

Evaluation of Tear Film Before and After Blepharoplasty

Ali Sharaf Eldin¹, Sahar Eltarshouby², Ayman Abd Elghaffar², Dina Abd Elfattah².

1. Resident of Ophthalmology Faculty of Medicine, Mansoura University, Mansoura, Egypt.

2. Mansoura Ophthalmic Center, Faculty of Medicine, Mansoura University, Mansoura, Egypt.

Corresponding author: Name: Ali Mohamed Sharaf Eldin. Resident of Ophthalmology Faculty of Medicine, Mansoura University, Tel. 00201145141122, E-mail: alisharaf11@yahoo.com

Received: 11-8-2024, Accepted: 19-8-2024, Published online: 16-9-2024

EJO(MOC) 2024;4(4):217-224.

Short title: Evaluation of Tear Film Before and After Blepharoplasty

ABSTRACT

Purpose: Blepharoplasty for both functional and aesthetic reasons may change the relative position of the eyelid and cornea, thus mechanically altering the corneoscleral and conjunctival interface to aggravate the dry eye disease. This study was performed to evaluate tear film before and after blepharoplasty.

Patients and methods: Patients with dermatochalasis prepared for blepharoplasty were included in the study. Every participant was subjected to preoperative evaluation including demographic, medical, and past surgical history, and clinical examinations included slit lamp examination, fundus examination, IOP measurement and Anterior segment OCT to measure tear meniscus height. Tear film break up time and Schirmer test were done preoperatively and postoperatively to evaluate the tear film.

Results: This study included 40 eyes of 20 patients who underwent blepharoplasty with mean age 58.9 ± 8.3 years, number of females were 13 (65%) and number of males were 7 (35%). Preoperative TBUT was 15.12 ± 1.67 second which showed no significant difference with the postoperative values at 1 week (16.35 ± 3.76), 1 month (15.47 ± 2.3) and at 3 months (14.2 ± 1.97) postoperatively. Schirmer test 1 (with anesthesia) was 20.27 ± 6.95 mm preoperatively and showed mild but non-significant decrease during the follow up period reaching 17.9 ± 1.65 mm in 3rd month follow up. Also, Schirmer 2 test showed non-significant decrease through the follow up period. Preoperative tear meniscus height was 0.51 ± 0.5 mm which decreased in the 1 week postoperatively to 0.41 ± 0.2 mm, 0.39 ± 0.19 mm in 1st month and 0.32 ± 0.22 mm in 3rd month but these changes were not statistically significant.

Conclusion: According to this study, the tear film was not significantly affected by blepharoplasty procedure used for management of dermatochalasis.

Key words: Tear Film, Blepharoplasty, Dry Eye, Orbit.

INTRODUCTION

The multifactorial ocular surface illness known as dry eye is caused by ocular surface inflammation and injury, tear film instability and hyperosmolarity, and disorders related to the nervous system. Dry eye is characterized by a lack of tear film homeostasis and accompanying symptoms. Depending on how it is diagnosed and treated, it can be categorized as either evaporative or aqueous deficient¹.

The symptoms of moderate-to-severe dry eye disease include noticeable pain, ongoing discomfort, and sporadic visual

impairment. Individuals who encounter these symptoms report feeling less satisfied with their lives, needing to attend the clinic more frequently, and worrying more about their illness. These symptoms seriously impair their mental and physical well-being².

The cause might be a variety of ophthalmic surgical and non-surgical procedures as lid, refractive, keratoplasty, and cataract operations³. A common procedure that is done for both functional and cosmetic reasons is blepharoplasty⁴.

Egyptian Journal of Ophthalmology, a publication of Mansoura Ophthalmic Center.

Address: Mansoura Ophthalmic Center, Mansoura University, Mansoura, Egypt.

Tel. 0020502202064. Fax. 0020502202060.

E-mail: ejo@mans.edu

The primary function of the eyelid is to shield the cornea by distributing tears across it and altering their normal course. When done properly, surgery can maintain the optimal symmetry and proportions of the eyelids while retaining their critical functions⁵.

