

ASSESSING THE IMPACT OF LEVATOR RESECTION BY ANTERIOR APPROACH WITH AND WITHOUT UPPER LID BLEPHAROPLASTY ON DRY EYE SYNDROME

Original Research

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Acknowledgement: The authors sincerely thank the staff of Al-Shifa Trust Eye Hospital for their invaluable support and assistance during the study.

Conflict of Interest: None

Grant Support & Financial Support: None

ABSTRACT

Background: Dry eye disease is a multifactorial condition that significantly affects tear film homeostasis, resulting in ocular discomfort and surface damage. Surgical interventions like upper eyelid blepharoplasty, often performed for aesthetic and functional purposes, can disrupt the tear film, particularly when combined with levator resection. Understanding the impact of these procedures on dry eye parameters is crucial for optimizing patient outcomes, especially in populations predisposed to dry eye symptoms due to age or other risk factors.

Objective: To evaluate and compare the effects of upper eyelid blepharoplasty with levator resection versus levator resection alone on dry eye parameters, focusing on tear film stability and subjective symptoms.

Methods: This prospective study included 120 eyes from 120 patients diagnosed with acquired ptosis, equally divided into two groups: one undergoing upper eyelid blepharoplasty combined with levator resection and the other undergoing levator resection alone. Dry eye parameters, including tear break-up time (TBUT), Schirmer's test, and Ocular Surface Disease Index (OSDI) scores, were assessed preoperatively, and at 1 and 3 months postoperatively. The surgeries were performed under local anesthesia, and postoperative evaluations excluded the use of lubricants to ensure unbiased tear film assessments.

Results: In the blepharoplasty with levator resection group, the mean preoperative TBUT decreased from 15.27 ± 2.62 seconds to 14.32 ± 2.89 seconds at 1 month, followed by partial recovery to 14.87 ± 2.72 seconds at 3 months. Schirmer's test values dropped from 14.88 ± 2.12 mm preoperatively to 13.87 ± 2.29 mm at 1 month, improving to 14.60 ± 2.13 mm at 3 months. The OSDI score increased from 48.05 ± 19.12 preoperatively to 48.95 ± 19.24 at 1 month and improved to 46.55 ± 19.13 at 3 months. In contrast, the levator resection alone group showed stable dry eye parameters, with preoperative TBUT, Schirmer's test, and OSDI scores remaining consistent at 1 and 3 months.

Conclusion: Upper eyelid blepharoplasty with levator resection temporarily exacerbates dry eye symptoms and reduces tear film stability, with partial recovery by 3 months. Levator resection alone did not significantly impact dry eye parameters, underscoring the role of blepharoplasty-specific interventions in these changes. Proactive patient counseling and early postoperative management are essential for mitigating transient discomfort.

Keywords: Blepharoplasty, Dry eye syndrome, Eyelid surgery, Ocular surface, Ptosis, Tear break-up time, Tear film quality.

INTRODUCTION

Dry eye disease (DED) is a complex and multifactorial condition defined by the disruption of tear film homeostasis, which plays a critical role in maintaining the health of the ocular surface and ensuring clear vision. This loss of homeostasis can result in ocular surface damage, discomfort, and a significant reduction in quality of life for millions of individuals worldwide (1). Tear film homeostasis involves the dynamic balance of tear production, distribution, and drainage, with disruptions often linked to various contributing factors, including age, gender, environmental exposures, systemic diseases, and certain medications (2, 3). Among the procedures that may influence ocular surface health, blepharoplasty has garnered significant attention in recent years. Blepharoplasty is a surgical intervention performed to address deformities and improve the aesthetics of the eyelids, and while it is generally regarded as safe and effective, concerns have emerged regarding its potential to disrupt the delicate tear film balance. Upper eyelid blepharoplasty, in particular, involves manipulation of the orbicularis oculi muscle, which is essential for eyelid closure and the distribution of the tear film, raising the possibility of exacerbating or precipitating DED (4, 5, 6).

