients undergoing MSICS in tertiary care hospitals.[14,4] Grade III cataracts provide an appropriate balance between surgical ease and adequate assessment of postoperative visual recovery, making them suitable for evaluating the effectiveness of different incision techniques.

One of the principal findings of the present study was the marked improvement in postoperative visual acuity following temporal clear corneal MSICS. The mean uncorrected visual acuity (UCVA) improved from 1.18 ± 0.26 logMAR preoperatively to 0.10 ± 0.08 logMAR at three months. Similarly, the mean best-corrected visual acuity (BCVA) improved from 0.94 ± 0.22 logMAR before surgery to 0.04 ± 0.05 logMAR at the final follow-up. Statistical analysis demonstrated highly significant improvement at every postoperative visit compared with baseline ($p < 0.001$). These findings clearly indicate that temporal clear corneal MSICS provides rapid and sustained visual rehabilitation.

The improvement in visual acuity observed in the present study is comparable with the findings of Gogate et al., who demonstrated that MSICS produces visual outcomes equivalent to phacoemulsification for uncomplicated senile cataracts while maintaining a lower surgical cost.[11] Similarly, Ruit et al. reported excellent visual rehabilitation after sutureless MSICS, with visual outcomes comparable to phacoemulsification in patients with dense cataracts.[4]

The progressive improvement in visual acuity observed from the first postoperative day to the third postoperative month reflects gradual resolution of transient postoperative corneal edema, stabilization of wound architecture, reduction in postoperative inflammation, and adaptation of the visual system following intraocular lens implantation. Early postoperative visual recovery is particularly important because it allows rapid restoration of functional vision and improves patients' ability to perform routine daily activities. The temporal clear corneal incision may contribute to faster rehabilitation by inducing minimal tissue trauma, preserving corneal biomechanics, and reducing postoperative discomfort.[15]

An important observation in the present study was that 90% of patients achieved a final BCVA of 6/9 or better, while 54% attained 6/6 vision at three months. Furthermore, only one patient had a final BCVA of 6/18, and none had vision worse than 6/18. These findings satisfy the World Health Organization recommendations for successful cataract surgery outcomes.[16]

Comparable visual outcomes have been documented in several contemporary studies evaluating temporal MSICS. Venkatesh et al. demonstrated that over 90% of patients achieved good postoperative visual acuity following temporal incision MSICS, attributing these results to reduced corneal distortion and stable wound construction.[17] Likewise, Hennig et al. emphasized that the self-sealing temporal incision provides rapid visual rehabilitation with minimal postoperative complications, making it particularly suitable for high-volume cataract surgery programs in developing countries.[18]

Overall, the findings of the present study reaffirm that temporal clear corneal MSICS is a highly effective surgical technique capable of producing excellent visual outcomes with rapid postoperative recovery. The consistent improvement in both uncorrected and best-corrected visual acuity throughout the follow-up period highlights the reliability of this procedure in restoring functional vision among patients with age-related cataract. The favorable visual results observed are comparable with those reported in contemporary international literature and further support the continued role of temporal MSICS as an effective alternative to phacoemulsification, particularly in resource-limited healthcare settings.

One of the principal objectives of the present study was to evaluate postoperative corneal astigmatism following temporal clear corneal manual small incision cataract surgery (MSICS). Surgical astigmatism remains an important determinant of postoperative uncorrected visual acuity because even accurate intraocular lens power calculation cannot compensate for excessive surgically induced corneal changes. Consequently, modern cataract surgery is increasingly regarded as a refractive procedure, where minimizing surgically induced astigmatism (SIA) is essential for achieving optimal visual outcomes. Recent evidence suggests that appropriate incision placement and wound architecture play a greater role in reducing postoperative astigmatism than the surgical technique itself.[25]

In the present study, the mean preoperative corneal astigmatism was 0.89 ± 0.48 D, which increased transiently to 1.14 ± 0.41 D at one month before stabilizing at 1.08 ± 0.39 D at three months. The mean surgically induced astigmatism at the final follow-up was 0.58 ± 0.29 D, indicating minimal alteration of corneal curvature following temporal clear corneal incision. These findings demonstrate that the temporal approach effectively preserves corneal biomechanics while facilitating rapid visual rehabilitation.

Our findings are comparable with those reported by Zawar and Gogate, who evaluated the safety and efficacy of temporal MSICS and observed a mean postoperative surgically induced astigmatism of approximately 0.70 D, with excellent visual outcomes in the majority of patients.[15] They concluded that temporal MSICS is associated with minimal postoperative astigmatism, stable wound construction, and rapid visual recovery.

