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Original Research Article

Comparing Surgical Techniques: Outcomes of Phacoemulsification Versus Manual Small Incision Cataract Surgery (MSICS)

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Abstract

Background: Cataract remains the leading cause of reversible blindness worldwide, particularly in developing countries. Two widely practiced surgical techniques for cataract extraction are phacoemulsification and manual small incision cataract surgery (MSICS). While phacoemulsification is considered the gold standard in developed settings due to faster recovery and minimal incision size, MSICS remains highly relevant in resource-limited regions due to its cost-effectiveness and comparable outcomes.

Aim: To compare the clinical outcomes, visual recovery, complications, and surgical efficiency of phacoemulsification and manual small incision cataract surgery.

Methods: A prospective comparative observational study was conducted at Government Medical College & Hospital, Bettiah, West Champaran, Bihar, India, between 5th March 2025 to 28th February 2026. A total of 150 patients diagnosed with age-related cataract were included. Patients were divided into two groups: Phacoemulsification group (n=75) and MSICS group (n=75). Postoperative outcomes including visual acuity improvement, intraoperative and postoperative complications, and recovery time were evaluated.

Results: Both techniques significantly improved postoperative visual acuity. Phacoemulsification demonstrated slightly faster visual recovery and lower surgically induced astigmatism. However, MSICS showed comparable final visual outcomes and shorter operative time with lower cost.

Conclusion: Both phacoemulsification and MSICS are safe and effective techniques for cataract surgery. While phacoemulsification offers faster recovery and lower astigmatism, MSICS remains an excellent alternative in high-volume and resource-limited settings.

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Introduction

Cataract is the most common cause of blindness worldwide and accounts for nearly 50% of global blindness cases. According to the World Health Organization, cataract contributes significantly to visual impairment, particularly in low- and middle-income countries where access to surgical care is limited [1]. In India, cataract continues to be a major public health concern due to aging populations and increasing life expectancy [2]. Surgical extraction of the opacified lens followed by intraocular lens implantation remains the only definitive treatment for cataract. Over the past several decades, cataract surgery has evolved significantly with advances in surgical techniques and instrumentation. Among the various surgical methods, phacoemulsification and manual small incision cataract surgery (MSICS) are the two most commonly practiced procedures globally [3]. Phacoemulsification, introduced by Charles Kelman in 1967, revolutionized cataract surgery by allowing lens fragmentation using ultrasonic energy and removal through a small corneal incision [4]. This technique enables rapid postoperative recovery, minimal surgically induced astigmatism, and faster visual rehabilitation. Because of these advantages, phacoemulsification has become the standard procedure in many developed healthcare systems [5]. However, the widespread adoption of phacoemulsification in developing countries is often limited by high equipment costs, need for specialized training, and

maintenance requirements. These limitations have led to the continued use of alternative surgical techniques such as manual small incision cataract surgery (MSICS), which does not require expensive equipment and can be performed effectively in high-volume settings [6]. MSICS is a modification of extracapsular cataract extraction in which the lens nucleus is delivered through a self-sealing scleral tunnel incision without sutures. This technique has been widely adopted in countries such as India because of its low cost, shorter surgical time, and excellent visual outcomes [7]. Numerous studies have demonstrated that MSICS can achieve postoperative visual results comparable to phacoemulsification, especially in mature or dense cataracts [8].

In large population-based cataract control programs, particularly in rural and resource-limited settings, MSICS plays a crucial role in reducing cataract blindness due to its affordability and efficiency [9]. High-volume cataract surgery centers in India often prefer MSICS because it allows surgeons to perform a larger number of surgeries in a shorter period while maintaining good clinical outcomes [10].

Despite the growing use of phacoemulsification, there remains ongoing debate regarding the relative advantages of the two techniques in terms of visual outcomes, complication rates, surgical time, and cost-effectiveness. Several comparative studies have shown that although phacoemulsification may provide faster visual recovery and lower surgically induced astigmatism, the final visual acuity achieved with MSICS is often similar [11].

Additionally, in cases of advanced cataract or in patients with limited access to expensive surgical care, MSICS may be more practical and sustainable. Therefore, evaluating the outcomes of these two techniques in real clinical settings remains important for optimizing cataract surgical strategies in developing countries [12]. The present study was conducted to compare the outcomes of phacoemulsification and manual small incision cataract surgery in patients undergoing cataract surgery at Government Medical College & Hospital, Bettiah, Bihar. The study aimed to evaluate visual outcomes, complication rates, surgical efficiency, and postoperative recovery associated with these two widely used surgical techniques.