Lid surgery can have an adverse effect on both the position of the eyelid and the blink force. Damage to the innervation and the creation of scars can result in incomplete reflex blinks, which reduce blink rates and induce lagophthalmos, which decreases the synthesis of lipids by the meibomian glands. Increased tear evaporation, reduced tear outflow, and decreased mechanical tear film distribution may be the cause of postoperative dry eye disease. Additionally, elective cosmetic blepharoplasty may alter the relative locations of the cornea and eyelid, which might alter the corneoscleral and conjunctival contact and exacerbate the dry eye syndrome. Furthermore, surgery may alter the function of the meibomian and lacrimal glands, which might result in postoperative dry eye disease⁶.

Determining the incidence, pathophysiology, causes, therapy, and prevention of dry eye disease after blepharoplasty is an important focus to be considered, with the goal of improving postoperative quality of life, so this study was conducted to evaluate tear film before and after blepharoplasty

PATIENTS AND METHODS

This prospective interventional study was held in Mansoura Ophthalmic Centre, Mansoura University between September 2021 and December 2022. Patients with eye lid dermatochalasis who were prepared for blepharoplasty were included in the study. Individuals taking eye drops that induce dry eye, such as antiglaucoma drops, and those with ocular surface disorders like conjunctivitis, keratitis, trichiasis, blepharitis, and thyroid eye disease were excluded. Individuals who have undergone prior eyelid surgery, ectropion, entropion, lagophthalmos, or periocular trauma resulting in mispositioned eyelids were not included.

A. preoperative evaluation: Every patient experienced a full history taking, including name, age, sex; history of: burning sensation, stinging, redness in the eyes, light sensitivity, past surgical and medical history

clinical examination included UCVA, BCVA, slit lamp examination, fundus examination using indirect ophthalmoscope, ocular tension measurement using applanation tonometer. Tear film break up time, Schirmer test and fluorescein staining were done to evaluate the tear film. Anterior segment OCT was used to measure tear meniscus height using the TOPCON-DRI OCT Triton plus ver. 10.18 OCT equipment.

B) Surgical procedure: All patients had surgeries by one surgeon (Prof. Dr. Ayman Elsayed Abd Elghaffar).

Throughout the preoperative marking procedure, the patient was positioned with their brow raised appropriately, sitting upright, and keeping a neutral expression on their face. The eyelid crease was situated 8 to 9 mm above the ciliary border in females and 7 to 8 mm above it in males. The lower limit of excision was along the eyelid crease, and the lateral range of the marking was defined by an imaginary line from the lateral canthus to the lateral end of the forehead. A pattern of skin excision was seen, with the excision area being at least 10 mm away from the brow's inferior border. At least 20 mm of vertical lid height was maintained for a normal eye closure. The fat was found and reported prior to surgery.

2% lidocaine and 1:100,000 epinephrine was then superficially injected into the upper lids using a 27–30-gauge needle. The skin incision was made using a No. 15 Bard Parker blade. Upper lid blepharoplasty was combined with a conservative fat reduction surgery. The medial and central fat compartments were accessed, teased out, and removed through microscopic septal incisions. From the medial and central areas of fat, only the fat that readily enters the incision was eliminated. It was important to refrain from aggressively clearing fat from the orbit.

Beneath the lateral orbicularis across the superior orbital border, retro-orbicularis oculi fat was reached. Resection was explained as a way to lessen the weight of the lateral brow and upper lid. Sutures held the sub-brow fat pad in place as the incision healed, using eyelid suspension sutures. Two to three absorbable sutures were used to do this, integrating the superolateral arcus marginalis with the orbicularis from the incision's lower and upper borders. These sutures may cause an

early overcorrection of the upper eyelid, which heals into lagophthalmos a few days after surgery. Interrupted sutures with non-absorbable materials were used to repair the skin wound.

