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COMPARATIVE EVALUATION OF POSTOPERATIVE DRY EYE CHANGES FOLLOWING SMALL INCISION CATARACT SURGERY (SICS) AND PHACOEMULSIFICATION

Ophthalomology

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ABSTRACT

Background: Cataract surgery, while effective in restoring vision, may temporarily affect the ocular surface and tear film. This study compares postoperative tear film changes following Small Incision Cataract Surgery (SICS) and Phacoemulsification. **Materials And Methods:** A prospective study on 100 patients (50 in each group) was conducted. Schirmer's test (ST-1), Tear Film Break-Up Time (TBUT), and Ocular Surface Disease Index (OSDI) were evaluated preoperatively, and at 1 week, 1 month, and 3 months postoperatively. Statistical significance was set at $p<0.05$. **Results:** Both groups showed transient postoperative decline in Schirmer's and TBUT values at 1 week with recovery by 3 months. Phacoemulsification demonstrated better tear film preservation. OSDI scores indicated temporary mild discomfort that improved over time. **Conclusion:** Both surgical techniques induce mild, transient dry eye, but Phacoemulsification maintains better postoperative tear film stability.

KEYWORDS

Cataract surgery, SICS, Phacoemulsification, Dry eye, Schirmer's, TBUT, OSDI.

INTRODUCTION

Cataract surgery remains one of the most frequently performed and successful ophthalmic procedures worldwide. However, postoperative dry eye symptoms are commonly reported and can affect patient comfort and satisfaction. Surgical manipulation, incision size, and corneal nerve disruption can transiently disturb tear film homeostasis. This study compares postoperative ocular surface changes following Small Incision Cataract Surgery (SICS) and Phacoemulsification.

MATERIALS AND METHODS

A prospective, observational, comparative study was carried out on 100 patients undergoing cataract surgery.

Group A: Small Incision Cataract Surgery (SICS) – 50 eyes
Group B: Phacoemulsification – 50 eyes

Inclusion Criteria: Patients aged 50–75 years with age-related cataract and no pre-existing ocular surface disorders.

Exclusion Criteria: History of dry eye, ocular inflammation, lid abnormalities, or systemic diseases affecting tear production.

Parameters evaluated included Schirmer's Test (ST-1), Tear Film Break-Up Time (TBUT), and Ocular Surface Disease Index (OSDI). All parameters were assessed preoperatively and postoperatively at 1 week, 1 month, and 3 months.

Statistical Analysis

Data were expressed as mean ± standard deviation (SD). Intergroup comparisons were performed using the independent Student's t-test. Intragroup comparisons were analyzed using paired t-tests. A p-value <0.05 was considered statistically significant.

OBSERVATION AND RESULTS

A total of 100 patients were included and divided equally into two groups. Both groups were comparable in terms of age, gender, and laterality. The baseline characteristics showed no statistically significant difference ($p>0.05$).

Parameter	SICS	Phaco	p-value
Age 60–69 years	50%	56%	>0.05
Age 70–75 years	30%	28%	>0.05
Female (%)	52%	54%	>0.05
Right eye (%)	48%	49%	>0.05
Left eye (%)	52%	51%	>0.05

Schirmer's Test (ST-1): There was a significant postoperative decline in both groups at 1 week ($p<0.05$). Values improved gradually by 3 months but remained slightly below baseline. Phacoemulsification demonstrated less reduction compared to SICS.

Tear Film Break-Up Time (TBUT): A significant reduction was observed at 1 week, with gradual improvement thereafter. Phacoemulsification maintained relatively higher TBUT values across all time intervals.

Ocular Surface Disease Index (OSDI): Both groups showed an increase at 1 week, indicating mild discomfort, followed by recovery over time. At 3 months, OSDI values were near baseline, reflecting restoration of comfort.

Dry Eye Incidence: The incidence of dry eye was highest at 1 week (40%), reduced to 20% at 1 month, and only 9% at 3 months postoperatively.

Figures

Figure 1: Schirmer's Test (ST-1) Trends

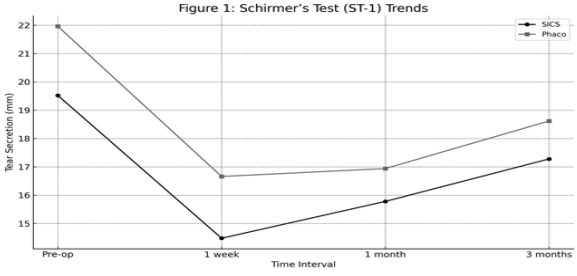


Figure 2: Tear Film Break-Up Time (TBUT)