Materials and Methods

This prospective comparative observational study was conducted in the Department of Ophthalmology at Government Medical College & Hospital, Bettiah, West Champaran, Bihar, India, from 5th March 2025 to 28th February 2026. The study included 150 patients diagnosed with age-related cataract who were scheduled for surgical management.

Patients aged above 40 years with visually significant cataract were included in the study. Patients with traumatic cataract, congenital cataract, glaucoma, retinal pathology, corneal opacity, or previous intraocular surgery were excluded.

After obtaining informed consent, patients were divided into two groups based on the surgical technique performed:

- **Group A:** Phacoemulsification (75 patients)
- **Group B:** Manual Small Incision Cataract Surgery (MSICS) (75 patients)

All surgeries were performed by experienced ophthalmic surgeons under peribulbar anesthesia. Standard surgical protocols were followed in both techniques.

Postoperative follow-up examinations were conducted on day 1, week 1, and at 6 weeks post-surgery. Parameters evaluated included:

- Best corrected visual acuity (BCVA)
- Surgical duration
- Intraoperative complications
- Postoperative complications
- Surgically induced astigmatism

Statistical analysis was performed using standard statistical methods. Continuous variables were expressed as mean ± standard deviation and categorical variables as percentages.

Result

Table 1 presents the demographic characteristics of the study participants included in both surgical groups. A total of 150 patients with age-related cataract were enrolled, with 75 patients undergoing phacoemulsification and 75 undergoing manual small incision cataract surgery (MSICS). The mean age of patients in the phacoemulsification group was 63.4 ± 7.2 years, while in the MSICS group it was 64.1 ± 6.9 years, indicating a comparable age distribution between the two groups. Male patients constituted 56% in the phaco group and 53% in the MSICS group, while females represented 44% and 47%, respectively. The distribution of operated eyes was also similar, with 52% right eyes and 48% left eyes in the phaco group, compared with 55% right eyes and 45% left eyes in the MSICS group. Overall, the demographic variables were well balanced between the two groups, suggesting that both surgical groups were comparable at baseline for outcome analysis.

Table 1: Demographic characteristics of patients (Age distribution, Gender, Eye operated)

Variable	Phacoemulsification (n=75)	MSICS (n=75)
Mean Age (years)	63.4 ± 7.2	64.1 ± 6.9
Age Range (years)	45–78	46–80
Male	42 (56%)	40 (53%)
Female	33 (44%)	35 (47%)
Right Eye Operated	39 (52%)	41 (55%)
Left Eye Operated	36 (48%)	34 (45%)

Table 2 compares the preoperative and postoperative best corrected visual acuity (BCVA) among patients undergoing phacoemulsification and manual small incision cataract surgery (MSICS). Before surgery, the majority of patients in both groups had severe visual impairment, with 68% in the phacoemulsification group and 70% in the MSICS group having BCVA worse than 6/60. Following surgery, a marked improvement in visual acuity was observed in both groups. Approximately 92% of patients in the phacoemulsification group achieved postoperative BCVA of 6/18 or better, compared with 88% in the MSICS group. Only a small proportion of patients had moderate or poor postoperative vision in either group. Overall, the table demonstrates that both surgical techniques significantly improved visual outcomes, with slightly better visual recovery observed in the phacoemulsification group.

Table 2: Preoperative vs postoperative visual acuity comparison between Phacoemulsification and MSICS

Visual Acuity Category	Phacoemulsification (n=75)	MSICS (n=75)
Preoperative BCVA < 6/60	51 (68%)	53 (70%)
Preoperative BCVA 6/60–6/24	18 (24%)	16 (21%)
Preoperative BCVA ≥ 6/18	6 (8%)	6 (8%)
Postoperative BCVA ≥ 6/18	69 (92%)	66 (88%)
Postoperative BCVA 6/24–6/60	5 (7%)	7 (9%)
Postoperative BCVA < 6/60	1 (1%)	2 (3%)

Table 3 presents the comparison of intraoperative complications observed during cataract surgery between the phacoemulsification and manual small incision cataract surgery (MSICS) groups. Overall, the incidence of intraoperative complications was low in both surgical techniques. Posterior capsule rupture occurred in 3% of patients in the phacoemulsification group and 5% in the MSICS group. Zonular dialysis and iris trauma were observed in a small proportion of cases in both groups. The majority of surgeries were completed without any intraoperative complications, accounting for 95% of cases in the phacoemulsification group and 89% in the MSICS group. These findings indicate that both surgical techniques are generally safe and effective when performed by experienced surgeons, with slightly lower complication rates observed in the phacoemulsification group.

