



ORIGINAL RESEARCH ARTICLE

Visual Outcome Following Phacoemulsification with Superior Scleral versus Temporal Clear Corneal Incision: A Prospective Comparative Study

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Abstract

Background: The site of the phacoemulsification incision, whether superior scleral or temporal clear corneal, may influence the rate and extent of postoperative visual rehabilitation in addition to its effect on surgically induced astigmatism.

Objectives: To compare uncorrected and best corrected visual acuity outcomes following phacoemulsification performed via a superior scleral incision versus a temporal clear corneal incision.

Methods: This was a hospital-based, prospective, comparative study conducted in the Department of Ophthalmology of a tertiary care centre at SBKS Medical College And Research Centre, Baroda in India over a two-year period. One hundred eyes of 100 patients with uncomplicated senile cataract were divided into two groups of 50 eyes each: Group 1 underwent superior scleral incision phacoemulsification and Group 2 underwent temporal clear corneal incision phacoemulsification. Uncorrected visual acuity (UCVA) was recorded preoperatively and at 1, 2, and 4 weeks postoperatively, and best corrected visual acuity (BCVA) was assessed at 4 weeks.

Results: The two groups were comparable at baseline for preoperative visual acuity, with 62% and 66% of patients in Groups 1 and 2 respectively having preoperative vision of 6/60 or worse. At 4 weeks, UCVA of 6/9 or better was achieved by 27 (54%) patients in Group 1 and 26 (52%) patients in Group 2. All patients (100%) in both groups achieved BCVA of 6/9 or better at 4 weeks, with no significant difference in visual outcome between the two incision groups at any follow-up point.

Conclusion: Both superior scleral and temporal clear corneal incisions provide comparably rapid and complete visual rehabilitation following phacoemulsification, with all patients in both groups achieving good best corrected visual acuity by 4 weeks, supporting the selection of incision site primarily on the basis of preoperative astigmatism axis without compromising visual outcome.

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1 | INTRODUCTION

The primary goal of modern cataract surgery is not only removal of the cataractous lens but rapid and complete visual rehabilitation with minimal postoperative astigmatism. Since Kelman's original description of phacoemulsification, progressive reduction in incision size and refinement of surgical technique have contributed to earlier visual recovery and greater refractive predictability compared with older large-incision extracapsular techniques. (1)

Incision site, in addition to influencing the magnitude of surgically induced astigmatism, has also been proposed to influence the early postoperative course, given differences in proximity to the visual axis, corneal wound architecture, and healing characteristics between superior and temporal locations. (2, 3) Some authors have reported more rapid stabilisation of visual acuity with temporal incisions, attributed to their greater distance from the visual axis and reduced tendency toward wound-related irregular astigmatism, while others have found comparable visual outcomes between the two approaches once adequate wound construction and IOL implantation technique are ensured. (4, 5)

Given the practical importance of rapid visual rehabilitation to patient satisfaction following cataract surgery, and the ongoing use of both superior and temporal incision approaches in routine clinical practice, comparative data on visual outcome, in addition to astigmatic outcome, remain clinically relevant. This study was undertaken to compare uncorrected and best corrected visual acuity outcomes following phacoemulsification performed via a superior scleral incision in eyes with with-the-rule astigmatism, compared with a temporal clear corneal incision in eyes with against-the-rule astigmatism.

2 | MATERIALS AND METHODS

2.1 | Study Design and Setting

This was a hospital-based, prospective, comparative clinical study conducted in the Department of Ophthalmology at a tertiary care teaching centre

at SBKS Medical College And Research Centre, Baroda in India, over the period November 2009 to November 2011.

2.2 | Study Population and Sample Size

One hundred eyes of 100 patients attending the eye outpatient department were enrolled and divided into two groups of 50 eyes each according to preoperative keratometric astigmatism: Group 1 (with-the-rule astigmatism, superior scleral incision) and Group 2 (against-the-rule astigmatism, temporal clear corneal incision).

2.3 | Inclusion and Exclusion Criteria

All patients with uncomplicated senile cataract and preoperative astigmatism between 0.25 D and 2 D were included. Patients with no pre-existing astigmatism, irregular astigmatism, astigmatism greater than 2 D, significant ocular surface, corneal, scleral, macular, or retinal pathology, intraoperative or post-operative complications, previous ocular surgery, or unwillingness to participate were excluded.

2.4 | Surgical Technique

All surgeries were performed by the same surgeon under peribulbar anaesthesia. Group 1 eyes underwent phacoemulsification via a superior scleral incision 2 mm from the limbus with a scleral tunnel and 2.8 mm keratome entry at the 12 o'clock position. Group 2 eyes underwent phacoemulsification via a temporal clear corneal incision with 2.8 mm keratome entry at the 9 or 3 o'clock position as appropriate. In both groups, standard technique was used, comprising continuous curvilinear capsulorhexis,

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hydrodissection, multiple chop nucleus disassembly, cortical aspiration, and implantation of a foldable posterior chamber intraocular lens in the capsular bag.