The relationship between blepharoplasty and DED remains a topic of ongoing debate, as existing studies have yielded inconsistent results. While some research reports an increase in both subjective dry eye symptoms and objective DED parameters following blepharoplasty (7, 8), others have observed no significant changes or even improvements in certain cases (9, 10). These discrepancies may reflect differences in patient populations, surgical techniques, study designs, and methods used to measure outcomes. Consequently, the interplay between surgical modifications of the eyelids and the tear film system requires further investigation to clarify these conflicting findings.

This study aimed to examine the effects of upper eyelid blepharoplasty, performed with and without concurrent levator resection, on various dry eye parameters. By evaluating parameters such as tear break-up time (TBUT), Schirmer's test, tear film height, and scores from the Ocular Surface Disease Index (OSDI) questionnaire, this research sought to elucidate whether the addition of levator resection exacerbates dry eye symptoms and destabilizes the tear film to a greater extent than blepharoplasty alone. The findings are intended to provide clinically relevant insights to guide surgical decision-making and optimize patient outcomes in this growing field of oculoplastic surgery.

Methods

This study included 120 eyes from 120 patients diagnosed with acquired ptosis, classified into Grade 2 (moderate ptosis, with the upper eyelid covering part of the pupil) and Grade 3 (severe ptosis, with the upper eyelid covering more than half of the pupil). Patients were recruited from the Orbits and Oculoplastics Clinic at Al-Shifa Trust Eye Hospital Rawalpindi between March 2024 and September 2024. Comprehensive ophthalmologic evaluations were conducted for all participants, including visual acuity testing using a Snellen chart, intraocular pressure (IOP) measurement with a pneumatic tonometer, anterior segment and fundus examination, and pachymetry for corrected IOP calculations.

Preoperative assessment of dry eye parameters involved evaluating the tear break-up time (TBUT) and performing Schirmer's test. TBUT was measured by instilling fluorescein dye into the lower fornix, with a break-up time of less than 10 seconds deemed abnormal. Schirmer's test was conducted after administering topical anesthetic (proparacaine). A 5 mm by 35 mm strip of filter paper was placed at the lateral one-third of the lower eyelid margin, approximately 5 mm into the lower fornix, and wetting length was recorded over five minutes, with values below 10 mm considered indicative of dry eye. Additionally, tear film meniscus height was measured using the eyepiece graticule of a slit lamp. Subjective symptoms of dry eye were assessed through the Ocular Surface Disease Index (OSDI) questionnaire, which evaluated discomfort, visual disturbances, and environmental triggers, with higher scores reflecting more severe symptoms. Patients were excluded if they had a history of prior eyelid surgery, congenital or acquired eyelid abnormalities, glaucoma or ocular hypertension, ongoing dry eye treatment, or any systemic or local disease that could affect the ocular surface. This ensured the results reflected the impact of the surgical procedures on dry eye parameters without confounding factors.

Participants were divided into two groups based on the presence or absence of excess upper eyelid skin requiring excision: the first group underwent upper eyelid blepharoplasty combined with levator resection, while the second group received levator resection alone. Preoperatively, precise markings were made on the eyelid skin to guide the surgical incision while ensuring sufficient eyelid closure postoperatively. All surgeries were performed under local anesthesia with sedation. In the blepharoplasty group, excess skin and a portion of the orbicularis oculi muscle were excised, and prolapsed orbital fat, if present, was removed. Skin closure was performed meticulously using 6-0 nylon interrupted sutures to ensure accurate wound approximation and minimize scarring. Postoperatively, patients were prescribed topical antibiotic ointments and oral antibiotics, with no use of eye drops to avoid influencing subsequent ocular surface evaluations. Dry eye parameters, including TBUT, Schirmer's test, and OSDI, were reassessed at one month and three months following surgery to determine the impact of each surgical approach on ocular surface stability and dry eye symptoms.

RESULTS

The study included 120 eyes from 120 patients diagnosed with acquired ptosis, divided into two equal groups: 60 patients underwent upper eyelid blepharoplasty with levator resection, while 60 underwent levator resection alone. The first group had a majority of females (70%, n=42), with a mean age of 54.75 years (SD = 8.92), whereas the second group included 80% females (n=48), with a mean age of 53.25 years (SD = 8.21). Both groups demonstrated comparable preoperative dry eye parameters, as indicated by non-significant p-values for tear break-up time (TBUT) ($p = 0.41$), Schirmer's test ($p = 0.12$), and Ocular Surface Disease Index (OSDI) scores ($p = 0.09$), confirming baseline homogeneity.