C) Postoperative follow up: Topical combined antibiotic/steroid eye drops and oral anti-inflammatory drugs were prescribed for all patients for one week postoperatively. All patients were observed in the 1st day, 1st week, 1st month and 3rd month postoperatively. In each visit, the patients were assessed for uncorrected and best-corrected visual acuity, slit lamp examination, tear film evaluation using Schirmer's test (both with and without topical anaesthesia), Fluorescein staining, tear film break up time (TBUT) and anterior segment OCT to measure tear meniscus height. Complications as edema of the lower and upper eye lids and echymosis were recorded.

Ethics and Consent

The current study was submitted for approval by IRB of Faculty of Medicine at Mansoura University before starting the study on 25/1/2022 (code number MS.21.12.1789). All individuals signed a written informed consent before study contribution. The 1964 Declaration of Helsinki and its later amendments or equivalent ethical standards were followed during study.

Statistical Analysis

The Statistical Package for Social Science (SPSS) programme, created in Chicago, Illinois, USA, was used to do a statistical analysis. Descriptive statistics were reported as mean ± standard deviation for quantitative variables and as percentage for qualitative elements. The appropriate statistical tests were used as needed. A statistically significant P value was defined as one that was 5% or less.

RESULTS

This study included 40 eyes of 20 patients suffered from eye lid dermatochalasis and underwent blepharoplasty.

Demographic data in studied cases showed mean age of patients was 58.9±8.3 years, number of females were 13 (65%) and number of males were 7 (35%) (Table 1).

Table (1): Demographic data in studied group.

Variables	Studied group (n=20)	
	Mean	SD
Age	58.9	8.3
Sex	N	%
male	7	35
female	13	65

Number of eyes suffered from stinging was 22 (55%), burning sensation was 26 (65%), redness of the eye was 26 (65%) and light sensitivity was 30 (75%) As shown in (figure 1)

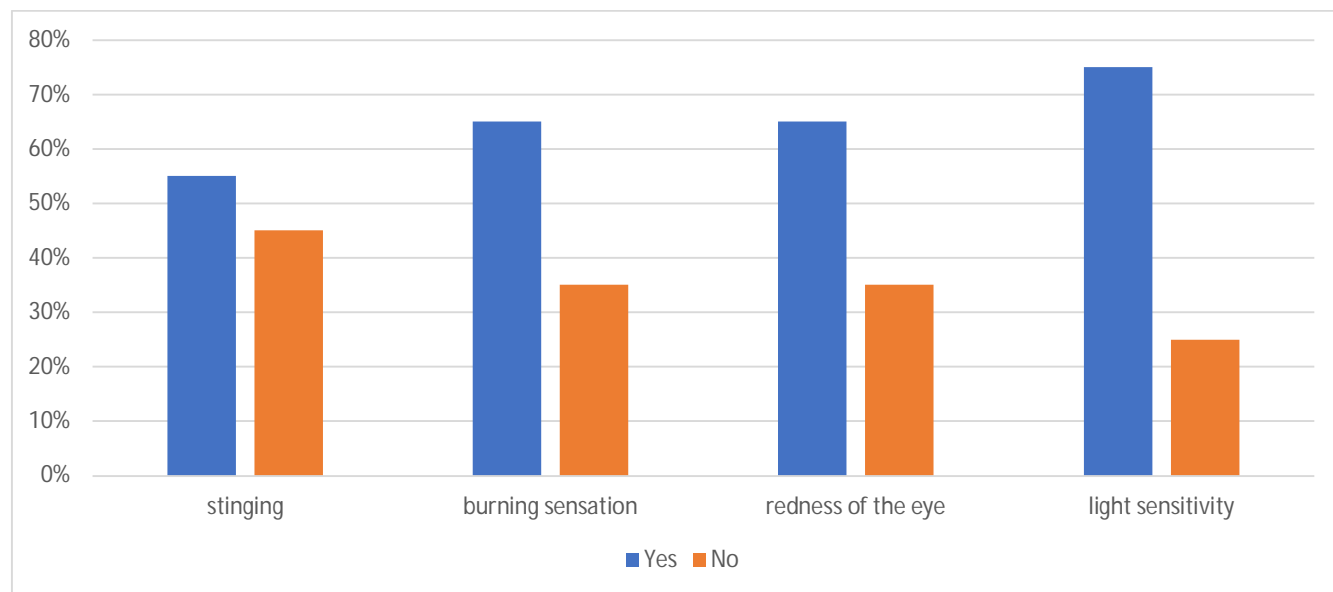


Figure (1): Distribution of Medical History.