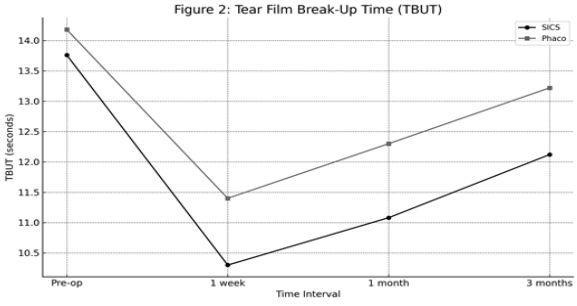
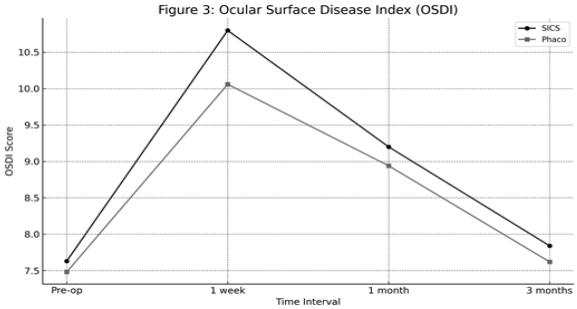
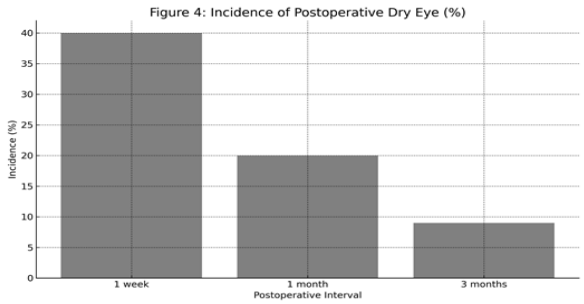


Figure 3: Ocular Surface Disease Index (OSDI)





DISCUSSION

This study demonstrates that both Small Incision Cataract Surgery (SICS) and Phacoemulsification temporarily affect tear film stability and ocular surface integrity during the early postoperative period. The initial decline in Schirmer's and Tear Film Break-Up Time (TBUT) values at one week postoperatively can be attributed to corneal nerve transection, ocular surface inflammation, and the effects of surgical manipulation. During cataract surgery, corneal nerves—especially those in the superior and temporal corneal regions—are partially disrupted, resulting in decreased corneal sensitivity and reduced reflex tearing. This leads to transient aqueous tear deficiency and instability of the tear film (Kasetsuwan et al., 2013).

Gradual improvement in tear parameters by the third postoperative month reflects corneal nerve regeneration and restoration of lacrimal gland feedback mechanisms. Similar results have been documented by **Ram et al. (2018)** and **Sahu et al. (2019)**, who reported near-baseline recovery of tear film parameters by 8–12 weeks postoperatively. The faster recovery seen in the Phacoemulsification group in this study can be attributed to the smaller incision size (2.2–2.8 mm) and lesser disturbance to the limbal nerve plexus compared to the larger scleral incision (6–7 mm) in SICS. Phacoemulsification also involves less conjunctival handling and lower inflammatory response, factors that help preserve tear film integrity.

The postoperative rise in Ocular Surface Disease Index (OSDI) scores at one week indicates subjective discomfort, dryness, and foreign body sensation commonly reported by patients after surgery. These symptoms can be explained by transient epithelial irregularities, exposure to intraoperative microscope light, and use of topical medications containing preservatives such as benzalkonium chloride, which can exacerbate ocular surface inflammation (Garg et al., 2020). However, the significant improvement in OSDI scores by three months demonstrates recovery of the ocular surface and patient adaptation over time.

The incidence of dry eye was found to be highest at one week and declined progressively by one and three months. This pattern mirrors the findings of **Li et al. (2017)** and **Kasetsuwan et al. (2013)**, who observed that postoperative dry eye is typically transient and self-limiting. The temporary nature of this condition underscores the physiological adaptability of the ocular surface and the importance of adequate postoperative lubrication and follow-up.

From a pathophysiological perspective, surgical trauma induces localized inflammation, leading to the release of cytokines and prostaglandins that can temporarily disrupt meibomian gland function and epithelial cell turnover (Garg et al., 2020). Furthermore, postoperative use of antibiotic and steroid eye drops can transiently affect the lipid and mucin components of the tear film. In SICS, due to a relatively larger incision, these changes are more pronounced, resulting in delayed restoration of tear film stability compared to Phacoemulsification.

Clinically, these findings highlight the need for thorough preoperative evaluation of ocular surface health, especially in elderly patients or those with pre-existing dry eye. Preservative-free lubricants, punctal plugs, or tear substitutes may be recommended to minimize postoperative discomfort and accelerate recovery. Patient counseling regarding possible transient dryness can also enhance satisfaction after cataract surgery. Early recognition and management of postoperative dry eye not only improve comfort but also contribute to better visual rehabilitation and overall surgical outcomes.

In summary, both SICS and Phacoemulsification produce mild, transient postoperative dry eye that resolves within three months. However, Phacoemulsification provides superior preservation of tear film stability due to its minimally invasive approach and smaller incision size. Incorporating ocular surface management protocols into cataract surgery care can significantly enhance postoperative comfort and quality of life for patients.

CONCLUSION

Both SICS and Phacoemulsification induce mild, transient postoperative dry eye, which improves within three months. Phacoemulsification demonstrates better tear film preservation due to minimal surgical trauma. Appropriate lubrication and postoperative care are essential to enhance comfort and outcomes.

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