In the blepharoplasty with levator resection group, the mean preoperative TBUT was 15.27 seconds (SD = 2.62), which declined to 14.32 seconds (SD = 2.89) at 1 month postoperatively, followed by partial recovery to 14.87 seconds (SD = 2.72) at 3 months. Similarly, the mean Schirmer's test value decreased from 14.88 mm (SD = 2.12) preoperatively to 13.87 mm (SD = 2.29) at 1 month and subsequently improved to 14.60 mm (SD = 2.13) at 3 months. The OSDI score exhibited a slight postoperative increase from 48.05 (SD = 19.12) preoperatively to 48.95 (SD = 19.24) at 1 month, followed by an improvement to 46.55 (SD = 19.13) at 3 months. Tear film height demonstrated a transient decrease from a mean of 29.28 mm (SD = 4.97) preoperatively to 26.98 mm (SD = 5.04) at 1 month, with recovery to 28.60 mm (SD = 4.92) by 3 months.

In the levator resection alone group, dry eye parameters remained relatively stable over time. The preoperative mean TBUT was 14.93 seconds (SD = 3.16), which showed minimal variation at 1 month (14.97 seconds, SD = 3.11) and 3 months (14.95 seconds, SD = 3.09). The Schirmer's test values were similarly consistent, with a preoperative mean of 15.42 mm (SD = 2.05) and postoperative values of 15.45 mm (SD = 2.05) at 1 month and 15.44 mm (SD = 2.06) at 3 months. The OSDI score remained steady, with a preoperative mean of 52.67 (SD = 15.65) and minimal changes at 1 month (52.83, SD = 15.52) and 3 months (52.79, SD = 15.57). Tear film height also remained unchanged throughout the study period, indicating no significant impact on dry eye parameters in this group.