There was no statistically significant difference between preoperative and at 3rd month Follow up regarding UCVA, BCVA and ocular tension (Table 2).

Table (2): Distribution of visual acuity and IOP between studied groups.

	Preoperative (n=40)	At 3 months Follow up (n=40)	P. Value
	Mean± SD	Mean± SD	
UCVA.	0.189±0.128	0.185±0.21	0.9
BCVA.	0.535±0.24	0.583±0.28	0.41
IOP	15.1±1.75	14.71±1.64	0.30

p value >0.05: nonsignificant, p value <0.05 significant, IOP was measured in mmHg

Preoperative TBUT was 15.12±1.67 second which showed no significant difference with the postoperative values at 1 week (16.35±3.76), 1 month (15.47±2.3) and at 3 months (14.2±1.97) postoperatively. (Table 3)

Table (3): Preoperative and postoperative follow up Tear film break up time (TBUT) using the anterior segment OCT.

	Preoperative Mean± SD	At 1 week Mean± SD	At 1 month Mean± SD	At 3 months Mean± SD	P value
Tear film break up time (TBUT) (n=40)	15.12±1.67	16.35±3.76	15.47±2.3	14.2±1.97	0.07

P value <0.05 statistically significant, TBUT was measured in seconds

Schirmer test 1 (with anesthesia) was 20.27±6.95 mm preoperatively and showed mild but non-significant decrease during the follow up period reaching 17.9±1.65 mm in 3rd month follow up. Also, Schirmer 2 test showed non-significant decrease through the follow up period from 18.1±6.5 mm preoperatively to 15.9±1.48 mm at 3rd month follow up (Table 4).

Table (4): Preoperative and postoperative follow up of Schirmer test1 and Schirmer test2.

	Preoperative mean± SD	At 1 week mean± SD	At 1 month mean± SD	At 3 months mean± SD	P. Value
Schirmer test1(with anesthesia) mm (n=40)	20.27±6.95	19.1±3.03	18.6±2.11	17.9±1.65	0.06
Schirmer test2(without anesthesia) (n=40)	18.1±6.5	17.1±2.96	16.9±1.89	15.9±1.48	0.08

P value <0.05 statistically significant, The test was measured in mm

Using the anterior segment OCT, the preoperative tear meniscus height was 0.51±0.5 mm which decreased in the 1week postoperatively to 0.41±0.2 mm, 0.39±0.19 mm in 1st month and 0.32±0.22 mm at 3rd month but these changes were not statistically significant (table 5).

Table (5): Preoperative and postoperative tear meniscus height by anterior segment OCT.

	Preoperati ve Mean± SD	At 1 week Mean± SD	At 1 month Mean± SD	At 3 months Mean± SD	P valu e
Tear meniscu s Height (n=40)	0.51±0.5	0.41±0.2	0.39±0.19	0.32±0.22	0.05

P value <0.05 statistically significant

Table 6 illustrated that 65% of cases had ecchymosis, while 35 % had lid edema and they all improved within 1 week by conservative treatment as cold fomentations, anti-inflammatory drugs and lubricant eye drops.