2.5 | Follow-up and Visual Acuity Assessment

Uncorrected visual acuity (UCVA) was recorded preoperatively and at 1, 2, and 4 weeks postoperatively by the same observer for all patients, using a standard Snellen chart. Best corrected visual acuity (BCVA) was assessed at 4 weeks following manifest refraction. All preoperative and postoperative assessments, including visual acuity testing, were performed by the same observer to minimise measurement bias.

2.6 | Statistical Analysis

Categorical visual acuity outcomes were expressed as frequencies and percentages and compared descriptively between the two groups at each follow-up point.

3 | RESULTS

The mean age was 60.64 ± 6.51 years in Group 1 and 61.60 ± 6.75 years in Group 2, with a comparable gender distribution in both groups (Table 1).

Preoperatively, 31 (62%) patients in Group 1 and 33 (66%) patients in Group 2 had visual acuity of 6/60 or worse, while only 1 (2%) patient in each group had a relatively better preoperative vision of 6/18, confirming comparable baseline visual acuity between groups (Table 2, Figure 1).

Uncorrected visual acuity improved progressively in both groups over the follow-up period. At 1 week, 21 (42%) patients in Group 1 and 22 (44%) patients in Group 2 had achieved UCVA of 6/9 or better; this increased to 27 (54%) and 26 (52%) patients respectively by 4 weeks (Table 3, Figures 2 and 3).

At 4 weeks, all 50 patients (100%) in Group 1 and all 50 patients (100%) in Group 2 achieved best corrected visual acuity of 6/9 or better (Table 4, Figure 4).

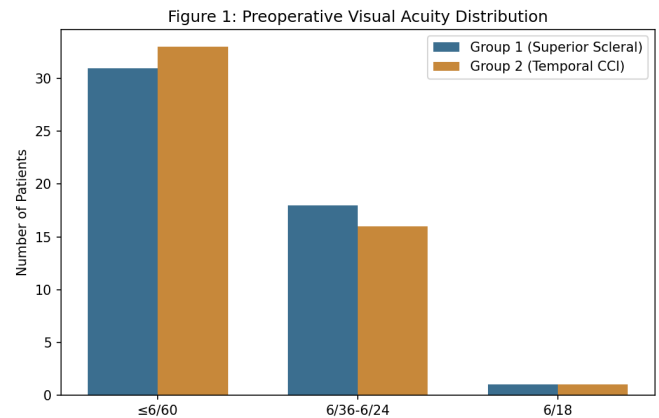


FIGURE 1: Preoperative Visual Acuity Distribution

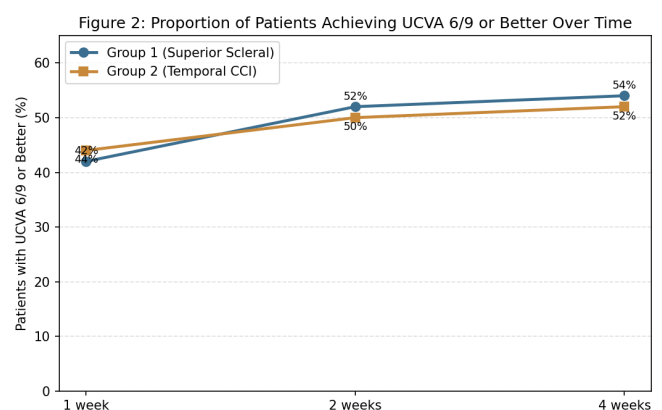


FIGURE 2: Proportion of Patients Achieving UCVA 6/9 or Better Over Time

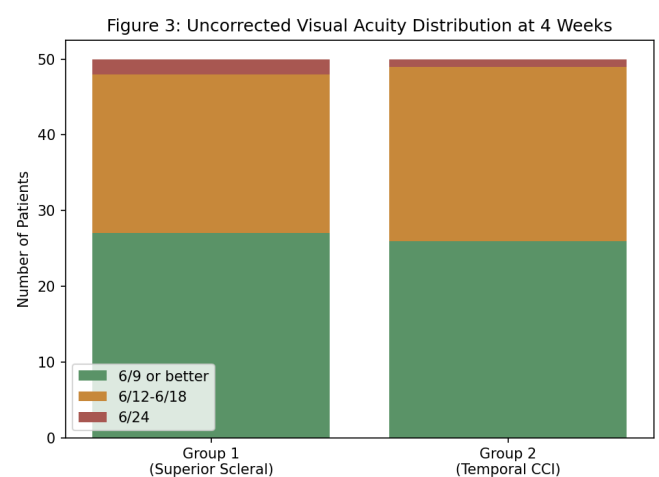


FIGURE 3: Uncorrected Visual Acuity Distribution at 4 Weeks

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TABLE 1: Age and Gender-wise Distribution of Study Subjects (n = 100)

Characteristic	Category	Group 1 (Superior Scleral, n=50)	Group 2 (Temporal CCI, n=50)
Age (years)	Mean ± SD	60.64 ± 6.51	61.60 ± 6.75
Sex	Male	26 (52%)	27 (54%)
	Female	24 (48%)	23 (46%)