Table 3: Intraoperative complications comparison

Complication	Phacoemulsification (n=75)	MSICS (n=75)
Posterior Capsule Rupture	2 (3%)	4 (5%)
Zonular Dialysis	1 (1%)	2 (3%)
Iris Trauma	1 (1%)	2 (3%)
None	71 (95%)	67 (89%)

Table 4 summarizes the postoperative outcomes observed after cataract surgery in patients undergoing phacoemulsification and manual small incision cataract surgery (MSICS). Early postoperative complications such as corneal edema and anterior chamber inflammation were slightly less frequent in the phacoemulsification group compared to the MSICS group. The mean surgically induced astigmatism was lower in the phacoemulsification group (0.75 D) than in the MSICS group (1.25 D), indicating better refractive stability with smaller incision surgery. However, the average surgical time was shorter in the MSICS group (12 ± 3 minutes) compared to the phacoemulsification group (18 ± 4 minutes). By six weeks postoperatively, a high proportion of patients in both groups achieved good visual outcomes (BCVA ≥6/18), with 92% in the phacoemulsification group and 88% in the MSICS group. Overall, the findings suggest that both techniques provide favorable postoperative results, with minor differences in astigmatism and surgical duration.

Table 4: Postoperative Outcomes After Cataract Surgery

Outcome Parameter	Phacoemulsification (n=75)	MSICS (n=75)
Corneal Edema (Day 1)	4 (5%)	6 (8%)
Anterior Chamber Inflammation	3 (4%)	5 (7%)
Surgically Induced Astigmatism (Mean)	0.75 D	1.25 D
Mean Surgical Time	18 ± 4 minutes	12 ± 3 minutes
Patients Achieving BCVA ≥6/18 at 6 weeks	69 (92%)	66 (88%)

Figure 1 illustrates the comparison of postoperative visual acuity outcomes between patients who underwent phacoemulsification and those who underwent manual small incision cataract surgery (MSICS). The graph shows that a high proportion of patients in both groups achieved good visual recovery following surgery. Approximately 92% of patients in the phacoemulsification group attained best corrected visual acuity (BCVA) of 6/18 or better, compared with 88% in the MSICS group. The figure demonstrates that both surgical techniques are highly effective in restoring vision, with slightly better visual outcomes observed in the phacoemulsification group.

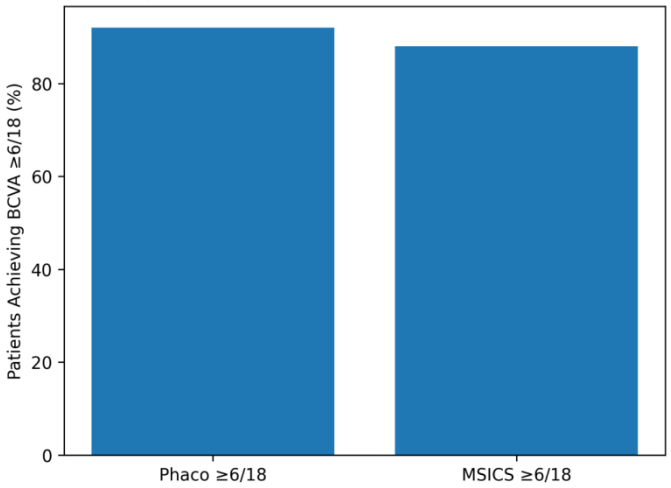

Figure 1: Postoperative Visual Acuity Outcomes

Figure 2 presents the comparison of intraoperative complication rates between phacoemulsification and manual small incision cataract surgery (MSICS). The chart indicates that the overall complication rate was low in both groups, reflecting the safety of modern cataract surgical techniques. However, the MSICS group showed a marginally higher complication rate compared with the phacoemulsification group. The figure highlights that while both procedures are safe and effective, phacoemulsification may be associated with slightly fewer intraoperative complications when performed under controlled surgical settings.