Table (6): Distribution of complications between studied groups.

complications	Studied groups
	N= 40
Edema	14 (35%)
ecchymosis	26 (65%)
Improvement within 1 week	
Cold fomentations	24 (60%)
Anti-inflammatory drugs	18 (45%)
lubricant eye drops	36 (90%)

DISCUSSION

Upper eyelid blepharoplasty has been widely accepted as an effective and long-lasting therapeutic option for dermatochalasis⁷. However, the disturbance to the ocular surface's homeostasis following an upper blepharoplasty contributes to the development of non-infectious postoperative complications such as dry eye, which may develop in patients having upper blepharoplasty, or it may worsen existent conditions⁸. The differences in the current research findings make it unclear if those who have eyelid surgery are more likely to get dry eye disease. Owing to a few risk factors, eyelid surgery may result in dry eye disease, a complicated illness⁹. So, this prospective interventional study was carried out to evaluate tear film before and after blepharoplasty.

In the current study, there was no statistical significance difference between preoperative and postoperative follow up regarding to UCVA, BCVA, IOP, tear film evaluation in regarding TBUT, Schirmer test 1(with anesthesia) or Schirmer test 2 (without anesthesia).

In concordance with our results, Floegel et al.¹⁰ and Soares et al.¹¹ found that the findings of the Schirmer and TBUT tests did not significantly change after blepharoplasty. Similarly, Dailey et al.¹² and Uğurbaş et al.¹³ studies which no adjustments were made that might cause dry eyes when TBUT and Schirmer's test were performed to analyse the tear film quality in patients who received Muller's muscle excision during ptosis surgery. Also, our results are consistent with the study performed by Mak et al.¹⁴. They proposed that post-operative

dry eye was unlikely to be caused by blink dynamics, which were not impacted by upper blepharoplasty.

Similarly, Hollander et al.¹⁵ randomized controlled trial discovered that, with or without excision of the orbicularis oculi muscle, there were not statistically significant or clinically meaningful differences in dry eye parameters in either treatment group during a long-term follow-up (12 months) compared with baseline. Also, Lima et al.¹⁶ in a series of 29 cases that underwent blepharoplasty, found that there were no discernible changes in any of the postoperative tests, such as the Schirmer's, TBUT, and rose bengal tests. This is because the Schirmer's test was performed in response to alterations in the palpebral fissure.

However, Shao et al.¹⁷ found that, one week after the operation, the Schirmer test result had significantly decreased. Kim et al.¹⁸ found a significant increase in the Schirmer test at 1 month postoperatively, while Watanabe et al.¹⁹ showed a decrease in tear volume after cosmetic blepharoplasty.

In our study, we used the tear meniscus height which is a readily available, non-invasive, and practical clinical tool for determining tear volume and identifying dry eye with inadequate tears²⁰, we found no significant difference between preoperative and postoperative tear meniscus height in the studied group. In disagreement with Shao et al.¹⁷ study, in which the tear meniscus height, tear meniscus cross section area, and tear meniscus depth returned to baseline at 3 months postoperatively. Which can explain why patients feel dry with decreased tear secretion but with tearing or tearful eyes simultaneously. They hypothesize that the increased tear meniscus resulted from the following factors:

(1) lacrimal canalicular distortion: the tightened tension of the lower eyelid resulting from the excision of eyelid skin and suspension of the orbicularis muscle to the periosteum of the lateral orbital rim led to the change in the lacrimal punctum and canaliculi; (2) the excision of the orbicularis muscle weakened the pump ability of the lacrimal punctum; and (3) hypersecretion resulted from exposure of conjunctiva owing to temporary mild inferior displacement of the lower eyelid after surgery, which may be caused by the temporary orbicularis dysfunction, imbalance in lower eyelid forces, and scar retraction.

Although blepharoplasty is a surgical method that yields good results, occasionally issues may still occur. Before surgery, patients need to be informed about these complications. In this study, we found that there was 65% had ecchymosis, while 35% had edema and they improved within 1 week by the following, 60% of patients used Cold fomentations, 45% used Anti-inflammatory drugs and 90% used lubricant eye drops. The pathogenesis of ecchymosis is not clearly understood but may be attributable to conjunctiva exposure resulting from temporary mild inferior displacement of the lower eyelid after surgery.