Similarly, Singh et al. reviewed the effect of incision location on postoperative astigmatism and concluded that temporal incisions consistently produce lower surgically induced astigmatism than superior incisions because they are positioned farther from the visual axis and experience less eyelid-induced mechanical pressure during blinking.[25]

Several comparative clinical studies have also demonstrated the superiority of temporal incisions over superior approaches. Mallik et al. reported significantly lower surgically induced astigmatism in patients undergoing temporal MSICS compared with superior scleral incisions.[20] Likewise, Sekharreddy et al. observed improved refractive stability and lower postoperative astigmatism following temporal scleral incisions.[21] Gokhale and Sawhney also demonstrated that changing the incision site from superior to temporal significantly reduced postoperative astigmatism and improved uncorrected visual acuity.[22]

The favorable refractive outcomes observed in the present study can be explained by the biomechanical advantages of temporal clear corneal incisions. Temporal wounds are subjected to less vertical eyelid pressure during blinking, thereby reducing postoperative wound flattening and minimizing alteration of corneal curvature. Furthermore, temporal incisions are located farther from the visual axis, resulting in reduced optical distortion and lower surgically induced astigmatism compared with superior incisions.[25]

Another important finding of the present study was the low incidence of postoperative complications. Mild transient corneal edema occurred in 12% of patients, anterior chamber reaction in 8%, transient elevation of intraocular pressure in 4%, and posterior capsular opacification in only 2% of eyes. No patient developed wound leak, persistent corneal edema, intraocular lens decentration, or postoperative endophthalmitis. These observations indicate that temporal clear corneal MSICS is a safe procedure associated with minimal postoperative morbidity.

The transient corneal edema observed during the first postoperative day resolved completely with routine medical management and did not adversely influence the final visual outcome. Similar findings have been reported by Zawar and Gogate.[15] Likewise, Venkatesh et al. demonstrated that meticulous wound construction and standardized surgical technique significantly reduce postoperative complications while maintaining excellent visual outcomes.[24]

No case of postoperative endophthalmitis or wound dehiscence was encountered during the present study. This finding highlights the effectiveness of meticulous surgical technique, proper wound construction, and routine postoperative antimicrobial therapy. Previous reports have similarly demonstrated that self-sealing temporal incisions provide excellent wound integrity without the need for sutures, thereby minimizing wound-related complications and promoting rapid visual recovery.[19,15]

The overall outcomes of the present study compare favorably with previously published literature evaluating temporal MSICS. Contemporary studies have consistently reported postoperative best-corrected visual acuity of 6/9 or better in approximately 85–95% of patients, with surgically induced astigmatism generally remaining below 1.0 D.[24,25] In the present study, 90% of patients achieved a BCVA of 6/9 or better, while 92% demonstrated surgically induced astigmatism of ≤1.0 D, indicating that the visual and refractive outcomes achieved are comparable with international standards.

Overall, the findings of the present study demonstrate that temporal clear corneal MSICS provides excellent visual rehabilitation, predictable refractive outcomes, minimal surgically induced astigmatism, and a low incidence of postoperative complications. These characteristics make the procedure particularly suitable for high-volume cataract surgery programs and resource-limited healthcare settings where safe, effective, and economical surgical techniques remain essential.[19,23,25]

Its pertinent to mention here that all the above studies fashioned their temporal tunnel starting from sclera hence creating a sclero-corneal tunnel where in outer incision stays away from the limbus but in our study, the temporal incision was limbal or clear corneal. The net SIA was still comparable with the above studies without any additional disadvantages of wound leak or other corneal wound related complications.

Hence this limbal/clear corneal tunnel is considered to be better and a step towards phacoemulsification for beginners.

CONCLUSION

Temporal clear corneal manual small incision cataract surgery is a safe, effective, and economical surgical technique for the management of age-related cataract. The procedure provides excellent postoperative visual acuity, minimal surgically induced astigmatism, rapid visual rehabilitation, and a low incidence of complications. In the present study, 90% of patients achieved a best-corrected visual acuity of 6/9 or better, while the mean surgically induced astigmatism remained low (0.58 ± 0.29 D). These findings are consistent with published literature and support the continued use of temporal clear corneal MSICS as an effective alternative to phacoemulsification, particularly in high-volume and resource-constrained healthcare settings.

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