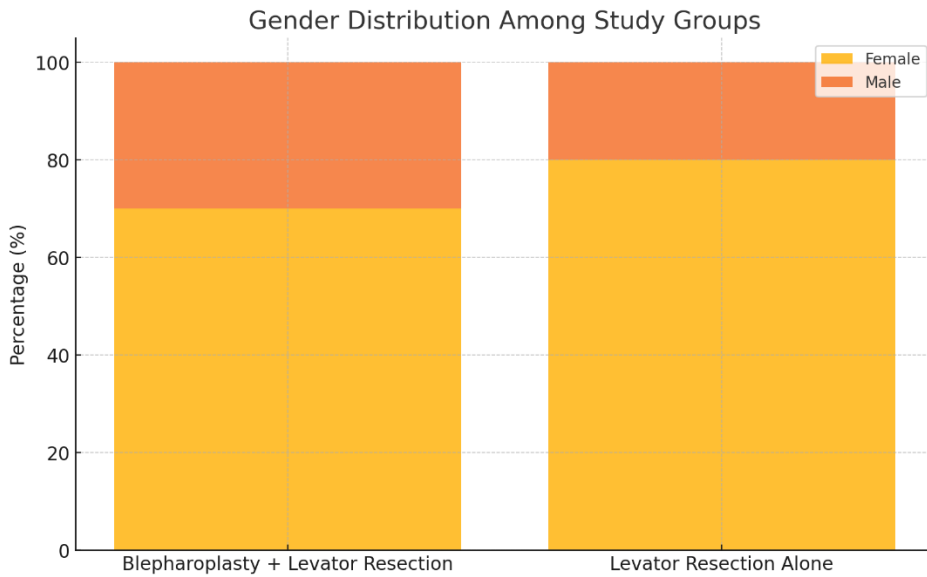


Figure 1 Gender Distribution Among Study Groups

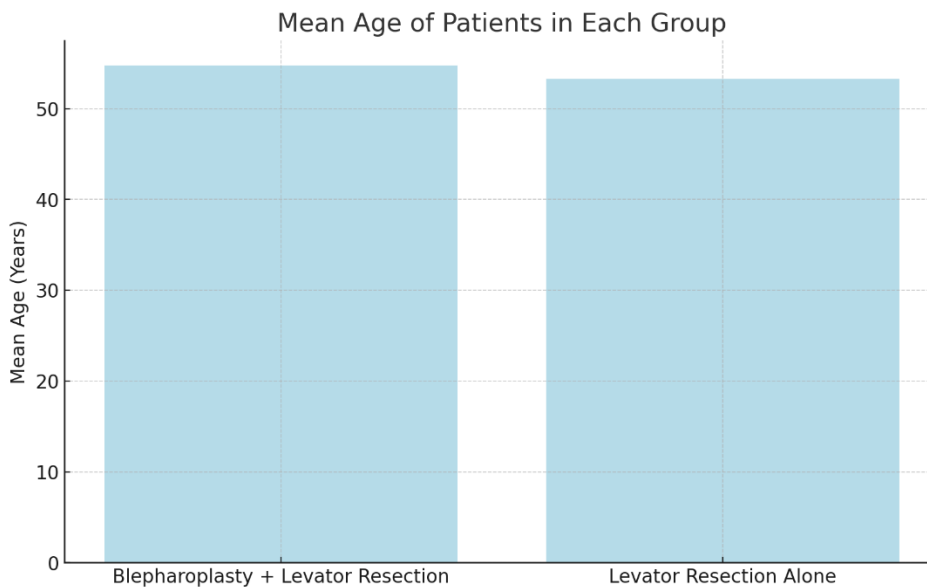


Figure 2 Mean Age of Patients in Each Group

The first chart illustrates the gender distribution across the study groups, with females comprising 70% in the blepharoplasty with levator resection group and 80% in the levator resection alone group, highlighting a predominance of female participants in both groups. The second chart depicts the mean age of participants, showing similar averages of 54.75 years in the blepharoplasty group and 53.25 years in the levator resection alone group, indicating comparable age demographics between the two groups.

Table 1: Dry eye assessment among the study population

Parameter	Blepharoplasty + Levator Resection	Levator Resection Alone	P-value
TBUT (seconds)	15.27 (2.62)	14.93 (3.16)	0.41
Schirmer's Test (mm)	14.88 (2.12)	15.42 (2.05)	0.12
OSDI Score	48.05 (19.12)	52.67 (15.65)	0.09

Table 1 presents the dry eye assessment parameters among the study population. The mean TBUT was 15.27 ± 2.62 seconds in the blepharoplasty with levator resection group and 14.93 ± 3.16 seconds in the levator resection alone group ($P = 0.41$). The mean Schirmer's test values were 14.88 ± 2.12 mm and 15.42 ± 2.05 mm, respectively ($P = 0.12$). The mean OSDI scores were 48.05 ± 19.12 and 52.67 ± 15.65 , respectively ($P = 0.09$). No statistically significant differences were observed between the groups across all parameters.

Table 2: Dry eye parameters at different time points

Parameter	Preoperative	1 Month	3 Months
TBUT	15.27 (2.62)	14.32 (2.89)	14.87 (2.72)
Schirmer's Test	14.88 (2.12)	13.87 (2.29)	14.60 (2.13)
Tear Film Height	29.28 (4.97)	26.98 (5.04)	28.60 (4.92)
OSDI Score	48.05 (19.12)	48.95 (19.24)	46.55 (19.13)

Mean and standard deviation for the dry eye parameters at different time points (Preoperative, 1 Month, and 3 Months) for the group that underwent blepharoplasty with levator resection.

Table 3: Dry eye parameters at different time

Parameter	Preoperative	1 Month	3 Months
TBUT	14.93 (3.16)	14.97 (3.11)	14.95 (3.09)
Schirmer's Test	15.42 (2.05)	15.45 (2.05)	15.44 (2.06)
Tear Film Height	29.35 (4.31)	29.35 (4.31)	29.35 (4.31)
OSDI Score	52.67 (15.65)	52.83 (15.52)	52.79 (15.57)

Mean and standard deviation for the dry eye parameters at different time points (Preoperative, 1 Month, and 3 Months) for the group that underwent blepharoplasty without levator resection.