In agreement with our findings, Rhee et al.²¹ found that severe periocular edoema and chemosis are rare side effects of upper eyelid blepharoplasty. Increased episcleral venous pressure with chemosis and orbital congestion may be seen in patients with significant periocular inflammation. Similarly, Morax et al.²² stated that Orbital haemorrhage, ischemic optic neuropathy, keratoconjunctivitis sicca, epiphora, ptosis, ectropion or entropion, lagophthalmos, enophthalmos, and scar tissue healing are among the unfavourable results of surgery.

The present study has some limitations. For instance, there were just a few eyes, the follow-up period was short, and neither the assessment of interpalpebral fissures nor its evaluation occurred before or after the therapy. Furthermore, no assessment of the effects of perioperative medications including those that reduce inflammation has been published.

CONCLUSION

After blepharoplasty, the mechanics of tears stay the same. The surface of the eye and the tear film were not significantly affected by the procedure.

Informing patients that post-operative symptoms such as ecchymosis and lid oedema would resolve early after surgery might increase patient confidence and satisfaction. Doing a preoperative examination, diagnosing preoperative dry eye, and overseeing prudent medication use including topical anti-inflammatory medicines and artificial tears are all crucial throughout the perioperative period.

Conflict of interest statement

The authors declare that they have no conflict of interest.

Ethical approval

- All participants in the research provided written and verbal informed permission before sharing any information.
- Confidentiality and privacy were discussed at every stage of the study.
- Any additional purpose was assigned to the collected data.
- The patient was free to discontinue the study at any time.
- The IRB approved the study protocol.
- The Mansoura University Ophthalmic Centre administration, where the study was conducted, approved it.

Authors contribution

All authors are equally contributed.

ACKNOWLEDGEMENT: None

Data Availability: The authors declare that all data supporting the findings of this study are available within the article and its supplementary information file.

Competing interests: The authors declare no competing interests.

Corresponding author

Correspondence to: Ali Mohamed Sharaf Eldin

Email: alisharaf11@yahoo.com

Affiliations

Ali Mohamed Sharaf Eldin. Resident in Mansoura ophthalmic hospital ministry of health, Egypt.

Ethics declarations: All procedures performed in the study followed the 1964 Helsinki declaration and its later amendments, University Ethics Committee approved the project.

Conflict of interest

All authors have no conflicts of interest that are directly relevant to the content of this review.

Funding: No sources of funding were used to conduct this review.

Reviewer disclosures: No relevant financial or other relationships to disclose.

Declaration of interest: No financial affiliations or financial involvement with any organization or entity with a financial competing with the subject matter or materials discussed in the review.