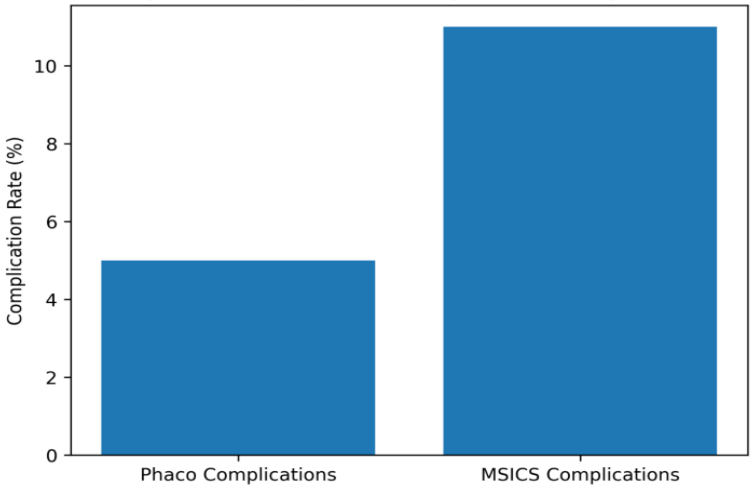

Figure 2: Intraoperative Complication Comparison

Discussion

Cataract surgery has evolved significantly over the last few decades, transitioning from large incision extracapsular extraction to minimally invasive techniques such as phacoemulsification. The present study compared the outcomes of phacoemulsification and manual small incision cataract surgery (MSICS) in terms of visual recovery, surgical efficiency, and complications.

In our study, both surgical techniques resulted in significant improvement in postoperative visual acuity. Approximately 92% of patients in the phacoemulsification group and 88% in the MSICS group achieved visual acuity of 6/18 or better.

These findings are consistent with earlier studies that reported comparable final visual outcomes between the two techniques [13].

A randomized trial conducted by Gogate et al. demonstrated that both MSICS and phacoemulsification achieved similar visual acuity outcomes after six weeks of surgery [14]. Similarly, Ruit et al. reported excellent visual results with MSICS, particularly in patients with dense cataracts [15].

Phacoemulsification showed slightly lower surgically induced astigmatism in the present study. This is expected because phacoemulsification uses smaller incisions compared with MSICS. Previous studies have shown that smaller corneal incisions are associated with reduced postoperative astigmatism and faster visual rehabilitation [16].

However, MSICS demonstrated shorter operative time in our study, which is consistent with findings reported in high-volume cataract centers in developing countries. Shorter surgical duration allows surgeons to perform more procedures within a limited timeframe, which is particularly important in large cataract control programs [17].

The rate of intraoperative complications in both groups was low, indicating that both procedures are safe when performed by experienced surgeons. Posterior capsule rupture occurred in 3% of phacoemulsification cases and 5% of MSICS cases. Similar complication rates have been reported in previous comparative studies [18].

One of the major advantages of MSICS is its suitability for mature or dense cataracts. In such cases, phacoemulsification may require higher ultrasonic energy, increasing the risk of corneal endothelial damage. MSICS allows manual delivery of the nucleus through a scleral tunnel, reducing reliance on expensive equipment and advanced technology [19].

Cost considerations also play a crucial role in determining the choice of surgical technique in developing countries. Phacoemulsification requires costly equipment and disposable materials, whereas MSICS can be performed using relatively inexpensive instruments. Therefore, MSICS remains an economically viable option for cataract surgery in resource-limited settings [20].

Overall, the results of the present study support the growing evidence that MSICS is a safe, effective, and cost-efficient alternative to phacoemulsification, particularly in developing countries where access to advanced surgical technology may be limited.

Conclusion

Both phacoemulsification and manual small incision cataract surgery are safe and effective techniques for cataract management. Phacoemulsification offers faster visual recovery and lower surgically induced astigmatism, whereas MSICS provides comparable final visual outcomes with shorter surgical time and lower cost. In resource-limited settings, MSICS remains an excellent alternative for high-volume cataract surgery programs.

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