DISCUSSION

This study evaluated the impact of upper eyelid blepharoplasty, with and without concurrent levator resection, on dry eye parameters. The findings demonstrated a notable increase in dry eye symptoms and a reduction in tear film stability following blepharoplasty with levator resection, as evidenced by elevated OSDI scores and decreased TBUT and Schirmer's test values during the first postoperative month. These results corroborated earlier studies reporting an association between blepharoplasty and heightened dry eye symptoms, particularly when the procedure involves manipulation of the orbicularis oculi muscle or additional interventions (11, 12). The transient exacerbation of dry eye symptoms observed in this study is likely attributable to postoperative changes such as altered eyelid closure dynamics, reduced blink efficiency, and temporary meibomian gland dysfunction, which collectively disrupt tear film homeostasis (13, 14). Notably, the deterioration in dry eye parameters was temporary, with partial recovery evident by three months postoperatively. This trend aligns with previous studies, such as Shao et al. (2014), which highlighted that tear film stability often returns to baseline within

a few months after lower blepharoplasty (15). This recovery phase suggests that postoperative inflammation and tissue remodeling are significant contributors to the temporary symptoms, with the ocular surface gradually adapting to structural changes induced by surgery. However, the resolution was incomplete within the study’s follow-up period, underscoring the need for long-term monitoring to confirm whether full recovery is achievable.

In contrast, patients undergoing levator resection alone exhibited stable dry eye parameters throughout the study period. This finding supports the hypothesis that upper eyelid blepharoplasty, particularly involving excision of the orbicularis oculi muscle, is a key factor contributing to postoperative dry eye symptoms (16). The orbicularis muscle is integral to tear film distribution and eyelid closure, and its manipulation during blepharoplasty likely disrupts these functions. Furthermore, no significant alterations in corneal microstructure were detected, consistent with Aygun et al. (2024), indicating that while blepharoplasty impacts tear film dynamics and subjective symptoms, it does not cause permanent structural damage to the cornea (17). The study’s strengths included its prospective design and comprehensive assessment of dry eye parameters using both objective and subjective measures. However, the relatively small sample size and a follow-up limited to three months are notable limitations. Future studies with larger sample sizes and extended follow-up periods are necessary to better understand the long-term implications of blepharoplasty on dry eye disease. Additionally, the study population predominantly consisted of older female patients, a demographic known to have a higher baseline risk for dry eye disease (18), which may limit the generalizability of the findings to younger or male populations.

Despite these limitations, the study provides valuable insights into the effects of upper eyelid blepharoplasty on dry eye disease. It highlights the transient but significant impact of blepharoplasty on tear film stability and symptoms, underscoring the importance of informing patients about this potential complication. Prophylactic interventions and close postoperative monitoring may help mitigate these symptoms in at-risk individuals. Further research is essential to elucidate the precise mechanisms underlying these effects and to develop targeted strategies for preventing and managing postoperative dry eye symptoms effectively.

CONCLUSION

In conclusion, this study demonstrated that upper eyelid blepharoplasty with levator resection significantly impacts dry eye parameters in the early postoperative period, leading to transient exacerbation of symptoms and decreased tear film stability. These changes were observed to improve partially over time, suggesting that the effects are predominantly temporary and likely related to postoperative inflammation and structural adjustments. Levator resection alone, however, did not produce similar changes, highlighting the role of blepharoplasty-specific interventions, such as manipulation of the orbicularis oculi muscle, in contributing to these symptoms. These findings underscore the importance of preoperative counseling, appropriate patient selection, and proactive postoperative care to minimize discomfort and optimize outcomes for patients undergoing blepharoplasty.

AUTHOR CONTRIBUTIONS

Author	Contribution
Muhammad Saad*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Muhammad Abdul Moqet Khan Adnan	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Hassan Mansoor	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Syed Ali Hasan Naqvi	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Faizan Tahir	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published

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