REFERENCES

1. Gomes JA, Azar DT, Baudouin C, Efron N, Hirayama M, Horwath-Winter J, Kim T, Mehta JS, Messmer EM, Pepose JS, Sangwan VS. Tfos dew's ii iatrogenic report. The ocular surface. 2017 Jul 1;15(3):511-38.
2. Gonnermann J, Klein JP, Klamann MK, Maier AK, Pleyer U, Jousseaume AM, Bertelmann E. Dry eye symptoms in patients after eyelid reconstruction with full-thickness eyelid defects: using the Tomey TG-1000 thermographer. Ophthalmic Research. 2012 Oct 1;48(4):192-8.
3. Zhang SY, Yan Y, Fu Y. Cosmetic blepharoplasty and dry eye disease: a review of the incidence, clinical manifestations, mechanisms and prevention. International journal of ophthalmology. 2020;13(3):488.
4. Su Y, Liang Q, Su G, Wang N, Baudouin C, Labbé A. Spontaneous eye blink patterns in dry eye: clinical correlations. Investigative ophthalmology & visual science. 2018 Oct 1;59(12):5149-56.
5. Mack WP. Blepharoplasty complications. Facial Plastic Surgery. 2012 Jun;28(03):273-87.
6. Belmonte C, Nichols JJ, Cox SM, Brock JA, Begley CG, Bereiter DA, Dartt DA, Galor A, Hamrah P, Ivanusic JJ, Jacobs DS. TFOS DEWS II pain and sensation report. The ocular surface. 2017 Jul 1;15(3):404-37.
7. Niamtu J. Cosmetic facial surgery. Elsevier Health Sciences; 2022 Mar 22.
8. Zhao S, Song N, Gong L. Changes of dry eye related markers and tear inflammatory cytokines after upper blepharoplasty. Frontiers in Medicine. 2021 Dec 9;8:763611.
9. Fan W, Rokohl AC, Guo Y, Heindl LM. Ocular surface and tear film changes after eyelid surgery. Annals of Eye Science. 2021 Mar 15;6:9.
10. Floegel I, Horwath-Winter J, Muellner K, Haller-Schober EM. A conservative blepharoplasty may be a means of alleviating dry eye symptoms. Acta Ophthalmologica Scandinavica. 2003 Jun;81(3):230-2.
11. Soares A, Faria-Correia F, Franqueira N, Ribeiro S. Effect of superior blepharoplasty on tear film: objective evaluation with the Keratograph 5M-a pilot study. Arquivos Brasileiros de Oftalmologia. 2018 Oct 8;81:471-4.
12. Dailey RA, Saulny SM, Sullivan SA. Müller muscle–conjunctival resection: effect on tear production. Ophthalmic Plastic & Reconstructive Surgery. 2002 Nov 1;18(6):421-5.
13. Uğurbaşı SH, Alpay A, Bahadır B, Uğurbaşı SC. Tear function and ocular surface after muller muscle-conjunctival resection. Indian Journal of Ophthalmology. 2014 May 1;62(5):654-5.
14. Mak FH, Ting M, Edmunds MR, Harker A, Edirisinghe M, Duggineni S, Murta F, Ezra DG. Videographic analysis of blink dynamics following upper eyelid blepharoplasty and its association with dry eye. Plastic and Reconstructive Surgery–Global Open. 2020 Jul 1;8(7):e2991.
15. Hollander MH, Pott JW, Delli K, Vissink A, Schepers RH, Jansma J. Impact of upper blepharoplasty, with or without orbicularis oculi muscle removal, on tear film dynamics and dry eye symptoms: a randomized controlled trial. Acta ophthalmologica. 2022 Aug;100(5):564-71.
16. Lima CG, Siqueira GB, Cardoso IH, Sant'Anna AE, Osaki MH. Evaluation of dry eye in before and after blepharoplasty. Arquivos Brasileiros de Oftalmologia. 2006;69:227-32.
17. Shao C, Fu Y, Lu L, Chen J, Shen Q, Zhu H, Fan X. Dynamic changes of tear fluid after cosmetic transcutaneous lower blepharoplasty measured by optical coherence tomography. American Journal of Ophthalmology. 2014 Jul 1;158(1):55-63.
18. Kim HH, De Paiva CS, Yen MT. Effects of upper eyelid blepharoplasty on ocular surface sensation and tear production. Canadian Journal of Ophthalmology. 2007 Oct 1;42(5):739-42.
19. Watanabe A, Selva D, Kakizaki H, Oka Y, Yokoi N, Wakimasu K, Kimura N, Kinoshita S. Long-term tear volume changes after blepharoptosis surgery and blepharoplasty. Investigative Ophthalmology & Visual Science. 2015 Jan 1;56(1):54-8.

20. Shrinkhal RV, Singh A. Diagnosis of Dry Eye. Dry Eye Syndrome: Modern Diagnostic Techniques and Advanced Treatments. 2022 Jan 7:47.
21. Rhee DJ, Gupta M, Moncavage MB, Moster ML, Moster MR. Idiopathic elevated episcleral venous pressure and open-angle glaucoma. *British Journal of Ophthalmology*. 2009 Feb 1;93(2):231-4.
22. Morax S, Touitou V. Complications of blepharoplasty. *Orbit*. 2006 Jan 1;25(4):303-18.