TABLE 2: Preoperative Visual Acuity Distribution

Preoperative Visual Acuity	Group 1, n (%)	Group 2, n (%)
≤6/60	31 (62%)	33 (66%)
6/36–6/24	18 (36%)	16 (32%)
6/18	1 (2%)	1 (2%)

TABLE 3: Uncorrected Visual Acuity at 1, 2, and 4 Weeks

Uncorrected Visual Acuity	1 Week Group 1	1 Week Group 2	2 Weeks Group 1	2 Weeks Group 2	4 Weeks Group 1	4 Weeks Group 2
6/9 or better	21 (42%)	22 (44%)	26 (52%)	25 (50%)	27 (54%)	26 (52%)
6/12–6/18	26 (52%)	27 (54%)	22 (44%)	24 (48%)	21 (42%)	23 (46%)
6/24	3 (6%)	1 (2%)	2 (4%)	1 (2%)	2 (4%)	1 (2%)

TABLE 4: Best Corrected Visual Acuity at 4 Weeks

Group	BCVA 6/9 or Better at 4 Weeks, n (%)
Group 1 (Superior Scleral)	50 (100%)
Group 2 (Temporal CCI)	50 (100%)

Figure 4: Best Corrected Visual Acuity at 4 Weeks (Group 1 and Group 2 Combined, n=100)

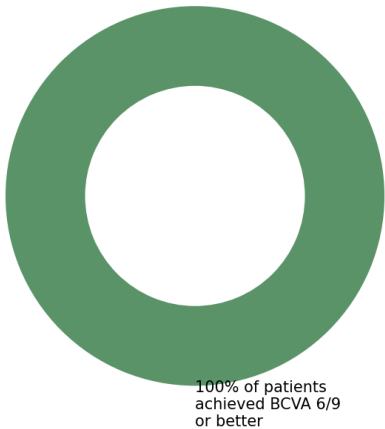


FIGURE 4: Best Corrected Visual Acuity at 4 Weeks

4 | DISCUSSION

Both groups in this study showed marked improvement in visual acuity from a predominantly poor

Figure 5: Study Timeline for Visual Acuity Assessment Following Phacoemulsification



FIGURE 5: Study timeline for visual acuity assessment following phacoemulsification.

preoperative baseline (approximately two-thirds of patients in each group having vision of 6/60 or worse) to a good postoperative outcome, consistent with the expected benefit of cataract extraction with intraocular lens implantation.^(6, 7) By 4 weeks, just over half of patients in each group had achieved UCVA of 6/9 or better without correction, and all patients in both groups achieved BCVA of 6/9 or better, indicating that neither incision approach compromised the ultimate visual potential achievable

with appropriate refractive correction.

The proportion of patients achieving good UCVA was numerically similar between the superior scleral and temporal clear corneal incision groups at each follow-up point in this study, consistent with reports such as that of Cillino and colleagues, who found comparable early postoperative outcomes between temporal and superior phacoemulsification approaches.⁽³⁾ This finding is reassuring given the ongoing debate in the literature regarding which incision location offers superior refractive and visual outcomes; the present data suggest that, provided surgical technique and wound construction are consistent, the two approaches yield essentially equivalent visual rehabilitation.^(5, 7)

The progressive improvement in UCVA from 1 to 4 weeks observed in both groups in this study is consistent with the well-recognised pattern of gradual resolution of postoperative corneal oedema and stabilisation of the surgical wound over the early postoperative period, a pattern similarly described by Long and Monica in their prospective evaluation of corneal curvature changes following small-incision phacoemulsification.⁽⁶⁾ The finding that all patients in both groups achieved BCVA of 6/9 or better by 4 weeks reinforces that any residual difference in uncorrected vision between the groups relates primarily to differences in residual refractive astigmatism rather than to any underlying difference in surgical safety or visual potential between the two incision approaches.

These findings, considered alongside the comparable astigmatic outcomes reported for the same cohort in the companion analysis of this dataset, support the conclusion that the choice between superior scleral and temporal clear corneal incision in phacoemulsification can reasonably be guided primarily by preoperative astigmatism axis, without concern for a differential impact on visual rehabilitation.

5 | STRENGTHS AND LIMITATIONS

This study's strengths include its prospective design, single-surgeon and single-observer methodology to minimise bias, and well-matched groups at baseline. Limitations include the relatively short follow-up

period of 4 weeks, which may not capture very late visual acuity changes such as those related to posterior capsule opacification; the use of Snellen visual acuity rather than logMAR notation, which may be less sensitive to small differences in visual performance between groups; and the single-centre, single-surgeon design, which may limit generalisability to other surgical settings.

6 | CONCLUSION

Superior scleral and temporal clear corneal incisions in phacoemulsification provide comparable and satisfactory visual rehabilitation, with all patients in both groups achieving best corrected visual acuity of 6/9 or better by 4 weeks postoperatively. These findings support flexible selection of incision site based on preoperative astigmatism axis without compromising ultimate visual outcome.

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